

Developing an Innovative Procurement Model for Construction in Ontario

Phase 1: Global Best Practices for Construction Procurement

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Nomenclature

CCA	Canadian Construction Association
CCDC	Canadian Construction Documents Committee
CM	Construction management
DB	Design build
DBB	Design bid, build
FIDIC	International Federation of Consulting Engineers
MLIT	Ministry of Land, Infrastructure and Transport
MOC	Ministry of Construction

1 INTRODUCTION

According to Statistics Canada, Ontario spent over \$8.5B in 2002 on non-residential construction, which was just under half (48%) of all non-residential construction in Canada. Further, institutions and governments purchase approximately 1/3 of all non-residential construction in Canada. Procurement procedures used by most public owner/clients in the North American ICI sector are based solely on the lowest bid award system. This is not always the case in other countries. Some use an award system based upon the belief that the best bid is the most reasonable one i.e. the one closest to some average. In some cases, the one or two highest and lowest bidders are disqualified, and the bid closest to the average of the remaining bids is selected. The owner or engineer's estimate is often included as a constraint in the evaluation process. For example, the winning bid is that which is lower than the owner's estimate and lower than but closest to the average bid. On large projects in Japan, the two most qualified contractors are awarded each one third of the project - the final third goes to the contractor that outperforms the other on their first phase contract. In Germany, the bidding process is open and highly regulated. Alternatives are encouraged but they must be accompanied by complete construction details. The contract is awarded to the most economical bid based on total life cycle costs. The European Union is currently standardizing procurement practices for public projects.

We envision a transparent flexible procurement system that encourages innovation and supports a business culture where industry players are willing to invest in new ideas and to take risks to implement their innovations.

Undesirable outcomes in the construction process, such as cost overruns, time delays, or litigation, are the initial motivations of owners seeking a better procurement strategy. Generally, when a "new" approach emerges from a number of successful practical case studies, it is initially considered a panacea for all problems. But once its limitations are found, the approach is discredited and there are calls for yet another new approach [Cox & Townsend 1998]. This is evidenced by the recent interest in partnering, which was considered by many to be *the* solution for the fragmented and adversarial culture in construction. Cox and Townsend [1998] argued that there can never be one best practice, and only senior corporate decision-makers with understanding of both of the

techniques available and the unique properties of supply chains within which the company is operating can give their strategic vision for the company. This opinion is commonly accepted by construction practitioners.

1.1 Research Objectives and Scope

The convenience and simplicity associated with the lowest bid procurement system comes at a cost – *lost opportunities, lost innovations, and lost value*. The primary objective of this research was to investigate global construction procurement practices, identifying advantages, disadvantages, limitations, and application areas.

1.2 Methodology

A number of countries with cultures reasonably compatible to Canada but having unique construction procurement practices were identified for this study to gain insight to trends and practices that may benefit the Ontario construction industry. This report first provides background information to establish common definitions of the procurement terms used throughout this report. A public procurement process model developed by the International Trade Centre¹ was used to organize the topics [ITC 2004]. The portions of this model (Figure 1) that were explored include:

- ✍ Procurement request, including delivery methods and contract types
- ✍ Identification of suppliers, including contractor prequalification and postqualification
- ✍ Evaluation, including evaluation and award systems
- ✍ Other issues, including partnering and lean construction

The countries investigated were Canada, Australia, China, Japan, UK, the European Union, and Russia. An initial literature review provides general and historical information.

¹ The ITC is an agency of the United Nations Conference on Trade and Development and the World Trade Organization to support the business development in developing and transitional economies.

Questionnaires related to current practices and industry problems were completed by experts in Canada, UK, Japan, China, and Australia.

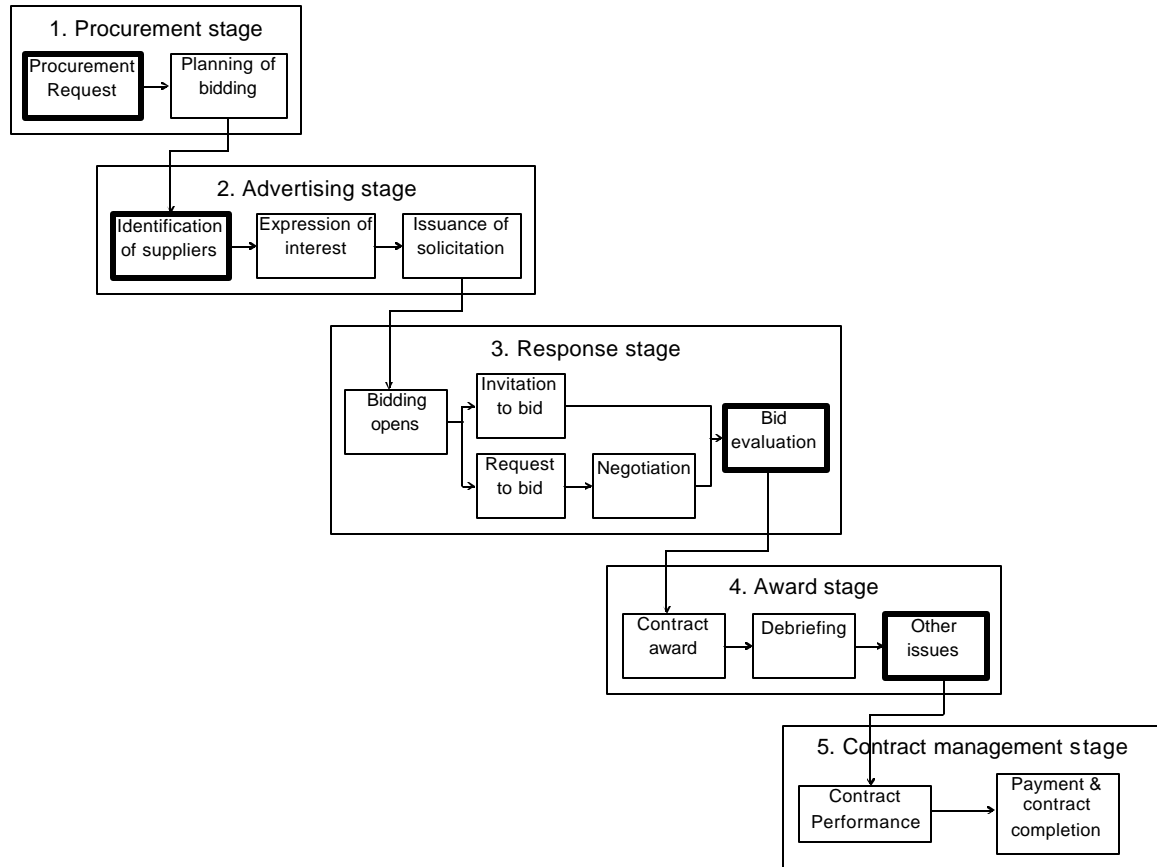


Figure 1: ITC Public Procurement Process Model [ITC 2004]

A total of twenty questionnaires were obtained from construction experts. They were conducted by e-mail in the Australia (3), UK (2) and Japan (2), by telephone interview in China (3), and face to face in Canada (10). The experts from Canada were asked for their opinions about current Canadian construction practices and the possibility of adopting procurement strategies from other countries.

2 PROCUREMENT REQUEST: DELIVERY METHODS AND CONTRACT TYPES

Construction procurement is the owner/developer's approach to organizing the project team and contractual issues to get projects finished safely, on time, within budget, and achieve certain quality and environmental requirements. Procurement strategies are a function of:

- ✍ Delivery methods. e.g. Traditional design-bid-build; design-build; construction management
- ✍ Contract types. e.g. Lump-sum; unit price; cost plus fee; guaranteed maximum price
- ✍ Procedure. e.g. Linear process; fast track
- ✍ Present methods. e.g. Public competitive bid; selective competitive bid; negotiation
- ✍ Partnering.
- ✍ Contractor prequalification.
- ✍ Incentives in construction contracts. e.g. Cost, time, quality, sustainability or safety
- ✍ Lean construction. e.g. Standardization & modularization in design and construction
- ✍ Financial resources. e.g. Public or private financing; public and private partnerships
- ✍ etcetera

“...[should be] moving toward the best value rather than lowest-cost bidding approaches to major capital procurement projects...”

Ted Chudleigh, Keeping Ontario industries competitive in the global marketplace”, 2002

Although design-build and construction management delivery methods are acknowledged and accepted by more and more construction practitioners, the traditional design-bid-build delivery method is still the predominant mode of delivery in the North American construction market.

2.1 Delivery Methods

Common delivery methods are defined here to ensure consistency in the discussions that follow. In the organization figures, solid lines represent contractual relationships. Dashed lines represent communication pathways.

2.1.1 Traditional design-bid-build (DBB)

The traditional design-bid-build (DBB) method separates the functions of design and construction. The owner enters into a contract with the designer, who prepares the design and the construction documents, and usually acts as the owner's representative throughout construction. After the project is awarded to the contractor, the contractor is responsible for delivering the completed project in accordance with the drawings, specifications, and contract documents.

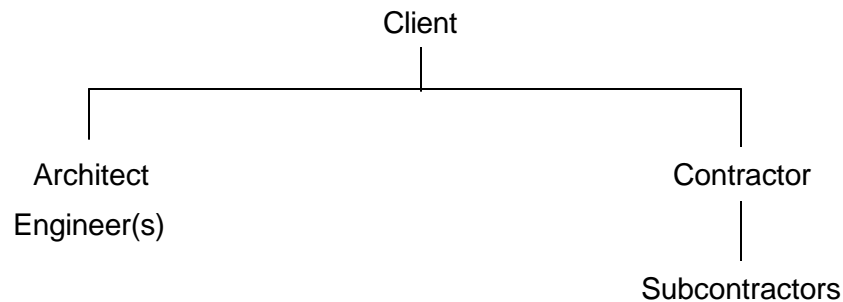


Figure 2: Typical design-bid-build structure

Because DBB has been the predominant project delivery system in North America (particularly in public projects), the procedures, rules of conduct, and contracts are well understood. Public agencies favor this arrangement because they have a fixed cost at the start of the construction. The lowest bid also provides owners a reliable market price for the project and presumably the greatest economic efficiency. The DBB method may be optimal if certain requirements are satisfied:

- ✍ The design of the project can be developed without the involvement of a contractor and can be completed before the contractor is chosen.
- ✍ The owner can manage to establish communication between the designer and constructor.
- ✍ The duration of the project is not crucial.

Many disadvantages of DBB have been recognized, including:

- ✍ The adversarial relationship that often develops between the owner, designer, and contractor due to conflicting goals and unfair unloading of risk.
- ✍ Construction professionals cannot contribute their expertise to improve the constructability and economy of the design.

- ✍ Project duration from conception to completion is maximized because there is no overlapping of design and construction. This issue is one of the primary reasons for the recent decline in the use of the traditional method [Gould and Joyce 2003].
- ✍ Poor contract documents could lead to costly claims by the contractor, which would increase the cost of the project and delay the construction time.
- ✍ Fierce price competition and reduced margins.

2.1.2 Design Build (DB)

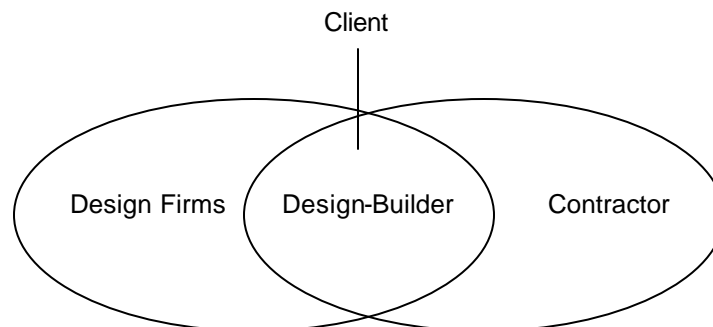


Figure 3 Typical Design Build Structure

Design build (DB) is the oldest known delivery method and is characterized by a single source provider for both design and construction. In ancient Mesopotamia, the Code of Hammurabi (1800 BC) fixed absolute accountability upon master builders for both design and construction [DBIA 2005]. Today, organizations offering this service may be DB firms with in-house employees skilled in design and construction or two distinct design and construction firms that joint venture to perform a project, often with the contractor taking the lead role. Slight variations on the theme include:

- ✍ *Detail design and construction* – used when the owner prepares the design to a significant extent then passes it over to contractor to complete the detail.
- ✍ *Design and Construct* – the classic design and build approach where the contractor does the design based on the owner's brief.
- ✍ *Turnkey* – is similar to design and construct with one difference - the owner is provided with a package deal, i.e. the product is presented by the contractor to the owner in a ready-to-use form.
- ✍ *Design-Manage* – the organization responsible for design and construction employs consultants to do the design and construction, preserving the managerial role for

itself. With such an approach it is unclear if this delivery method should be related to DB or Project Management.

- ✍ *Managing Contractor* – involves the contractor managing the design consultants, subcontractors, and having costs reimbursed plus a fixed or percentage fee. In this case, the contractor has less risk and responsibility than in full DB, and all site work is done by subcontractors.

The advantages of the design build delivery method are:

- ✍ The owner can focus on scope/needs definition and timely decision-making, rather than on coordinating the designers and builders
- ✍ Improved communication between the design team and construction team, which often leads to improved constructability and economy of the project, reduced change orders, claims, disputes and time delays
- ✍ Projects can be fast-tracked, reducing the time to project completion because the contractor may begin construction before the design is complete.

The disadvantages of the design build delivery method are:

- ✍ The design-builder may provide less facility (making the scope of work fit a certain price) than a bid approach to obtain maximum profit
- ✍ The owner loses its representative on site. Because the designer no longer acts as an owner's representative, hidden reductions in quality are possible when cost-savings and design changes are determined by the design-builder.

To reduce these problems, the owner may hire a design consultant to do the preliminary design then the design-builder for the detailed design and construction. Some owners also hire a consultant to supervise the project.

Ling and Kerh [2004] compared the performance of 65 DBB and 42 DB projects in Singapore. They found that other than delivery speed, there were no significant differences in cost or quality between the two delivery methods. They concluded that excellent project performance is not dependent on the delivery system, but more on the selection of designers and constructors.

2.1.3 Construction Management (CM)

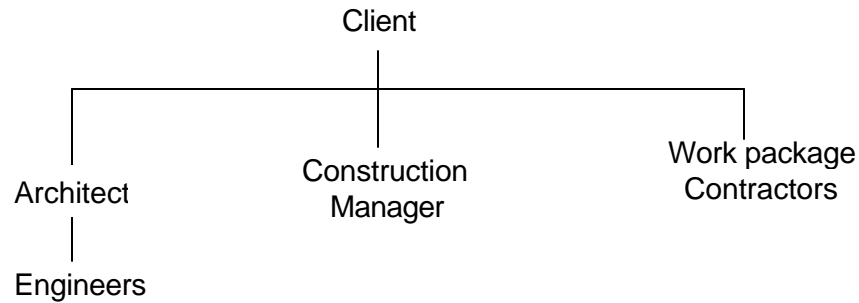


Figure 4 Typical Construction Management Structure

Few private owners or public agencies have the in-house ability to manage the planning, design and construction of a complex project. To address this problem, the owner may employ both a design consultant and a CM firm in the early phase of a project. Which firm is contracted first and the delegation of responsibilities depends on the degree of owner's level of involvement as well as the expertise of the design and CM firms. The CM could be a designer, a general contractor, or a management consultant.

CM services can be provided in two ways: Construction Manager as Agent (CM-Agent) and Construction Manager as Contractor (CM-Contractor). The difference between the two is that CM-Agent performs as an additional representative of the owner's interests; CM-Contractor provides both general contractor services and construction management services for a project. The important feature that distinguishes this system from all others is that all contractors and subcontractors have contracts with the client not with the CM, thus, allowing for more client's control of the process.

The advantages of the CM delivery method are:

- ✍ This arrangement allows value engineering and constructability analysis to be applied efficiently in a project. It also encourages fast tracking.
- ✍ Because the construction manager and designer are brought into the project early in the process, their collaboration can minimize design changes, claims and disputes and save money and time.

The disadvantages of construction management are:

- ✍ The fee that owners pay for the construction management work may be considered as extra to the overall project cost, particularly in the CM-Agent form.
- ✍ The adversarial relationships in CM-Contractor between the owner, designer, and builder may still exist as with that of the DBB approach.

2.1.4 Project management (PM)

In PM, the client employs an organization to carry out all the necessary functions to procure a project. Pure project management is where the project manager is given all decision-making powers, so that the PM firm can make economic, financial and strategic decisions on behalf of the client without asking for the client's approval at every decision making situation. The system is presented in Figure 5.

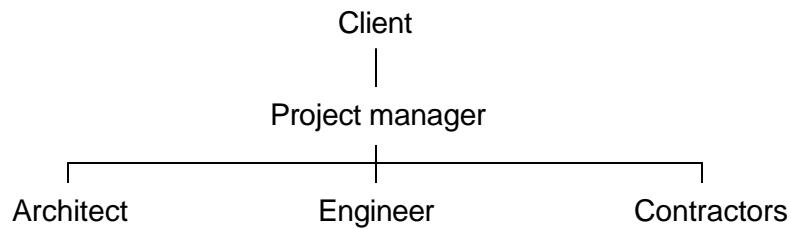


Figure 5: Typical project management structure

2.1.5 Management contracting

The system is presented in Figure 6.

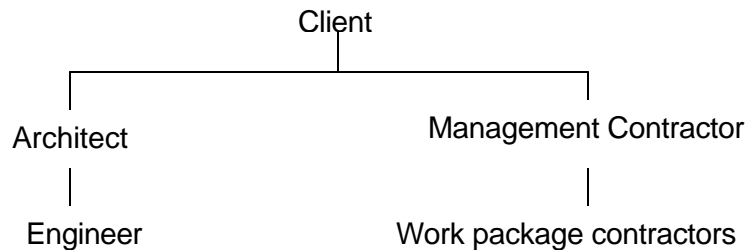


Figure 6: Typical management contracting structure

The major feature of the Management contracting system is that instead of a main contractor the client employs a management contractor who manages the construction process on behalf of the client. The management contractor does not employ direct labour but sub-contracts out all the construction activities to work package contractors.

Hamilton (1990) argues “Management contracting has all disadvantages of other forms of contract and none of the advantages”.

2.1.6 Design – Construct – Maintain (DCM)

This procurement method is used when maintenance issues or maintenance costs of the built asset are important throughout its life cycle. The contractor is accountable not only for the design and construction phases but also for the maintenance of the built facility. Noteworthy is that the maintenance risk is now transferred to the contractor while the owner maintains control of the facility. DCM is distinguished from Build – Own - Operate – Transfer in that the contractor never owns the built facility. A number of major highways, water treatment facilities, petroleum infrastructure and similar facilities have been delivered using DCM [Carmichael 2000].

2.1.7 Build Own Operate Transfer (BOOT)

This delivery method is similar to DB, but has a longer term involvement of the design build team. It is applied when the financial involvement of private sector is required in public sector. Normally, these are infrastructure projects of large scale such as highways, airports, power stations, canals, ports, etc. The investor is typically a group of organizations with interests in financing, operating and contracting. After the construction is finished, the investors own and/or operate the facility to gain return on their investment, after which the facility is generally transferred back to the public entity. Typically, the BOOT team is also responsible for the design. Variations on the theme include:

- ✍ Build-Operate
- ✍ Build-Operate-Transfer
- ✍ Build-Own-Operate
- ✍ Build-Operate-Lease-Transfer
- ✍ Build-Lease-Operate.

2.2 Contract Types

A contract is a legally-binding agreement between two or more individuals in which one agrees to perform or provide a specific task or service to another one in exchange for

something. The contract type, like the delivery method, is an important choice for the owner because it allocates project risks. Beside these broad groups of contracts, convertible contracts may be used when the project begins on the basis of one payment type and converts to another at a certain point in the process. For instance, a project can start on a cost plus fee and convert to a lump sum once the scope can be sufficiently defined.

2.2.1 Stipulated price (fixed price, lump sum)

In this contract, the contractor is required to complete a defined package of work in exchange for a predefined sum of money. Ideally, the project is accurately and completely determined in both the quality and quantity before the contract is set. Incomplete design drawings, design changes, and errors may open opportunities for the contractor to claim for extras to the contract resulting in additional costs [Gould & Joyce 2003].

The advantage of this contracting method is that the owner knows before the work begins what the final cost of the project will be. For this reason, stipulated price general contracting remains the preferred way to deliver most projects in the public sector, where the overriding consideration is the accountability of the taxpayers' money and objectivity in selection of contractors.

2.2.2 Unit price contract

In a unit price contract, the owner and contractor agree on the final tendered price based on a schedule of fixed price rates and quantities. The estimated quantities are provided by the owner/designer in the tender documents, and contractors bid by setting unit prices for these item quantities and calculating a final price. The unit price includes direct and indirect costs, overhead, general expenses and profit. The owner awards the contract to the lowest price based on the quantities given.

The advantage of unit price contracts is that in many projects, especially a large fast tracked complex project, it is difficult to accurately quantify the work. This approach has the flexibility to accommodate certain design changes and can minimize risk to both the owners and contractors.

This contracting method provides the owner with a competitive bid situation that allows a fair price for the work. However, actual quantities must be measured on the site, requiring an owner's representative to work with the contractor. Actual quantities may be a source of conflict between the contractor and owner. The owner risks not knowing the final cost until the work nears completion, but this disadvantage can be minimized by good design support.

2.2.3 Cost plus a fee

In this type of contract, the owner reimburses the contractor for all related costs and pays a fee for services. This contract is used when the scope of the project is difficult to define or when it is important to fast track the project.

The advantage of this contract is that the contractor can start work without a clearly defined project scope since all costs will be reimbursed and a profit guaranteed. Owners can further benefit from this contractual arrangement by entering into a guaranteed maximum price (GMP). Under this form, the contractor agrees that it will construct the total project in full accordance with the contract documents and that the cost to the owner will not exceed some total upset price. Often the contract includes an incentive clause that specifies that the contractor will receive additional profit for bringing the project in the GMP. This form is currently used in most CM contracts.

Even with a GMP, the risk to the owner is that the project begins with considerable unknowns. Project costs may be capped, but quality and scope may be sacrificed at the expense of the GMP. Owners should ensure they hire a reputable contractor or construction manager whom the owner can trust implicitly [Gould and Joyce 2003].

2.2.4 Incentives in Construction Contracts

Incentives can reduce the adversarial relationship between contracting parties by sharing risks and rewards. Incentives are used to enhance performance over and above baseline requirements specified in the contract, and may be categorized into four types: cost incentives, time incentives, quality incentives and safety incentives. In the future, sustainability incentives may become an important incentive as a result of limited resources, rising energy costs, the Kyoto Protocol, and other environmental issues.

3 IDENTIFICATION OF SUPPLIERS: PREQUALIFICATION

Prequalification is a process in which the owner or its representative evaluates contractors against specified criteria to determine their suitability to successfully perform the project(s), including quality, safety and potential disputes. The purpose is to minimize the chance of project failure by determining a constructor's competence and capabilities to perform the work if the owner awards that organization the contract (Russell, 1996). There are several methods to use when evaluating the ability and stability of a contractor. These include post-qualification and prequalification.

3.1 Contractor Post-qualification

This is an open bidding process where the bidder's qualifications are evaluated only after bidding has closed. At this time, tenders are opened and the qualifications of the lowest-bid contractor are reviewed. If the lowest bidder is deemed unqualified, the second-lowest bidder is reviewed and so on.

There are two serious limitations to this system:

1. Contractors invest significant resources to prepare a tender. Disqualification is a waste of those energies and disputes regarding the disqualified contractors' rights to be awarded the contract can result.
2. It is very difficult for an owner to accept a higher bid once the prices are public, even if the low bidder is found to be unqualified or if there is a significant difference between the lowest and second-lowest bid.

3.2 Prequalification

The pre-qualification process generally has either of the following objectives:

1. To identify contractors that are capable of completing the project.
2. To identify contractors that are not capable of completing the project.

This process requires a team that represents the project owner to use an established set of criteria to evaluate the contractor's Expression of Interest (EOI). In an EOI, the

contractor provides information that represents their capabilities. They may also be asked to provide references and independent confirmation that supports their claims. This information is assessed by the owner before the Invitation to Bid is released.

Assessment usually involves a weighted scoring system where subjective judgment of the contractors' experience becomes an essential part of the process. The prequalified contractors are then notified and invited to prepare a bid for the project.

Prequalification criteria vary from model to model and are usually specific to the project; however, the most common criteria appear in most models in some form. Table 1 shows criteria used in 8 different models listed from the most common to the least common, where:

- 1 = Public owner's projects, Qualifier-1 [Russell and Skibniewski 1990]
- 2 = Private owner's projects, Qualifier -1 [Russell and Skibniewski 1990]
- 3 = Artificial Neural Network model [Hanna et al. 1997]
- 4 = Fuzzy Sets model [Elton et al. 1997]
- 5 = Canada [CCDC 11 – 1996]
- 6 = Saudi Arabia and United Kingdom [Bubshait and Al-Gobali 1996]
- 7 = Japan [Paulson and Aki 1980]
- 8 = Australia [Liston 1994]

4 EVALUATION: CONTRACT AWARD SYSTEMS

The method with which an owner awards the contract is typically the lowest bid award system. However, other systems are or have been used.

4.1 Lowest bid

This competitive system encourages innovation and efficiency to bring the owner the lowest price for a particular set of specifications. In the public domain, this is the most common contract award system because it is transparent and protects the public from corruption [Assaf et al. 1998]. However, it does not necessarily provide the best value. Contractors may bid excessively low in an effort to win the bid, and then attempt to gain the money back by flooding the owner with claims for extra costs. Quality often suffers as contractors are forced to use low quality materials and shortcut workmanship to keep costs to a minimum. A direct correlation between defensive contracts and frequency of disputes has been found [Hartman 1993]. Most practitioners acknowledge that fixed price contracts based on the lowest bid award system fail to exploit constructability and alternative methods, and often do not provide the lowest price [Dozzi et al. 1996].

4.2 Nearest to the Average

In an effort to avoid the lowest bid, the owner may use the average of the bids received as the target, and award the project to the bid closest to that average or to the bid closest but below the average. The average bid method was popular in Italy, Portugal, Peru, Denmark, and Taiwan [Ioannou & Leu 1993]. In some cases, the highest and lowest bids may be removed from the competition before the average is calculated. Further, some rather innovative methods for calculating a weighted average have been developed, but in the end, the winning bid is chosen from the middle range of the bids.

The major disadvantage of the average bid method is that the chance of winning is independent of how careful and innovative the contractor was in preparing the bid. In fact, it might discourage innovation or efficiency because winning the bid is perceived as a random chance event.

4.3 Most economical bid (*best-value procurement*)

The most economical bid is that which shows the lowest life cycle costs of the proposed facility [Assaf et al. 1998]. The practice of awarding to the most economical bid is used in Germany, and is being promoted throughout the European Union. Generally, the lowest construction cost is not the most economical specification for the life of a facility. Criteria to establish most economical bid may include quality, price, technical merit, aesthetic and functional characteristics, environmental characteristics, running costs, cost-effectiveness, after-sales service and technical assistance, delivery date, delivery period, or period of completion [FHWA 2006], some of which are shown in Figure 7.



Figure 7: British Highways Agency value map [FHWA 2006]

4.4 Negotiated contracts

Negotiated contracts are generally not used in the public sector because of the need for transparency and accountability. However, it is used more frequently in the private sector. This method leaves allocation of risk, responsibilities, and scope to be determined by the negotiating parties.

5 OTHER ISSUES: PARTNERING AND LEAN CONSTRUCTION

5.1 Partnering

Partnering is a non-contractual agreement by project stakeholders and participants to work together to achieve the goals of the project. It can be applied to all delivery methods and contract arrangements. The benefit of partnering is that it can create a “win-win” culture and collaborative spirit, improve quality and safety, and reduce cost and time. But it is also limited by public accountability and the nature of the primary business goal: profitability. Widespread growth in project partnering can be traced to the 1994 Latham Report *Constructing the Team* [Jones et al. 2003]. Some believe that the owners’ benefit of partnering is not being fully exploited, particularly in the public sector [Dozzi et al. 1996]

“Partnering is a structured management approach to facilitate team work across contractual boundaries. Its fundamental components are formalized mutual objectives, agreed problem resolution methods, and an active search for continuous measurable improvements.”

CIB 1997

5.2 Lean Construction

Lean construction extends from the success of lean concepts and applications in manufacturing that resulted in a revolution in manufacturing design, supply chain, and assembly to maximize value and minimize waste. In the construction industry, this concept focuses on the standardization and modularization in design, construction and management. The Lean Construction Institute launched a research program called the Lean Project Delivery System (LPDS). It consists of 13 modules, 9 organized in 4 interconnecting triads or phases extending from project definition to design to supply and assembly. In addition, 2 production control modules and a work structuring module, both conceived to extend through all project phases, and the post-occupancy evaluation module, which links the end of one project to the beginning of the next, were developed [Ballard 2000]. A successful example of lean construction is McDonald’s restaurants. McDonald’s has solved problems such as inefficient design and poor schedule / budget performance through an increase in the use of standard, modular components.

6 PROCUREMENT PRACTICES AROUND THE WORLD

The investigation of the first 5 countries, namely, Canada (focus on Ontario), Australia, China, Japan, and United Kingdom included distribution of questionnaires to experts in those countries. European Union countries and Russia did not have questionnaires returned. Therefore, these discussions will be limited to information available through published literature and the Internet.

6.1 Ontario, Canada

The Canadian construction industry is characterized by both intense institutional regulation and strong market competition [Oliver 1997]. Problems in the Canadian industry include a lack of trust, adversarial relationships amongst stakeholders, poor technological and industry infrastructure, weaknesses in implementation, and lack of synergy [Kiran & Kenneth 1998]. The DBB procurement method is still dominant in Canada, although CM and DB are increasing. Based on responses from the questionnaire, CM is used more than DB in Canada. Research also shows that the design-build method decreased in the last 5 years, giving way to the CM method [Zhuang 2005].

Standard documents have been developed by the Canadian Construction Document Committee (CCDC). The CCDC 2 Stipulated Price Contract is the standard construction contract in Canada. Cost plus a fee contract (CCDC 3) is broadly used in construction management projects, and CCA 14 is broadly used in the design-build approach. Other contract types, such as unit price contract (CCDC 4), construction management contract form (CCA 5), are used less frequently. The Standard Acquisition Clauses and Conditions (SACC) contract form is used for Federal government projects, and the Ontario Provincial Standards General Condition Contract is specifically used for Ontario government projects.

Many frequent buyers of construction services have prequalified contractor lists or list the required qualifications when they publish the invitation to bid. Licensing contractors in Canada is only used in specific fields, such as the renovation sector, which differs from the practices in Australia, Japan and China, where licenses are required by all

general contracting firms. For example, all Ontario homebuilders and vendors must be registered with the Tarion Warranty Corporation to build or sell homes and condominiums in Ontario. The registration fee is dependent on the reputation/risk of the applicant. An additional security fee may be needed for the homebuilders that had claims against them [Tarion 2005]. To register each year, the applicant has to:

- ✍ prove financial stability;
- ✍ present their business experience, customer references, and bonding arrangements;
- ✍ estimate the number & type of homes to be built during the next twelve months; and,
- ✍ document inventories of homes and such other information as required.

Outside of the residential sector, bid bonds, performance bonds, and labour & material payment bonds are required by many owners, but it is mandatory in public projects. The bonding system is a major constraint to new contractors entering the construction industry. To obtain bonding, new contractors may be required to provide 3:1 collateral (assets to cover three times the value of the bond). The fee payable for these bonds is based on the risk level, which is assessed by the surety companies issuing the bonds.

The Construction Lien Act is used to protect subcontractor rights and fair competition. In common law, only those parties signatory to a contract have rights under that contract. Therefore subcontractors, suppliers and workers who provide services to a project have no corresponding rights to compel the owner to pay them if the contractor is either unwilling or unable, even though they have added value to the owner's property. The legislation differs in detail from province to province, but the basic premise is that someone who performs work, supplies a service, or supplies material that increases the value of the property should be remunerated for the added value they have provided. If they fulfill their contractual obligations but are not paid according to the contract, then they can register a lien against the owner's property [Stregger, 2001] even if their contract is with another party, such as the general contractor. The Ministry of Consumer and Business Services (MCBS) manages the process of registering a lien.

Public competitive bidding is broadly used in Canada. The lowest bid award system is almost exclusively used, even though it is not mandated by law. In most cases, a formal construction implementation plan is not required during bid evaluation, but may be requested in DB, where the implementation plan is usually part of the proposal.

6.2 Australia

The Australian building and construction industry undertakes about \$64 billion of work [Chiang et al. 2004]. Average construction employment was 634,000 of the 19,358,000 total population with approximately 169,000 firms operating in this sector. The industry contributes 14.4% of Australia's GDP and employs a total of 729,400 people. The construction industry in Australia is expected to grow by 3–4 % in the next 3 years with employment growth of 3-4 % per year [Australian Bureau of Statistics 2005]. The sector is defined by three segments:

- ✍ *Residential building*, involving one dwelling unit (i.e. house) or several dwelling units (i.e. apartments);
- ✍ *Non-residential building*, including hotels, shops, factories, offices; and,
- ✍ *Engineering construction*, which is focused on infrastructure including roads, bridges, telecommunication, water and sewerage, electricity generation and distribution.

In 1986, the Australian government commissioned a study to develop a national construction strategy to improve quality and to adopt international standards. As a result, approximately 33% of current Australian Standards are fully or substantially aligned with International Standards, and 33% of Australian Standards have no international equivalent. Several initiatives for quality assurance and enhancement have been implemented [Chiang et al. 2004]:

- ✍ adoption of ISO 9000 series of quality standards, including
 - ✍ *ISO 9001*- for quality assurance in design/development, production, installation and servicing
 - ✍ *ISO 9002* –for quality assurance in production and installation
 - ✍ *ISO 9003* –for quality assurance in financial inspection and test
- ✍ provision of government funding for the development of quality practices
- ✍ establishment of the joint Accreditation System of Australia and New Zealand to maintain surveillance and control of certificate organizations, the auditor registration schemes and auditor training courses

Established in 1994, the major victory of Australian Building Codes Board (ABCB) was the launch of the Building and Construction Industries Action Agenda by Australian government with funding of Aus\$3.6 million to address issues such as information technology, legislation, project delivery methods, environment, training, and skills development [Chiang et al. 2004]. The ABCB is also responsible for [ABCB, 2005]:

- ✍ developing and managing the Building Code of Australia (BCA),
- ✍ developing a simpler and more efficient building regulatory system, and,
- ✍ enabling the adoption of new and innovative construction technology and practices.

All construction procurement systems discussed in Section 2.1 are employed in Australia [Carmichael 2000]. Contracts fall, in general, into two groups [Carmichael, 2000]: fix price contracts (stipulated price or unit price), and, cost plus a fee. No indication of average bid evaluation strategies was found. Several documents that establish accepted practices for tendering are available:

- ✍ 1996 Code of Practice and Code Tendering: roles of participants are identified, tendering ethics explained (Construction Policy Steering Committee)
- ✍ 2001 Guidelines for Tendering: detailed instructions on the preparation of a tender, the tendering process, and tender evaluation [ACA 2006]

The prequalification of constructors based on the National Pre-qualification Criteria Framework [APCC 1998] is widely used by the private and public sectors of the Australian construction industry. Australian territories have their own guides and documents regarding the prequalification process. Their aim is to encourage contractors and consultants to commit to long-term continuous improvement and to achieve outstanding performance on services and work for building and construction related projects [APCC 2005]. For example, the Department of Commerce in New South Wales has successfully recently implemented a number of prequalification schemes for construction contract services and work of various types and value ranges, including:

- ✍ Contractor Best Practice Accreditation for construction contracts valued at \$2.5 million or over;
- ✍ Contractor Prequalification for construction contracts valued at \$500,000 or over;

- ✍ Regionally based Contractor Prequalification for minor and trade works construction contracts generally valued up to \$500,000;
- ✍ Consultant Prequalification for technical consulting engagements.

6.2.1 Licensing

The investigation of Australian construction procurement, prequalification, and tendering practices revealed no major discrepancies between Canadian and Australian construction. All major construction procurement systems used in Australia are well known in Canada. However, licensing of constructors in Australia is ahead of Canada. Home building contractors in Australia are not permitted to do any contracting that exceeds \$1,000 without a building or specialist license. This brings greater security to the clients and puts more responsibility on building service providers to keep a high level of professionalism and remain competitive. Three documents issued by the Australian government regulate licensing in the construction industry:

- ✍ Building Act 2004
- ✍ Construction Occupations (Licensing) Act 2004
- ✍ Construction Occupations (Licensing) Regulation 2004.

Provincial governments have their own licensing policies issued in accordance with the national licensing legislation. There are presently over forty categories of licenses identified in various documents of the Office of Fair Trading, which administers consumer laws and look after consumer rights. Licenses are identified as being an individual license, qualified supervisor certificate, company license, or partnership license.

The current licensing legislation regulates residential building and all other types of construction differently. Licensing for residential work is more advanced and strict than for non-residential construction. A construction license is subject to renewal according to

“an improved image of the Australian construction industry locally in both and private sectors and in overseas markets... has allowed contractors to invest resources to continuously improve their practice knowing that they will not be disadvantaged. In fact, contractors who will fail to keep up with the prevailing standards will not stay competitive.”

[National Pre-qualification Criteria Framework 1998]

the Construction Occupations (Licensing) Regulation 2004. An applicant may apply for a 1-year license, but the maximum period for a license is 3 years for builders, electricians, plumbers, and gas fitters. For residential construction work, one must have a contractor license to contract, subcontract or advertise to do:

- ✍ Residential building work where the labour and materials content is more than \$1,000
- ✍ Electrical wiring work
- ✍ Plumbing, draining and gas fitting work
- ✍ Air conditioning and refrigeration work (except plug-in appliances)

A recent report provided recommendations for improving the system [CFMEU 2005]:

- ✍ Licensing for the home building industry to be extended across the whole construction industry for all categories of construction work.
- ✍ Licensing categories to be rationalized with a single fee of \$300.
- ✍ Threshold value of \$1,000 to be removed. All so-called minor building work up to a value of \$5,000 to be performed by a licensed builder, specialist trade contractor or trade contractor only.
- ✍ Owner builder should be required to engage a licensed building contractor to oversee building work carried out by licensed contractors only.
- ✍ Color-coded skill card system to be implemented that includes photo ID and other relevant information.

6.3 China

China has a population 1.306 billion (2005), 56 nationalities and a land area of 9.6 million km². Chinese culture is strongly influenced by Confucianism, which is also reflected in Chinese business culture. Government officers or company managers often believe “As a ‘father’ of my region/company, I have to take care of my people and work hard to give them a good life”. A hierarchical organizational structure broadly exists in Chinese government and business relationships. A project manager considers the client as the boss and subcontractors as subordinates [Chen & Partington 2004].

In Chinese construction, relationships are more important than contracts, and claims result in a loss of reputation. Resolving conflict involves quiet negotiation and avoids direct debate or confrontation. Some argue that the weakness of China's legislation system and the lack of institutional protection have promoted this culture [Xin & Pearce 1996; Redding 1990].

Under a one party government, the Chinese economy was a planned economy before the 1980s. The government was not only responsible for providing all of the finances for construction but was also responsible for assigning projects to contractors. Clients were state-owned organizations and their management staff had no responsibility for overruns of budgets and schedules. Since the early 1980s, the Chinese government started an open door policy and the planned economy began to transform into a market-oriented economy within a socialist context, which promoted competition among economic sectors. Bidding mechanisms were introduced in mid 1980, and have developed dramatically since. To promote and manage the competitive tendering approach, the Chinese government set up a number of guidelines and regulations. The Chinese government still influences the construction market, although such influence is changing from traditionally administrative control to legal monitoring [Walker et al. 1998].

A construction cost database with average construction productivity rates is available across the country and is very transparent. Local government agencies publish monthly handbooks and labour prices based on the database, and owners use it to prepare their own project cost estimates. The owner appoints a committee composed of experts and representatives of the owner to evaluate the bids and select a contractor. Typically, the evaluation has two major parts: bid price and technical issues. Technical issues normally include a construction implementation plan and the company's reputation, such as any honors the firm has earned. The Chinese government has established some awards, including a national quality award, a provincial award and a municipal quality award. Technical issues also consider competence, which includes the financial status, the capacity of equipment, and professionals, field experience, work history such as safety records, and quality records.

Common practice is that if a bid falls outside of a certain percentage of the target price (e.g. ±5%), it becomes invalid and is removed from the competition. In the past 3 years,

particularly in big cities such as Beijing and Shenzhen, the lowest bid award system has replaced awards based on the price closest to the target. However, it is still common for the evaluation committee to disqualify bidders if they feel the bid is unreasonably low and the implementation plan unworkable. This is called the *reasonable lowest bid award system*. One interviewee felt that combining price and technical issues (the old way) is the best system for the current Chinese construction market. Recent changes that more closely reflect Western practices include the common use of contractor prequalification, short listing, bid bonds, and performance bonds, which were introduced to the Chinese construction market in 2003 [MOC 2005].

Selective tendering and negotiation once applied to most construction projects, and corruption became a very serious problem throughout China. In 2000, legislation required all public sector contracts to be awarded through open bidding [Wang & Shen 2001]. Now, open tendering is dramatically increasing, and selective tendering and negotiation is in decline. The most common contract type is the unit price contract, followed by lump sum, primarily because most of the projects currently underway in China are fast-track projects, where it is not reasonable to use the lump sum contract. The cost plus fee contract is rarely used. Time and quality incentive clauses are broadly used in contract documents.

The available working capital for construction in China has traditionally been low, and available funds are usually insufficient. This creates the situation that the owners owe money to contractors, and in turn the contractors owe money to financial institutions, material suppliers, or labour. This debt situation is termed the “construction triangular debt” [Shen & Song 1998]. The lack of legislation to constrain the owners’ behavior and protect contractors or suppliers has contributed to this situation, currently the biggest problem in Chinese construction. To resolve this problem, the government has issued more regulations that require sufficient capital to be secured by the client before construction can start. Progress payment bonds from the owner to the contractor have been used since 2003 [MOC 2005].

Unfortunately, these regulations have not had the desired effect since the construction triangular debt problem still exists. Perhaps a Construction Lien Act would allow contractors and suppliers to legally prevent the project being occupied by the owner

before the owner pays off all outstanding debts. Interestingly, the major barrier to applying a Lien Act is that most of the owners in China are state-owned.

Partnering has existed in the Chinese construction industry for a long time, but in a form similar to Japan in that mutual trust is expected with every construction contract. The general contractors must name their subcontractors and the extent of their contribution to the project in the tender process. On large or especially complex projects, joint ventures are common [MOC 2005].

6.3.1 Licensing

To ensure construction quality, safety and time, the contractor license system is key [NPC 1998; MOC 1995; MOC 2001]. Based on certain criteria, including the amount of registered capital, staff capacity, technology capacity, and previous track record, contractors are divided into three categories, namely main contractor, specialist contractor, and labour contractor. Main contractors are grouped into 12 categories (e.g. general building, road, or harbour) and four minor classes: Special Grade (highest) and Grades I, II, and III (III as the lowest level). Specialist contractors are divided into 60 categories based on their specialty, such as earthwork, foundation work, finish work, and graded as Grades I, II, or III. Labour contractors are divided into 13 categories such as carpentry and steel fixer, and classified as Grades I and II. Construction enterprises operate businesses within certain types of works in line with the specifications defined in their qualification grades. The grade can be lowered or upgraded through an official annual review.

In summary, Chinese construction procurement practices are still in a state of development and not mature enough to be compared to the procurement methods used in developed countries. There are still many problems, such as an ineffective legal system, construction triangular debt, and unfair competition. With the increase in foreign joint venture firms (over 2000 in year 2000) [Shen et al. 2004], there is a lot of pressure for the lowest bid to win the job. While the Chinese government has made significant gains to support the construction market, it still has a way to go.

6.4 Japan

Japan is composed of four main islands and 3,918 smaller ones with a combined area of 371,700 km² and a population of 127,687,000 (in 2004). In Japan, construction investment accounted for roughly 15 percent of the nation's GDP in 2002 and government projects accounted for 44% of Japan's total construction awards between 1997 and 2000 [Chiang et al. 2004]. The Japanese culture developed from people of the same race and religion who grew to depend upon each other for survival. It is evidenced in today's Japanese business culture, which is characterized by long-term business relationships and lifetime employment. Business decisions are collaborative and approved by all stakeholders prior to implementation. The long-term business relationships assure a good collaborative work environment between parties. The lifetime employment system is closely tied to seniority and rewards longevity with annual wage increases and usually increases in job responsibility [Levy 1990].

Before 1993, Japan had six major construction companies ('the big six') that were engaged in the majority of big public projects, thriving in the closed system of contractor prequalification that existed at that time [Levy 1993]. Tendering competition between these companies was focused more on qualifications and an implementation plan to demonstrate its ability to perform the project than the final bid price. If any bid fell below a predetermined lower bound, it was disqualified [Levy 1990]. This approach seems to have changed in recent years. The experts indicated that the requirement for an implementation plan with bidding documents is decreasing. The public statement of Procurement Procedures for Public Works states that a contract is awarded to the lowest priced bidder below a ceiling price. When a bid price is exceedingly low, it may be subject to examination to ensure its propriety. Many prefectural governments still use a system in which the lowest allowable bid price is specified beforehand and a contract may not be awarded to any bidder whose bid price falls below this minimum [Chiang et al. 2004].

DB is now being used in Japan; it was implemented on 14 projects under the direct supervision of the MLIT in 2001 [Chiang, et al 2004]. CM is also being used, but the percentage remains small. A new procurement method called *Technical Proposal Integrated Evaluation System* started in Japan in 1998. The criteria for evaluation of bids

is to consider both the price and the technical proposal, reviewing factors such as quality, speed, design, and safety of execution [MLIT 2005].

The contract between two parties is established on mutual trust. Compared to western documents, Japanese contract documents are very simple and vague. Although they tend to make verbal commitments rather than written ones, litigation in Japan is only one-tenth to one-twentieth as frequent as in other countries where common law is the basis of their legal structure [Levy 1990]. The most common contract type in Japan is lump sum; unit price runs a close second.

The widely used Standard Contract Form for Public Works includes a monetary guarantee, which may consist of [MLIT 2005]:

- ✍ Contract guarantee money or government bond
- ✍ Guarantee by financial institutions or prepayment of surety companies
- ✍ Public works performance bond
- ✍ Performance guarantee insurance
- ✍ Public works performance bonds

Partnering has been cited by many western researchers as an example of excellence [Womack et al. 1990; Lamming 1993]. Interestingly, experts from Japan indicated that partnering is not applied there, suggesting that the concept of partnering is somewhat different from Canada. The long-term relationship in business becoming less appropriate in the current Japanese marketplace in part because domestic markets are being opened to external competition [Cox & Townsend 1998].

A major problem in Japanese construction is corruption, which some people call the *iron triangle*. This system encourages business collusion (*dango* in Japanese) where organizations submit artificially high bids for public works. The politicians pressure the Ministries to accept these high bids, and in return for their help, the businesses kick back some of the overpayment to the politicians. Businesses also provide lucrative retirement posts to those officials that grant these contracts and prevent foreign competition [Broadbent 2002]. To avoid corruption, the Ministry of Construction is encouraging a more competitive environment in contracting through more open tendering and bidding for work packages. Open, competitive bidding is now mandatory for large-scale public

works, and the World Trade Organization (WTO) agreement on government procurement applies to most of these works. For other works, designated competitive bidding is widely used [MLIT 2005]. However, evaluation criteria are often not made available even to the bidders [JETRO 2003].

Public private partnership projects are appearing in Japan. Some Japanese firms are involved in build-operate-transfer (BOT) projects in Hong Kong, Australia, and other overseas markets. Britain's Private Finance Initiative (PFI) is also being adopted by the Japanese government to recover its financial problems. The PFI projects are mainly in the construction of toll roads, government buildings and other such infrastructure projects [Chiang et al. 2004].

6.4.1 Licensing

The Japanese Ministry of Construction takes an active role in the orchestration of construction activity at all levels. In 1971, the licensing system for Japanese contractors was established [Levy 1990]. There were 516,000 licensed contractors in 2004 [MLIT 2005] divided into three categories of prime contractors, subcontractors and special trade contractors. About 95% of all licensed prime contractors are small firms with less than 50 employees [Chiang et al. 2004].

Contractor licenses are issued for five years, after which they must be renewed. There are 28 classification licenses and operators must be licensed for each classification of work in which they intend to work. It is possible to obtain at one time a license covering more than one classification of work, and there is no limit to the number of classifications that may be added to the original license. To apply for an Ordinary Construction License the applicant must be able to meet four basic requirements: [MLIT 2005]

1. The managing executive of the firm must have at least 5 years experience in general management control in the relevant work, or have Ministry of Construction approve the experience.
2. There must be a regular staff engineer in every business office with background to meet one of three criteria:
 - A. Mastery of his discipline while at high school and business experience of 5 years in relevant construction work, or three years experience in relevant work after leaving a junior college, university, or college.

- B. Business experience in relevant construction work for a period of ten years.
 - C. Approval by the Ministry of Land, Infrastructure and Transport (MLIT) and must have passed either the Engineering Test under the Construction Contractor Vocational Training Law, or the Test for First or Second Grade Architect of the Architect's Law.
3. Financial standing or financial credibility sufficient to execute contracts. To achieve this, one of the following requirements must be satisfied:
 - A. Net worth: 5 million yen or more
 - B. Fund raising ability: 5 million yen or more
 - C. Experience: Continuous operation of a construction business with a license for not less than five years prior to the application.
 4. Requirements for fairness and honesty, a lack of which will cause disqualification.

A construction company having an office in two or more prefectures (districts) must obtain their license from the MLIT; a company with only one office will obtain its license from the governor of the prefecture in which it is located. However, a Construction License is unnecessary when a person or company contracts simple construction work, which is defined as:

- ✍ a contract less than 5 million yen (56,000 Canadian dollars) for work other than general building work, or,
- ✍ less than 15 million yen (168,000 Canadian dollars) for a general building work, and for which the total floor area of one wooden house is less than 150m² for general building work [MLIT 2005].

6.4.2 Prequalification

Prequalification is mandatory for public works projects in Japan. Requirements for qualification include a minimum score on the Business Evaluation (objective evaluation) by MLIT or a prefectural governor, and subjective evaluation by owners. Subjective evaluation includes past records of performance in a similar type of project, and availability of a qualified and experienced engineer. The criteria for the business evaluation are: [MLIT 2005]

1. Annual value of completed construction works by License classification
2. Net worth and business condition (financial statement analysis)
3. Number of years in business
4. Number of staff, technical staff, and qualified accounting clerks
5. Record of labour welfare conditions and safety performance

In summary, not many of the Japanese practices can be translated to Ontario. However, the concepts of licensing may be adaptable. Two other differences are evident. First is the enormous amount of research developed by the Japanese big six companies that used to dominate the market. Because of the closed market, they could afford and were willing to pursue a R&D. Second is the strict avoidance of litigation in the industry, which is evident by the lack of restrictive language and brief wording in contracts. There is no need for an alternative dispute resolution system in Japan!

6.5 United Kingdom

The United Kingdom (UK) includes England, Scotland, Wales, and the northern one-sixth of the island of Ireland. The UK has a land area of 244,820 km² and a 2005 population of 60,441,457 [CIA 2005]. As in most developed economies, the construction industry produces between 6 and 10% of GDP and employs around 1.5 million people [Jones & Saad 2003]. The value of construction output in 2000 was approximately £58 billion with repair and maintenance of existing infrastructure and facilities accounting for nearly 50% of the total [Jones & Saad 2003]. There were 163,426 construction firms in 2000, including 59,708 general trades and other specialist trades. Nearly 96% of the directly employed workforce is employed in companies with fewer than 13 employees, and more than 90% of all general and specialist contractors employ fewer than 7 people. The largest contractors, who account for less than 1% of all construction firms, account for 34% of total construction output and generate 20% of employment. Most of the work done by larger companies is capital construction and they dominate the infrastructure, non-residential building, industrial and commercial construction [CITB 2002]. In 1999, approximately 37% of the industry's turnover was funded by the public sector [Jones & Saad 2003]. As one of the largest clients, government departments and agencies greatly influence the construction industry as sponsors, regulators and purchasers.

In the past 20 years, there has been a revolution in the UK construction industry. The construction industry's performance had been heavily criticized because of cost overruns, program delays, poor productivity, and low profitability. Over 80% of building works were carried out using the traditional DBB through competitive, cost-oriented and fixed price tendering [Jones & Saad 2003]. The UK government responded by commissioning investigations into the industry [Briscoe et al. 2004]. A 1994 study concluded that the industry's traditional methods of procurement and contract management and its adversarial culture caused inefficiency and ineffectiveness [Latham 1994]. It was argued that the client should be at the core of the construction process, and client satisfaction could be achieved through teamwork and co-operation. Addressing these issues had the potential for saving 30% over 5 years and that implementation must begin with the client. Latham [1994] further recommended that the Government commit itself to becoming a best practices client.

A scrutiny into government procurement of construction concluded that departments and agencies were partly to blame for the poor performance of the industry. They 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 departments and agencies.

Recommendations were made to improve the structure and management of construction projects [HMCAG 2001], and in 1997 the government construction clients' panel was established by the Treasury. In 1998, a "breaking down barriers" project was launched to assess and demonstrate the benefits of supply chain integration. The Pilot Benchmarking study was the first attempt to benchmark performance across central government and provided quantitative evidence of the need for improvement [HMCAG 2001].

Although the recommendations of the Latham report were largely implemented by 1997, improvement in the industry's performance was slow. As a result, the Construction Task Force led by Sir John Egan was established to advise on opportunities to improve the

efficiency and quality of project delivery, to reinforce the need for change, and to make the industry more responsive to customer needs. The Egan report identified five key drivers of change:

- ✍ committed leadership
- ✍ a focus on the customer
- ✍ integrated processes and teams
- ✍ a quality driven agenda
- ✍ commitment to people

Its targets included annual reductions of 10% in construction cost and time, and 20% per year reductions in defects on projects. It proposed that the industry must replace competitive tendering with long term relationships, performance measurement, and sustained improvements in quality and efficiency. It was recommended that the major clients of the industry lead by implementing projects that demonstrate the described approaches [Egan 1998]. In the same time period, Jones and Saad [1998] argued against implementing partnering in construction. They felt that the positive role that participants such as specialist and trade subcontractors can play in projects had not yet been fully explored.

There remained a strong reliance on complex and rigid standard form contracts [Davis et al. 2000]. For example 91% of all contracts by number and 68% by value employed a traditional Joint Contracts Tribunal (JCT) standard form [Cox & Townsend 1998]. The two contracts most conducive to collaboration with provisions for sharing of rewards, the New Engineering Contract (NEC) and GC/Works/1, were only used for 0.45% and 0.1% of projects by value respectively [Davis et al. 2000].

In 2001, the Audit office report argued that awarding contracts to the lowest bids often did not provide best value in either the final cost of construction or through the life cycle cost. It pointed out that around 73% of projects were over budget and 70% delivered late. It suggested better integration of the construction process, more focus on end-users, less adversarial approaches, and the use of longer-term partnering relationships between clients and contractors [HMCAG 2001].

The Fairclough report argued that investment in research and development is essential to underpin innovation and continuous improvement in construction. It recommended that the government refocus existing resources toward improving the productivity of the industry, improving client relationships, and on strategic longer-term issues [Jones & Saad 2003]. The *Accelerating Change* report argued that UK must achieve maximum value and exceed expectations for all clients, end-users and stakeholders through the consistent delivery of world-class products and services. To achieve this, the construction industry must add value for its customer, exploit the economic and social value of good design, become more profitable, invest in its future, and, enhance the built environment in a sustainable way and improve the quality of life [Strategic Forum for Construction 2002].

The changes in construction procurement methods in the UK were significant between 1984 and 2000. The Royal Institute of Chartered Surveyors (RICS) undertook bi-annual surveys of the use of procurement systems, showing that the use of the traditional system declined from 78% to 40% between 1984 and 1998. CM grew from 5% to 22% and then fell to 18% in 1985, 1989, and 1998 respectively. The DB method grew from 5% in 1984 to over 41% in 1998. They also found that during the 1980s and 1990s, a significant number of disputes arose from the CM method, which may have led some clients to move away from this procurement system. [Davis et al. 2000]

The performance of contractors improved by 16% between 1995 and 1999 and the ability to stay on budget improved by 25% [CIBB 1999]. Consultants' design creativity and ability to innovate improved by 20%. Clients rated the overall value for money provided by consultants 18% higher than in 1995. In the mid-1990s, clients seldom gave contractors or consultants marks higher than eight or nine out of 10, but by 1999, one in seven clients gave their contractors 10, and one in fifteen clients rated consultants' performance at 10 [Jones & Saad 2003].

According to the UK respondents, the three types of delivery methods (DBB, DB and CM) are used about equally. Partnering is still limited but may become more popular in the next ten years. Stipulated sum contracts don't generally allocate all risks to the contractor, and unit price is becoming the most popular contract. The use of cost plus

contracts has increased to the same level as stipulated sum. These changes imply clients are willing to share at least part of the risk. Lean construction concepts have broadly been used to help improve the construction efficiency, and prequalification is used in most of projects.

In summary, it took many, many studies, programs, and projects to change the UK construction industry, but the improvement in performance is amazing. While the respondents acknowledged the weaknesses of the competitive bid and lowest bid award systems, these two methods are still practiced more than other methods.

6.6 European Union

European Union countries were grouped together because public works contracts are governed by the European Community Treaty principles [EU Guide 2004]:

- ✍ The right of establishment that allows individuals and companies from other member states to conduct business activities in a country and be treated equally with the member state's own nationals.
- ✍ The freedom to provide services with a temporary residence where the business is to be provided.
- ✍ The general ban on discrimination on grounds of nationality.

Provisions of the EU Council Directive apply to public works contracts whose estimated value, excluding the value added tax is greater than Euro\$5 million. Contractor qualifications are assessed at the time of drafting the invitation to bid. Candidates must be chosen on the basis of their personal standing and the information necessary for evaluating the minimum economic and technical conditions set out in the contract notice. The Directive allows for 3 contract award procedures: open, restricted, and negotiated. The restricted procedure requires that only the contractors who have expressed interested be invited to bid. Open procedures allow all interested contractors to submit tenders in response to a published invitation to bid. Finally, negotiated procedures may be used only in exceptional circumstances. The Directive wording is not very restrictive and leaves open possibilities for having several types of contracts under each of the first two procedures.

The Directive mentions the importance “the stimulation of technical progress in the construction industry” has for the European Community [EU Guide 2004]. Therefore, in submitting bids for public procurement contracts, bidders are allowed and even encouraged to propose alternates, as long as they comply with certain conditions. Submitting alternates is much easier than Canada where the process is bureaucratic and discouraging.

Local preferences are not allowed by the DU Directive. Before being considered, contractors must bring proof of enrolment in a professional trade (or equivalent for architects and engineers) to provide professional capacity. Contracts can be awarded by lowest price or most economically advantageous offer. In the second case, the contract administrator must clearly define advantageous, and what criteria will be taken into consideration, such as price, schedule, profitability or technical merit [EU Guide 2004].

6.7 Russia

Information about construction procurement in Russia is scarce and often inconsistent. In 2000, it was stated “Russia does not currently have a model set of contract conditions for construction works universally recognized in the industry” [Nikiforov 2000]. Currently, the most used model for public procurement is FIDIC. World Bank regulations [WB 2000] are used for a great number of public contracts that are financed by the World Bank. A 2001 World Bank Assessment Report stated “There are many gaps and conflicts in the legislation, the various laws are applied inconsistently, and procurement practices often fall far short of good practice. Added to that, most staff that handle procurement are untrained and the institutions in which they operate are invariably weak. Corruption affects many public procurement transactions, lessening the benefits, which accrue from public expenditure. A concerted effort is required from the government to combat it” [CPAR 2001].

Important issues to bidders include:

- ✍ Due to the instability of the Russian currency, bids are often expressed in USD or Euros.
- ✍ The bidders must submit the bid in its original language.
- ✍ Alternatives are allowed, but they are subject to negotiation.

- ✍ Legislation fails to require transparency of communications, site visits or bid protest procedures.
- ✍ Although exact closing times for bid submissions are published, they are sometimes inexplicably and illegally shortened by the authorities.

Contracts are generally awarded to the lowest bid. However, preferential awarding exists and is encouraged by the World Bank regulations. Some known irregularities are [CPAR 2001]:

- ✍ Unclear criteria of award. The 1999 Federal Procurement Law defines a winning bid as the one “offering the best conditions”.
- ✍ Inconsistency in the application of evaluation criteria.

7 COMPARISON OF PRACTICES

Table 1 compares the current procurement strategies used in Canada, Australia, China Japan and UK. Rating Notes: 0=not used; 1=rarely used; 2=somewhat or starting to be used; 3=broadly used; 4=dominative; 5=mandatory

Table 2: Comparison of Procurement Strategies

Procurement Strategies	Canada	Australia	China	Japan	UK
Traditional design-bid-build	4	4	4	4	4
Design build	2	3	1	2	4
Construction management	4	4	4	1	4
Partnering	2	3	2	0	3
Stipulated lump sum	4	3	3	4	4
Unit price contract	2	2	4	2	3
Cost plus a fee	3	2	3	0	2
Cost incentives in contract	2	3	4	1	2
Time incentives in contract	2	3	4	1	2
Quality incentives in contract	0	3	4	0	1
Safety incentives in contract	0	3	0	0	1
Sustainability incentives in contract	0	1	0	0	1
Lean construction concepts	1	1	1	0	2
Prequalification	4	4	4	3	4
Licensed contractors	2	4	5	5	2
Bid bond	4	2	4	1	3
Performance bond	4	2	3	1	4
Labour & Material payment bond	4	2	1	1	3
Progress payment bond (by owner)	0	2	2	1	2
Construction lien act	5	0	0	0	0
Public competitive bid	4	3	4	3	3
Selective competitive bid	3	4	4	4	3
Negotiation	3	3	2	2	2
Lowest bid award system	4	4	4	4	4
Lower bound target price to disqualify bids	1	0	4	4	1
Tender evaluation only considers price	4	2	1	3	3
Tender evaluation considers price, time, quality and safety	2	3	4	3	3
Implementation plan required with bid	2	4	4	3	4
Public private partnership	2	3	2	2	3

The use of DBB with a stipulated price contract and lowest bid award system is high in all countries, especially in the public sector where transparency and accountability are important. If owners are not pressed for time and can get reputable contractors to bid, this method is still generally favoured by owners. While this system is favoured by some contractors and is well suited to some projects, expectations of the owner and the contractor are sometimes not met using this method. The main reasons are increased disputes, adversarial relationships, low bid success rates, contractors cannot get creative, and requests for change orders are generally confrontational. One general contractor commented that approximately 75% of his time is spent on administration. Most of the experts interviewed think this system needs to change, but they also think there is room for this approach in practice, especially for public projects.

DB is used in the UK more than other countries. Generally speaking, DB can improve communication between the design and construction teams and improve collaboration. It minimizes change orders, claims, disputes and time delays, achieves better focus on the customer and integrates processes and teams. Its increased use in the UK is the result of industry-wide innovation in the last ten years. This approach is considered a best practice by many practitioners in Canada but the industry does not promote it and is actually decreasing in Canada. One general contractor said that 4 or 5 years ago, this approach was used on 60% of their projects, but now only 20% of their projects are delivered by this approach. The major reason is that if owners have a bad experience, they tend to go back to tried and true traditional methods, faults and all. It is recommended that the owner pay an honorarium for proposals, employ a good management team to manage the design builder, and ensure the design builder is reputable and experienced. Although it is not necessarily cheaper than DBB, it can obtain the best value for money, with fewer disputes, faster and higher quality construction.

CM is broadly used in four countries (all but Japan). CM encourages constructability input early and reduces the gap between the designer and builder. It also enables fast tracking thereby obtaining an earlier completion of the project. The approach used in China is a hybrid of CM and DBB, focusing on the fast track and ensuring construction quality as well as professional management. This approach is increasing in the Ontario

construction market. Ontario construction managers welcome this approach because it can provide a stable profit and pose less risk. This approach is also welcome when major projects need to fast track and there are many changes during the construction period. There are still some barriers to this method, including the owner may not know the project final cost until the project is completed, and most CMs are interested only when the project is reasonably large since the fee is small (0.5 - 3%).

It has widely been reported that extreme fragmentation is a particular trait of the construction industry. In Japan about 95% of all licensed prime contractors are small firms with fewer than 50 employees [Chiang et al. 2004]. This number is slightly higher than the UK. Why do researchers not consider fragmentation as one of the characters of Japanese construction? Because the Japanese construction industry is characterized by a network of tiered, interlocking supply relationships known as *keiretsus* [Bower 2003]. It is interesting that the Japanese experts identified the partnering concept used in western countries as non-existent in Japan. The reason is that the concept of partnering, which came from Japan, is still alive in Japan but it is different from that used in the UK and Canada.

Partnering in the UK is still not very common even after ten years of government promotion. Even in Canada, many experts are skeptical about the effectiveness of partnering, stating that long term business relationships already exist in practice. Two general contractors with extensive experience using the partnering method said that it works particularly well on public sector projects because public managers do not like confrontation and are willing to spend money to hold a partnering workshop. One of the benefits of partnering is that it encourages relationships and familiarity between the key stakeholders early in the project, which facilitates resolution of problems later on. Finally, by listing contacts for each organization and establishing the framework to solve conflicts, it achieves quicker conflict resolution.

The stipulated price contract is favored by all countries, in part because owners want or need to set their budget. Stipulated price is used least in the Chinese construction market because, perhaps, most projects in China use a fast-track approach.

Because of fast-tracking, the unit price contract is used more frequently in the Chinese construction industry than the other countries, where it is used mostly in renovation and infrastructure work. With the increased use of CM, the cost plus a fee contract type is now being used more frequently. In Canada, when the construction management contract is used, after project completion of up to 70% or 80%, owners like to switch it to a lump sum contract (when few changes may impact the project). In the UK, there is a new approach called “strategic cost management”, which is a concept of “open-book” negotiation. A supplier must explain the firm’s cost structures to the customer, and in return the customer must help the supplier obtain cost savings. The client is trying to engineer long-term reductions in cost through improved supplier performance, and is attempting to use the information gleaned from any frank discussions as a lever in price negotiations. Both organizations concentrate on the optimization of the supply chain [Cox & Townsend 1998]. This approach can effectively save the construction cost and avoid cost over runs, but it must be based on a high level of trust. There is another similar approach called “Prime Contracting”. It can be described as replacing short-term, contractually driven single project adversarial inter-company relationships with long-term, multiple project relationships based on trust and cooperation. These long-term, strategic supply chain alliances incorporate continuous improvement targets to reduce costs and enhance quality, and focus on the through-life cost and functional performance of projects [Holti et al. 1999].

Cost, time and quality incentives are broadly used in the Chinese construction market. To encourage design and construction quality, Chinese governments set up many awards for design and construction quality. Owners want their project to win these awards so they can sell or rent for higher prices. Owners always push contractors to complete the project as soon as possible. Time incentives appear in almost all contracts. Cost and time incentives are somewhat used in Canada, but people feel if there is a bonus clause, then there must also be a penalty clause and defining bonuses and penalties is difficult, subjective, and controversial. Sometimes these incentives will cause conflict between the designer and contractors. One expert said that if it is critical to the client, it has its place. For example, a Tim Hortons project may determine a level of sales for which they can reward a contractor a percentage for earlier completion but it may also be subject to a penalty. Although Canadian contractors vie for peer-based industry awards and recognition, the impact, if any, tends to be localized. Experts considered the

possibility of setting up a government agency to promote construction quality and sustainable design, but the Canadian government does not get involved in the industry except to regulate. The provinces are relatively independent in Canada; even the legal system and building codes differ from province to province. The experts said that quality, safety and sustainability are already embodied in contract documents and that the Canadian construction industry has a good reputation for quality and safety. Some felt that construction quality is decreasing as a result of pressures to shortened construction time and the use of poorly skilled labour. On the issue of sustainability, the experts all agreed that the best way to improve sustainability is to make it a legal issue.

In Canada, most experts think the concept of lean construction is great because of the standard components, better quality control and faster installation, but it is rarely used in practice.

Pre-qualification is practiced in all countries, driven by owners who want to select the right contractors, avoid unnecessary risks, and perhaps shortlist bidders. Prequalification criteria should be uniform and objective to ensure new contractors are not excluded.

Licensing contractors is mandatory in Australia, Japan and China. This approach may increase the construction entry level, limit the intensity of competition, and further ensure construction quality. In Canada, bonding practices seem to have a similar function of limiting firms entering the construction industry, but the major consideration of a surety company is the risk level. They mainly focus on the company's financial stability. Surety companies put less emphasis on the staff's education and experience which is important to ensure construction quality. Prequalification limits unqualified contractors from getting jobs beyond their capabilities. Although there are no legal constraints to limit firms from becoming contractors, it is very difficult to establish a new construction business in a mature competitive construction market such as in Canada. The reactions to licensed contractors are quite different between experts. Some of them think there is no need to license contractors, but it may increase professionalism in the industry. Some indicated that most of contractors would not like this idea, especially small contractors. Some thought that licensing contractors would decrease construction quality and the increase disputes.

Bonding is broadly used in all the countries except Japan. The labour and material payment bond is not yet used in China, whilst progress payment bonds were only recently introduced in the UK and China. Bid bonds, performance bonds, and labour & material payment bonds are used in the public sector all the time and on large private projects. In the private sector, owners prefer not to request certain bonds not only to save on costs but also because it excludes some good small contractors that may be incapable of obtaining bonds. Bonding is considered by all the experts who were interviewed in Canada as a good way to ensure that sincere contractors bid on jobs and protect the owner's interest. They also expressed an opinion that the progress payment bond (by owner) may be welcomed by all the contractors as it is sometimes quite difficult to collect money from private owners, however, this bond would not be accepted by the owners in Canada. Another barrier for this bond, in Canada, is that owners normally can get a 70% loan from the bank and owners would need to disclose the loan agreement to the contractors.

Public competitive bid with lowest bid award system is used by all countries' public projects because of its transparency. Prequalification is used in most cases to ensure the quality of contractors and gain the optimal number of bidders. Using a lower bound target price to disqualify bidders is only practiced in Japan and China. It seems an unlikely practice in Canada.

Tender evaluation that only considers price is broadly used in Australia, Japan, the UK and Canada. Tender evaluation in China emphasizes construction quality since poor construction quality is one of their biggest problems. Accepting the lowest price does not guarantee the best value, and this was recognized by many construction participants. In Canada, many people think quality and safety are already considered in the prequalification stage, and all prequalified contractors are expected to demonstrate proficiency in these areas. The quality and safety requirements are also embedded in the contract documents, therefore it may be irrelevant in an evaluation process. On the other hand, assigning points to contractors based on their past project history is too subjective and open to corrupt practices.

An implementation plan is submitted at the contractor prequalification stage in Japan, whilst in China it is submitted with the tender documents. In the UK, a Method Statement

and risk assessment are also submitted as part of the tender under the Management of Health and Safety at Work Regulations 1999. Implementation plans can give owners a clear idea how a project is to be executed. Because the implementation plan normally includes construction site layout, labour arrangement, equipment arrangement, material selection and the key techniques that will be used, the owner can decide which implementation plan is best. In China, an assessment of the implementation plan is a part of the tender evaluation.

Japan and China use a lower target price to disqualify bidders, reduce fierce price competition, and keep decent margins. This approach encourages the owner to emphasize value rather than price. It may also allow big construction companies to survive and avoid fragmentation in the construction industry. In Canada, the time limitations and low bidding success rates make it difficult for submission of an implementation plan to become standard practice. In Ontario, most of the general contractors do not have a self-directed labour force. Their competitive advantage over other contractors is heavily based on how they plan and execute the project using subcontractors. Their implementation plan is integrated in their bidding strategies and is considered confidential. Generally, an implementation plan is needed only for very large projects such as a major airport or in DB projects.

Public private partnership as a financial strategy is now used in most countries, with UK using it more than the other reviewed countries.

Questionnaires were conducted to obtain and confirm the related information as well as the construction experts' opinions on certain construction procurement strategies. All experts surveyed had more than ten years experience in the construction industry, with an average work experience of twenty-one years. They work in reputable universities, industry associations, or large construction or consulting companies. Their personal opinions were very valuable and contributed to the goals of this work. The limitations are that their opinions were heavily based on and limited by their specific field and work experience, especially those surveyed in Japan and the UK by e-mail, which did not facilitate a broad discussion of the effectiveness of the current procurement practices.

8 CONCLUSIONS AND RECOMMENDATIONS

Canadian construction participants have long recognized that accepting the lowest price bid does not guarantee maximum value for money and therefore more consideration needs to be given to the costs of a project over its whole life cycle. Achieving this value based approach is a challenge. The willingness of project stakeholders to critically evaluate the most appropriate construction procurement method to determine the degree of effectiveness for a particular project is paramount to achieving maximum value.

All procurement strategies have advantages and disadvantages. There is no perfect universal procurement strategy. Although many have realized that public competition DBB with lowest bid award system has its weakness, it is the most effective way to minimize corruption and collusion. The open, public competition DBB with a lowest bid award system dominates a large portion of public projects. In contrast, the design-build, construction management and their hybrids will be accepted and favored by many people because of their potential to accept and develop value based evaluation and performance based contracting.

Some bid evaluation methods attempt to assign points to bidding price and the contractors' past performance records in achieving owner's needs. The only challenge is to keep this evaluation objective and accountable to the public and stakeholders. The Chinese practice of assembling a committee of an odd number of experts (five or more) may offer a solution. The long-term relationship in prime contracting (Strategic partnering) is the best way to deliver a project. However, most construction clients are one time buyers and public accountability restrictions may not allow this to be practiced in the public sector.

In Canada, there exist no apparent minimum construction entry level created or regulated by legislation or regulations. However, bonding and prequalification practices actually dictate high entry level requirements. In direct contrast, the process in China and Japan of licensing contractors suggests that the entry level is very high by law. There may be an unwillingness to accept the concept of licensing contractors in Canada.

However, should construction quality continue to decrease, people may consider this as a viable solution.

In the Canadian contract-based construction culture, the level of trust between parties is low. Therefore, while using lower bound target price to disqualify bidders is accepted by Chinese and Japanese owners, it was not readily acceptable to Canadian owners. They seem to prefer to capitalize on the lower price now rather than worry that it may be a problem in any future collaborative work with that contractor. In contrast the Chinese and Japanese culture respects a good business relationship more than any contractual arrangement. However, the credibility of Canadian contractors is higher than in these two countries.

In Japan, the basic concept of mutual trust is much greater than a partnering agreement. Trust is not high in a contract based western culture. So if people only see the partnering agreement as a framework to improve communication, better relationship, avoid future disputes and solve conflicts quicker, they would be satisfied. If they want to get real partnering trust, they might be disappointed under the current business culture.

There are two broad ways to increase the level of trust between construction participants. One is to improve professional ethics, the other is to professionalize the construction industry, i.e. to license contractors and professionals. Although increasing ethics is more important than licensing contractors, licensing may lead to the other. It was suggested that public awareness be increased by means of poster campaigns to raise the ethical practices bar in construction and that courses in ethics be made mandatory for professional designations and development.

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APPENDIX I - LIST OF EXPERTS

Name	Company Name	Field of experience	Title/Position	Experience Years	
Canada					
Allen M. Atefi	Bird	Construction Management	Branch Manager	15	
Bill Nichols	Mutual Gain	Project Management	Vice President	25	
Brian Sirbovan	Stantec	PM & Engineering	Vice President	29	
Clive Thurston	Ontario General Contractors Assoc.	Construction	President	30	
Jim Strachal	J.D.Strachal Construction Ltd.	Construction Management	President	31	
Les Medd	Stantec	Project Management	Principal, Prog Mgmt	24	
Michael Kennedy	Stantec	Project Management	Principal	15	
Siosio Porretta	Bird	Construction Management	Production Manager	25	
Tim Harris	Toronto Construction Association	Construction	President	30	
Tom Stephenson	George Brown College	Construction	Coordinator - CABT	26	
Australia					
Colin Duffield	The University of Melbourne	Construction Management	Professor	25+	
Michel Chaaya	The University of Sydney	Construction Management	Professor	17	
Marton Marosszeky	The University of New South Wales	Construction Management	Professor		
China					
Lydia Wang	China Construction First Division/ Beijing Vanke Co.ltd.	Contract management and Quantity surveying	Department Manager	10	
Ling Xuefeng	TAHP project management (Beijing)	Project management	General Manager	12	
Zhi Guo Zhen	Government Construction Department (Shenzhen)	Constuction Management	Chief Engineer	18	
Indonesia					
Loesie Hartono	PT. Pertafenikki Engg	Procurement	Engineer	5	
Japan					
Kazumasa Ozawa	University of Tokyo	Project Management	Professor		

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Name	Company Name	Field of experience	Title/Position	Experience Years	
Masahiko Kunishima	University of Tokyo	Project Management	Professor	18	
UK					
Denise Bower	University of Leeds	Project management	Senior lecturer	10	
Keith Tweedy	London South Bank University	Quantity Surveying	Senior Lecturer	35	

APPENDIX II – QUESTIONNAIRE RESULTS

Questionnaire #	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
Traditional design-bid-build	4	4	4	4	5	4	4	3	3	4	1	4	3	4	3	3	4	3	4	3	1
Design build	2	2	0	2	2	4	4	2	3	3	1	2	1	3	2	2	2	3	3	4	3
Construction management	2	1	4	3	2	4	4	4	4	3	4	3	4	3	4	4	2	2	4	4	4
Partnering	0	0	2	2	1	3	3	4	2	2	3	1	0	2	4	1	4	2	3	3	1
Stipulated lump sum	4	5	3	4	4	3	4	3	3	4	2	4	3	4	3	3	5	1	3	3	4
Unit price contract	2	1	4	4	2	4	2	1	3	2	3	3	1	3	1	1	3	2	0	3	3
Cost plus a fee	0	0	2	3	1	3	1	3	3	2	3	3	1	2	3	2	3	2	4	2	3
Cost incentives in contract	2	0	4	5	1	3	1	0	3	2	3	1	0	3	0	2	2	3	3	1	3
Time incentives in contract	2	0	4	5	2	3	1	0	3	2	3	1	2	2	0	2	2	3	3	1	3
Quality incentives in contract	0	0	4	4	3	2	1	0	2	2	2	1	0	1	0	0	0	3	3	1	2
Safety incentives in contract	0	0	4	0	1	2	1	0	2	2	1	1	0	1	0	0	0	5	1	1	2
Sustainability incentives in contract	0	0	0	1	1	1	1	1	2	1	3	1	0	1	1	0	1	2	1	1	2
Lean construction concepts	0	0	2	1	2	3	1	3	3	1	2	0		0	3	0	0	4		1	3
Pre-qualification	4	2	3	5	5	4	4	5	2	4	5	4	4	4	5	3	4	3	4	4	5
License contractors	5	5	5	5	5	3	0	2	3	1		0	0	3	2	0	1	4	4	5	5
Bid bond	1	0	4	5	3	3	3	4	3	4	3	5	4	3		3	5	1	3	1	5
Performance bond	1	0	2	4	4	3	4	4	3	4	3	5	4	4	4	3	5	3	1	4	5
Labour & Material payment bond	1	0	0	2	3	3	1	4	3	4	3	5	4	4	4	3	5	2	4	0	2
Progress payment bond - by owner	1	0	3	1	2	2	1	0	1	0	3	0	0	2	0	0	0	2	3	0	2
Construction lien act		0	0	2	5		1	5	5	5	5	5	5	5	5	5	3	0		5	2
Public competitive bid	5	2	5	4	5	4	3	5	3	3	4	3	5	4	5	3	5		4	1	5
Designated (selected) competitive bid	4	4	3	4	2	2	3	5	2		4	3	4	3	5		3	3	4	5	2
Negotiation	2	1	2	1	2	2	2	4	3	2	4	3	4	2	4	3	3	2	4	3	1
Lowest bid award system	4	5	4	4	2	4	4	4	3	3	2	4	3	3	4	3	5	2	4	5	4
Using lower bound target price to disqualify bidders	4	3	4	3	2	2	0	0	2	1	0	0	0	0	0	0	1	0		0	4
Tender evaluation only considering bidding price	2	4	2	0	1	3	3	2	1	1	1	4	3	1	2	4	3	1		4	1
Tender evaluation considering bidding price, time, quality and safety record	4	2	3	5	4	4	3	2	2	4	3	1	2	3	2	0	5	3		3	4
Implementation plan required with bidding documents	3	2	4	4	5	4	5	2	3	3	1	3	3	3	2	3	3	4		5	4
Public and private partnership	2	2	2	1	2	3	4	0	1	2	3	3	0	2	0	2	3	3	3	3	2

Questionnaire – Definition of Terms:

Bid Bond	A form of bid security, provided to the owner by contractors. The bid bond does not usually exceed 10 percent of the estimated bid price. It is a guarantee that if awarded the contract, the principal (contractor) will, within the time required, enter into a formal contract; otherwise the principal and the surety will pay the obligee the difference in money between the amount of the bid and the amount for which the obligee legally contracts with another party to perform the work if the latter amount is in excess of the former.
Construction Lien Act	A statute enacted to correct the inequitable result from common law. In common law, only those parties to a contract acquire rights under that contract. Therefore subcontractors, suppliers and workmen who have provided valuable services to an owner to add value to the owner's property have no corresponding rights to compel the owner pay them if the contractor is either unwilling or unable. The basic premise of the legislation of lien is that certain specified people who have performed works or supplied services or materials for the benefit of the owner of the land, whether under direct contract or under a subcontract, obtain some measure of security for payment by enabling them to register a lien against the owner's property.
Construction Management	In this method of project delivery the owner employs a construction manager to provide site management, administrative and technical skills for a contract fee. The owner, construction manager and consultant, work together to complete the work on time and within budget. This method allows the work to start before completion of the design and separate contractors to be hired sequentially.
Cost plus a Fee	In this type of contract arrangement, the owner reimburses the contractor for the actual cost of the work done, plus a percentage or fixed fee.
Design Build	In this project delivery system, the owner enters into a contract with a single firm with design and building capabilities or a construction entity that employs the architect as a consultant. The design-builder whose proposal best suits the owner's needs is selected to design and construct the project according to the owner's basic requirements and intentions.
Designated Competitive Bid	Obtaining bids from one or more contractors who have been pre-qualified according to their financial ability and capacity to perform the work.
Incentives in Contract	Provisions for the mutual benefit of both parties typically used to achieve desired enhancements in performance over and above baseline requirements specified in the contract. These mainly include cost, time, quality, safety and sustainability incentives.
Labour & Material Payment Bond	A guarantee that all labour and material suppliers having direct contractual relationship with the Principal (Contractor) will be paid for labour and materials supplied to the Principal for use on the project. The Obligee (Owner) in a Labour and Material Payment Bond is expressly designated as trustee for the suppliers who qualify as "claimants" under the bond. The Surety's total obligation to the claimants is limited to the amount of the Payment Bond
Lean Construction Concepts	This is a production management-based approach to project delivery - a new way to design and build capital facilities. Lean construction extends from the objectives of a lean production system which has caused a revolution in manufacturing design; supply and assembly- maximize value and minimize waste. In the construction field, lean focus on the standardization and modularization in design and construction, as well as in management.
Licensed Contractors	Contractors licenses are designed to protect the public from faulty work or unqualified contractors, as well as help enforce safety and building codes.

	Generally, contractors are required to meet some basic requirements to receive a contractor's license. a contractor's license can be issued for certain periods, after which time they must be renewed. A contractor licensed for one classification of work is prohibited from contracting projects of any other classification, unless it is also licensed for that other classification.
Lowest Bid Award System	A policy to systematically award the contract to the lowest bidder in which the price is the primary determinant of a successful bid.
Partnering	A team-building process that establishes working relationships among the parties through a mutually developed, formal strategy of commitment and communications. Its fundamental components are formalized mutual objectives, agreed problem resolution methods, and an active search for continuous measurable improvements.
Performance Bond	A guarantee to the Obligee (Owner) that the Principal (contractor) will properly perform its contract with the Obligee. If the Principal fails to complete or properly perform its contract then the Surety will do so provided that the Obligee has performed its obligation under the contract and has satisfied any conditions contained in the Performance Bond. The Surety's liability is further limited to the coverage of the Performance Bond
Pre-qualification	Pre-qualification is a process in which the owner/developer pre-evaluates the contractors against a number of pre-determined criteria, in order to select a limited number of contractors to involve in the bidding competition, and improve bidding efficiency.
Progress Payment Bond (by owner)	A guarantee to the contractor that the owner will pay progress payments for the duration of the contract in accordance with the stipulations of the contract agreement and conditions.
Public and Private Partnership (P3)	a public private partnership is a legally-binding contract between government and business for the provision of assets and the delivery of services that allocates responsibilities and business risks among the various partners. In a P3 arrangement, government remains actively involved throughout the project's life cycle. The private sector is responsible for the more commercial functions such as project design, construction, finance and operations.
Public Competitive Bid	invites bids from contractors by advertising in an electronic bulletin board or a commonly read industry publication such as major daily newspapers, trade publications and construction association bulletins.
Stipulated Lump Sum	In this contract, the contractor is required to complete a defined scope of work in exchange for a fixed price.
Traditional Design-Bid-Build	In this method of project delivery, the owner hires a designer, whose primary responsibility is to provide and oversee the design and construction documents for the project. Once the construction documents and specifications are completely finished the project is tendered and subsequently awarded to the general contractor with the lowest acceptable bid. The contractor is responsible for delivering the completed project in accordance with the drawings and specifications and as stipulated in the contract documents.
Unit Price Contract	In this contract, the contractor performs the work based on pre-agreed unit prices. The final contract price is established by applying the contract unit rates to the actual quantities of work done, determined by a defined standard method to measure these quantities.
Using Lower Bound Price to Disqualify Bidders	a bid evaluation using a lower bound for the target price. If any low bid fall outside the parameters of what the owner feels is "low", it will be disqualified and the project awarded to the next lowest bidder

APPENDIX III – INTERVIEW COMMENTS

Questionnaire for Effective Construction Procurement

Method	Comments
Bid bond	May exclude good contractors. Requires 3/1 collateral for new contractor.
Construction lien act	Not enough legal enforcement - 45 days time frame is unrealistic
Construction management	Unnecessary money spending; legal disputes. Construction is too risky - never can tell what may prevent getting to a milestone
Cost plus a fee	owner has to take all cost risk; quantities must be measured on the site; owner can not know the final cost until the project is completed; Invoices and payroll statements difficult to verify
Design build	few facilities provided by design-builder; hidden reductions in quality; difficulties in the definition of the scope of work; Owner may never know if the price was right
Designated (Selected) competitive bid	fairness of competition; the public accountability; Increases bid levels
Implementation plan required with bidding documents	tender preparing time issue; necessity; number of competing bidders; difficult to evaluate
Incentives in contract	unnecessary money spending; Creates conflicts between parties
Lean construction concepts	the unique character of construction project; Great for factory assembly, not for the site
License contractors	the authority of license contractors; the necessities (we have bonding system and building code); fairness of competition; No guarantee of getting competency;
Lowest bid award system	legal disputes; adversarial relationships; construction quality issues; construction safety issues; Restricts bid evaluators in the selection process;
Negotiation	may not maximize the value of money; Relies on negotiation skills of either party
Partnering	can not maximize the value of money; partnering only works in certain situations; the nature of the business goal-profitability; the public accountability. Rely greatly on trust which may turn to distrust if partners start to lose money
Performance and Labour & Material payment bond	necessity; May exclude good contractors. Require a 3/1 collateral for new contractor;
Pre-qualification	Time consuming; the fairness to all contractors; May look good on previous projects, but no guarantee for the next;
Progress payment bond (by owner)	necessity; Restricts financing capabilities
Public competitive bid	procurement time and money consuming; low reliability; high cost overrun and time delay risk; high legal disputes; adversarial relationships; Contractor selection based on low price not efficiency
Public Private Partnership	definition of the scope of work; risk allocation; Higher long term costs

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Method	Comments
Stipulated lump sum	construction time; the complexity of project; economy uncertainty; unclear scope of work; uncompleted drawings; unclear specifications; Change orders--a project manager's nightmare
Consider bidding price, time, quality and safety record	necessity
Tender evaluation only considers bidding price	construction quality issues; construction time saving issues; construction safety issues exclude good contractors;
Traditional design-bid-build	Increased legal disputes; time consuming; adversarial relationships; Design features should but cannot be built more economically or effectively; Low win percentage for bidders result in wasted man-hours
Unit price contract	quantities must be measured on the site; owner can not know the final cost until the project be completed; Method of measurement not fair in all conditions
Lower bound target price to disqualify bidders	may not maximize the value of money; Exclude low price contractors with the ability to construct with competitive resources;