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Trends in buildings and procurement: Implications for construction economists in the twenty-first century

Abstract

This article discusses trends that are reshaping traditional procurement and delivery systems used by clients of the building construction industry. Procurement appears to have significant potential for innovation and improvement, particularly its potential for reorganisation to deliver better value for clients by making it both more open to design innovation and by encouraging best practice. Procurement is here broadly defined as the process that deals with project definition and delivery and the technical capabilities of the industry. A survey of online databases on current journal articles and reporting on procurement identified trends and issues. The argument is made that a changing business environment will lead to fundamental changes in the roles of building project participants in general, and construction economists in particular.

Keywords: Procurement, building construction industry.

TENDENSE TEN OPSIGTE VAN GEBOUE EN KONTRAKVERKRYGING: DIE IMPLIKASIES DAARVAN VIR BOU-EKONOME IN DIE EEN-EN-TWINTIGSTE EEU

Die artikel gee aandag aan vernuwende tendense ten opsigte van kontrakverkryging en dienslewering aan kliënte in die bou- en konstruksiebedryf. Kontraklewering vra om innoverende denke ten opsigte van ontwerp-vernuwing. Die verhoogde toepassingsmoontlik-hede hang nou saam met verbeterde dienslewering aan kliënte. Kontrakverkryging word breedweg gedefinieer as die proses wat betrekking het op projekbeskrywing en -lewering wat ook verband hou met die tegniese vaardighede binne die industrie. 'n Opname van die jongste rekenaardata en tydskrif-artikels gee 'n aanduiding van die jongste rigtingwysers en vraagstukke. Daar word aangevoer dat 'n veranderende sake-milieu fundamentele aanpassings vir die rolspelers in bouprojekte in die algemeen en vir konstruksie-ekonome in die besonder, inhou.

Sleutelwoorde: Kontrakverkryging, bou- en konstruksiebedryf.

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Background

A literature survey was conducted in 1997 with the aim of evaluating the growth in non-traditional procurement methods and use of alternative delivery systems in the international building construction industry. These are typically design and build (D&B) or design and construct (D&C) project delivery methods. The survey revealed a definite and widespread move away from traditional methods towards single-point project delivery systems in the over 400 journal articles and reportage collected.

The method used was to collect and classify current and emerging practices in tendering and procurement from as many sources and covering as many countries as possible, through a search of online databases for relevant material. The major databases used were ABI/Inform 1985-97, Compendex Plus 1993-97, Current Contents 1993-97, and Carl Uncover. The search was generally restricted to publications after 1993, to try to maintain currency and relevance.

The increase in popularity of these alternative procurement practices can be accounted for by various factors, but attempts to improve time and cost performance and reduce the number of disputes appear to be the most prevalent reasons behind changing procurement practices. Contributing to this are factors such as:

- Responses to changes in national and state regulations and government policies
- The effects of international trade agreements; new financial structures to accommodate the transformations in the industry
- Refinements and changes in procurement and delivery methods that are occurring as problems are encountered
- Large number of trials and demonstration projects aimed at identifying the best methods.

Part of the difficulty in discussing procurement and tendering practices is the lack of a standard terminology. Seven main types of procurement systems are in use:

- Traditional Lump Sum
- Provisional Lump Sum/Schedule of Rates
- Cost Reimbursement (Cost-Plus)
- Design and Construct (D&C) or Design and Build Contract

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- Construction Management
- Project Management
- Build, Own, Transfer (BOT) and Build, Own, Operate and Transfer (BOOT).

In this paper, any discussion of turnkey contracting equally applies to D&C or design/build (the US term) contracts and thus includes BOT and BOOT projects. Under a turnkey contract, the builder undertakes to furnish all the components of a project. This includes performing work design and construction to complete the plant; providing testing and start-up; and placing the plant in production. Turnkey places all design, construction and building, and performance responsibilities under a single entity, and the primary advantage to turnkey work is this single point of responsibility. Turnkey projects can be done by a lead company that subcontracts out the different aspects of the project, alternatively the principal participants join in a consortium or joint venture or other project arrangement. The goal under either framework is to appropriately allocate and assign the risks to the party best able to control that risk. Schedule, performance and price guarantees can thus be provided with a maximum amount of risk sharing and a minimum opportunity for disputes.

Client role

In 1994 the UK government began a review of its construction procurement policies based on the Latham Action Plan for reducing construction costs by 30%. One of the key recommendations in Latham's (1994) report was a call for the Government to become a model client in an overhaul of the workings of the industry. Clients should be demanding and become the driving force behind industry restructuring, and he targeted 30% because he thought it was the most realistic target. The savings would not all be made by productivity improvements, but also by reducing the contractual problems and interface effects which hamper the efficient working of the industry. Latham clearly spelled out the need for a complete re-engineering of the industry and argued that this must be led by the client (Doyle, 1994).

A series of inquiries, Commissions and Agencies have pursued building industry reform in Australia since the late 1980s. There have been some successes in areas such as QA and multiskilling

the site workforce, but benchmarking, best practice and quality management techniques have not been widely implemented (Karim, Marosszeky, de Valence & Miller, 1997a; 1997b). Over the 1990s the NSW Government in particular has become a leading edge client of the industry through its increasingly stringent prequalification requirements and its promotion of best practice, partnering and long-term relationships involving sequential contracting (of 35 projects) and maintenance contracts. There has been a series of Discussion Papers (NSW Government, 1996, 1997) that led to the adoption of the Construction Australia policy document by all state governments in Australia and the achievement of a public sector national procurement policy in 1997 (de Valence & Marosszeky, 1997).

Procurement and value

The history of procurement over the last few decades strongly shows a trend toward greater professionalism and specialisation by industry organisations, with the growth of project management, structured financing and increased subcontracting of site work being good examples. The main trends have been:

1970s Emergence of formal construction management systems as clients expand their methods and scope. Professionals trained in architecture and engineering assume a greater role in development process.

1980s Real estate, development, financial arrangements and cash management become critical. Alternative forms of ownership emerge, e.g. property trusts, syndicates, corporatisation and privatisation.

1990s Total design solutions linked to new forms of company and project organisation become critical to value adding. Clients seek single-point responsibility with the objectives of improved quality and efficiency of product.

2000 New procurement and organisational forms, ideas and methods emerge to deliver improvement in product quality and efficiency.

The actual definition of procurement that applies here is from Hawk's study of the 60 largest global contractors, from which the timeline above has also been adapted. He describes procurement as a strategic activity:

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Procurement includes the R&D for new and traditional materials for new and old uses. It includes development of new production methods of materials and new means of producing products with these materials. It can involve issues of automation, efficiency, product life cycle studies and responses to problems of environmental deterioration and pollution. Linked to an improved model of design, procurement can be extremely important to transforming the industry (Hawk, 1992: 47).

Procurement has become a more central issue to the industry for several reasons. Clients have been demanding 'better value for money' since the early 1970s, driven partly by the industry's own poor productivity performance and partly by comparisons with manufacturing productivity growth. Studies such as Walker (1996) and lean construction reports (e.g. Miles & Ballard, 1997) show clearly that non-traditional procurement systems have better time performance and cost benefits. Following Hawk's argument above, non-traditional procurement systems would also offer better opportunities for "development of new production methods of materials and new means of producing products with these materials".

This is the driving force behind the current thinking about procurement and innovation. As better benchmarks and performance measures evolve across a range of building features the idea of value is beginning to lose its fuzzy "eye of the beholder" quality and become focussed on the key performance indicators that are relevant to that building. Examples are the features measured by the Building Quality Assessment System used by Rider Hunt Terotech, Anderson Consulting uses earnings per square metre of office space, supermarkets revenue per metre, and so on. In all cases the better the building's internal environment and the systems that support it, the better the performance. The benefits include lower health costs and sick days in offices, also fewer mistakes in work and improved productivity, higher sales in well-designed retail, and so on. All these can often be delivered through the combination of good design and quality services.

Also, the method of project procurement and delivery used by the client determines the nature of competition in the industry. The industry may be seen as a competitive game with its players, with the rules set by its clients. The evolution of procurement and

delivery strategies and policies developed by clients has changed the rules of the game over time, and clients are seeking ways to raise the standard of performance. At the end of the day, the industry competes on a playing field defined by clients under rules set by clients. Thus the Latham Report (1994) urged the UK public sector to play a leading role in restructuring the industry, as did Gyles in Australia (RCBI, 1992). In the US the CII has promoted best practice to both clients and contractors with significant project time and cost results. Singapore's CIDB is the archetypal leading edge client (CIDB 1994), and there are many other government ministries and agencies. Examples from the private sector include British Airways (BA), Toyota, Coca Cola, Shell, Hewlett-Packard, Intel and Ciba-Geigy.

In Australia governments are experimenting with electronic procurement and alternative delivery methods. As argued in the NSW Government Discussion Paper *A Perspective of the Construction Industry in NSW in 2005*, innovative ways of procuring goods, services and infrastructure will increasingly distinguish one organisation from another. Clients are raising their expectations and setting new standards, and in determining the standards of performance they expect they will increasingly monitor performance and reward the better performers. The NSW challenge to the local construction industry firms is to show that they can produce client-driven, high quality, value-for-money outcomes, and sustain long-term relationships:

> *In future, the services packaged for clients will extend beyond the familiar range of construction services associated with a single project. For example, to gain competitive advantage and improve profitability, a client may seek the means by which purchases and ownership costs can be reduced (including investment in capital infrastructure) and instead introduce management systems that transform purchasing, inventory, and materials management activities into strategic, value-added, business functions/outcomes (NSW Government, 1997:15).*

As a result of the push for better value, there is a renewed effort in investigating tendering and procurement practices around the world. The factors behind this interest are diverse, but greater efficiency and lower costs are universal goals, and a significant opportunity for the industry comes from the fact that improved

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environmental performance comes from better designed, more efficient buildings, which deliver lower through life costs. Also a major impetus has come from the increasingly widespread use of IT and electronic procurement by large public and private clients.

Trends in procurement

Many surveys have established that clients perceive the design and build approach as providing better value for money and giving rise to less disputes than other procurement methods, and that an experienced client with a clear brief can use it satisfactorily with most project sizes (Songer and Molenaar, 1996; Feddersen, 1994; Middleton, 1995; Rosenbaum, 1995; Ndekugri & Turner, 1994; Akintoye, 1994). The quality of the design brief and project specifications appear to be fundamental to the success of alternative delivery systems. Some clients are concerned about the quality of the finished project and the possibility of disputes due to abortive work, inaccuracies in the clients' brief, conflict between the brief and the contractors proposal, valuation of variations, and the dubious quality of the work by some firms (Dozzi et al., 1996; Olson, 1996; Friedlander, 1997).

Owners and clients are increasingly using a variety of alternative procurement methods aimed at reducing cost, achieving time schedules and milestones, shortening duration, reducing claims, and improving constructability and innovation. The overall trend is toward versions of design-build and turnkey construction because of the advantages of a project delivery system that combines designers, builders, and sometimes suppliers into a single entity. For example, changes in the US federal governments procurement system, to solve the problems inherent with traditional low-bid procurement, allowed federal agencies to use a limited form of design-build and many states are following this example by allowing procurement options that encourage alternative methods.

The greatest concerns with alternative procurement methods are their long term performance, their influence on project performance, project delivery time and reliability (Naoum, 1994; Songer et al. 1997; Sullivan, 1997; Friedlander & Roberts, 1997; Middleton, 1995). However, it has statistically been found that costly competitive bids are likely to have high cost growth

(Crowley & Hancher, 1995). With changes in procedure there are the inevitable unanticipated consequences and uncertainties, particularly as the methods are still evolving and players (owners and managers) are moving up the learning curve as they gain experience. Apart from issues such as long-term performance and profitability, a concern facing owners and clients is the correct choice of delivery system appropriate to the project. The selection may have a direct bearing on the success or failure of the project, and the evaluation of tenders has become more complicated with all the variables to be considered.

The design-build project delivery process can be procured with competitive negotiation, performance-based standards and best value selection criteria. Whatever the exact form, the integrity of the bidding process is vitally important. Ideally very clear criteria are established at the outset for evaluation of competing designs and work plans. A building purchased through a tender process, which must be able to evaluate design, production capability, time and price, and do so on a competitive basis, is an inherently complex process. One option is to select first on technical ability, and then on price, by a process involving two envelopes (Connaughton, 1994). The technical tender is opened and evaluated first, whilst the 'fee' envelope remains sealed. The technical assessment is scored by the tender panel while the fee tender is assessed independently by the fee panel, who report back to the tender panel.

British Airways (BA) have recently introduced a variant of this process in their procurement of design, construction management and project management, in order to place emphasis on technical quality ahead of price. Consultants are first asked to make two competitive bids for each project, that is one technical bid and one commercial bid. BA first assesses the technical bids and selects two bids for further assessment in the second stage, which involves analysis of the commercial bid. An interview then follows. This new scheme is intended to maximise technical value from consultants rather than merely taking the lowest price bid that may not offer technical competence. BA have acted on the basis that the cost of employing consultants is a small portion of the life-cycle costs of its buildings, but the function and value of buildings is greatly affected by the consultants involved in their procurement.

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The sort of detail as provided in a technical bid is much the same information considered in any process of prequalification: experience, resources, CVs, etc. All criteria are assessed and scored. The commercial bids from firms not short-listed on the technical appraisal are opened only after a contract has been awarded. This enables a check on the price paid to employ the most technically advanced consultants.

Craig (1997) discusses design and built or construction procurement systems where the contractor bears single-point responsibility for the complete product, like any other manufacturer. However, unlike, for example, deciding which car to buy either by description or by sample, a building is purchased through the tender process which must not only be able to evaluate design, but also production capability, time and price, and on a competitive basis. Procurement of projects through the tendering processes appears to limit the successful tenderer's scope to be innovative. Although tendering rules or codes have been developed to maintain the integrity of the bidding process, they are not designed to encourage innovation but rather to produce direct price competition for a specified product.

It would appear that the traditional tendering process for building works is not amenable to design innovation by tenderers. Alternatively, tenderers may seek competitive advantage through novel construction methods, to an extent permitted by the tender documents. There are, however, processes available in the procurement of separate design services that allow competition on innovative design, in which design technical matters of the tenders are evaluated separately from price. This process could also be used for 'design and construct' procurement (Craig, 1997).

Regulatory and legislative trends

To keep up with the changes in project delivery procedures, governments in several countries have made changes in their policies and regulations on procurement which have significant effects on the construction industry. A special case of this is the set of regulations formulated by the World Trade Organisation. Examples of reforms carried out in individual countries include the US "Dispute Avoidance and Resolution Task Force Declaration of Principles for the Prevention and Resolution of

Disputes in the Construction Industry"; Britain's 1994 efficiency review of its construction procurement policies aiming to bring public sector practices in line with best practice in the private sector; Indonesia's efforts to find ways to increase productivity by examining procurement practices, cost control, scheduling, and management integration, and the work of the CIDB in Singapore (Korman, 1997; Ashenfelter et al., 1997; Mattoo, 1996; Doyle,1994; Ichniowski, 1995; Schriener, 1996).

Reforms are under way in the bidding and contractual systems used for public projects in Japan, South Korea, the US and other countries, to open their construction markets to contractors from foreign countries, often with less discriminatory and more competitive forms of tendering (Hodgson, 1995; Carbullo, 1995; Bedelian, 1996; Gransberg & Ellicott, 1996; Kunishima et al., 1995;, Gelston, 1993; Markus, 1997; Krizan, 1996; Loulakis & Cregger, 1996; Spacek, 1996; McManamy, 1994; Reich, 1997).

Reform of the bidding and contractual system used for public projects in Japan and government policies on further opening of the construction market to foreign countries are discussed by Kunishima et al. (1995). Japan's 1995 'Action Plan' provided for open and competitive bidding procedures to be used by public agencies for procurement of construction, design, and consulting work that are valued at or above the WTO government procurement thresholds (Dunn, 1995).

Legislative changes in the US are allowing public owners the opportunity to use design-build as a project delivery option (Krizan, 1996; Loulakis & Cregger, 1996). Changes in the US federal government's procurement system to allow federal agencies to use a limited form of design-build construction contracts has led to the establishment of strict procedures for the agencies to follow when they decide to enter into a design-build project. To combat the problems inherent with traditional low-bid procurement, many states are following the example of the federal government by enacting procurement options to allow and encourage alternative methods. The design-build project delivery process can be procured with competitive negotiation, performance-based standards and best value selection criteria (Charles, 1996; Markus, 1997).

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Conclusion

In conclusion, there is strong evidence from the literature that the trend away from traditional procurement and delivery systems is gathering momentum as more clients try new systems and public clients gain greater freedom to contract for buildings and structures. The trend is supported by two major external developments. World trade treaties are opening up previously protected national markets in public procurement, and this is happening at the same time as increased private participation in infrastructure projects come into being. There is also an increase in the use of two-stage tendering, where the first stage narrows the field of tenderers to a short-list of two or three finalists. This is typical of consortiums or joint ventures including design, building and financial firms, who prepare their bids on the basis of both price and value. The future for low-bid tenderers may not be very promising if clients pursue current moves toward alternative procurement and delivery systems based on value and performance.

Comparisons of the various project delivery methods are plentiful in the literature, with the characteristic features identified for each type. The traditional method of procurement and project delivery is generally considered the safest but is also the slowest as the design must be completed before the project is bid. Design-build is faster and more convenient with the design and construction dovetailed and coming from a single point of responsibility, and D&B allows concurrent engineering, which is claimed to reduce project delivery time without increasing project overall cost. Finally, design-build and finance is often used for large international engineering or construction infrastructure projects, and provides expertise and capital for clients.

The development of a two-level market noted by Hawk (1992) and others is also apparent. The local or regional industry is increasingly separate from the global market for large projects, or those requiring specific expertise. For many firms in the industry irregular and infrequent clients in their local market will be the main source of demand for traditional forms of project procurement and delivery. However, based on the evidence from this survey, clients will increasingly use alternative forms because the advantages far outweigh the disadvantages from the client's perspective. Use of D&B, BOT and BOOT on projects

in rapidly industrialising countries has raised familiarity with alternative procurement methods, and often involved complex consortia or joint venture structures. At the same time clients in the developed countries are increasingly using non-traditional forms of procurement on a wider range of projects as they redefine their expectations of the industry. In mid 1998 an Australian Local Government Authority let a D&B contract for a project worth $500 000.

This paper has argued that these trends have the potential to transform procurement of buildings and structures. In particular, the combination of these three trends has enormous implications for the role of construction economists. The key trends are:

- A shift toward a more complex range of services required by clients
- The move toward single-point responsibility for projects
- A greater focus on value (generally through life costs) by clients.

One of the outcomes might include increased emphasis on build and maintain contracts, or warranty and insurance schemes for each building, or other measures as clients seek value from ongoing performance rather than just construction. This extends to the increasing use of maintenance contracts, as seen recently for railway track, highways and schools in NSW. Other outcomes will include a greater diversity of procurement and delivery systems used by clients as they attempt to find the most appropriate method for individual projects or contracts. Again, many of these contracts will be best met by consortia or alliances of specialist firms.

The implications for construction economics of these trends in procurement discussed here present major challenges and opportunities to the profession, and to the education and training of graduates for the future. Firstly, with the move away from traditional procurement and delivery come changes in the traditional roles in the industry. Increasingly the construction economist's client will be a project-specific entity, a joint venture, consortium or alliance, and it will become more common for the QS firm to be a member of such an entity rather than an independent consultant (in my opinion). Also, the move from BQs and cost plans prepared for principals toward builders' bills for tender bids will continue, and many of the larger contractors and

builders may want to bring this expertise inhouse. This suggests that among successful firms will be those that specialise in key areas and build competitive strength through strategic alliances in a more complex business environment.

Secondly, the profession has traditionally focussed on saving clients' money as their core service, but the new challenge is to find ways to add value to projects for all stakeholders. This requires greater involvement during the design stage of a project, where the cost outcomes of design and structural options can be calculated and discussed with clients, including life cycle costs, to help maximise the return on investment. The core competencies here are design literacy and financial analysis. It is therefore possible that a natural division will occur, as some QS firms position themselves with expertise in the design and pre-design stages of projects while others will focus on skills for managing the construction stage.

Thirdly, major projects are becoming part of an international globalised market as public sector procurement is deregulated and private sector clients develop relationships with industry partners. In both cases the traditional QS practice could be competing against aggressive new entrants into their field from other professions, such as accounting, finance and legal firms, that might try to use the increasing diversity and complexity of procurement methods to make a grab for a share of the market. Also, the clients who have major projects are typically experienced, long-term investors with considerable expertise in alternative procurement methods.

The alternative methods and systems of procurement and delivery being sought by clients will be value driven and emphasise innovative design solutions, the materials used and building methods employed, in order to lower ownership or occupancy costs. The opportunity is for those in the industry who are interested in responding to client requirements to find organisational forms and alternative delivery systems that will deliver better value for the money clients invest.

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