
MINIMISING RISK IN CONSTRUCTION PROCUREMENT

Choosing the Optimal Procurement Route

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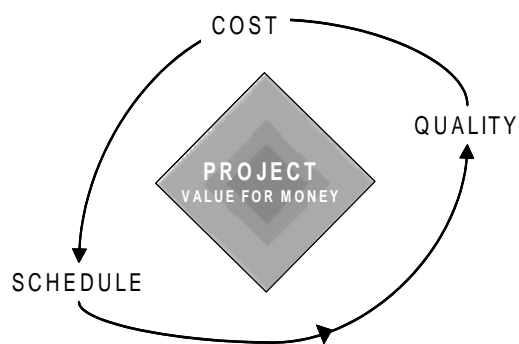
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Introduction

Developing the optimal procurement strategy for a construction project is a key element to ensure success with a range of risks and benefits associated with any given approach. Careful upfront consideration needs to be given to development of the strategy to match the overall project objectives and a Developer's¹ risk profile. In this paper we discuss the issues for consideration in order to develop a procurement strategy to match a Developer's risk profile.

Procurement in a construction environment can be defined as the best blend of time, cost and quality to achieve the construction objective. A construction procurement strategy is the means, contractual or non-contractual, by which the objectives of the construction project are achieved.



The procurement strategy looks to optimally transfer and minimise the risks that a Developer of a construction project will face during a project's lifetime. This strategy comprises several elements including the overall management approach and procurement system. Inherent in each choice that a Developer makes for each of these elements is a trade-off between the competing objectives of schedule, cost and quality.

The term "procurement system" encapsulates the interaction at two distinct levels. Those levels are:

- i. Delivery system
- ii. Contract system

This paper examines the risks inherent in each choice that is made during the development of the procurement strategy; to match a given risk profile

and the advantages and disadvantages of each procurement approach. An outline of an approach that can be used to develop the strategy is then outlined.

¹ The term Developer is used throughout the article to indicate the individual, company, public authority etc. who intends to develop the construction project.

Delivery Systems

At a simple level a delivery system is the number of contracts controlling the delivery of a project. The selection of delivery system affects the allocation of certain project risks and the probability they will be realised. For example, under a single contract system, risk associated with the co-ordination of separate contract packages are transferred to the Contractor whereas contract co-ordination risks are with the Developer under a multiple contract system.

The key types of delivery system include: -

- i. A Single Contract for the whole of a project.
- ii. Multiple Contracts in one of the following forms.
 - (a) Multiple contracts on a works package basis
 - (b) Multiple contracts on a trade package basis

Single Contract

With a single contract delivery system, one major contract determines most of the cost of the project and is used to carry out most of the project work. This system may include one or several small associated contracts, but the bulk of the work is covered in a major single contract. Design and other consultants and project managers' engagements would also be involved.

A project may not require as much management or ongoing co-ordination by a Project Manager with a Single contract delivery system, as the Developer is only required to award one contract at an appropriate time to achieve the desired completion date.

A Single Contract is the most appropriate choice if:

- i. The project budget is relatively fixed at commencement
- ii. Time is available to complete contract and some or most design documentation before construction starts
- iii. Limited skills or resources are available or sought for project/construction management for the Developer
- iv. The Developer's brief and any applicable Developer's design components are clear
- v. Projects where there is no advantage in

- splitting work activities
- vi. Projects where there is less need for fast tracking
- vii. Projects where one Contractor can most efficiently manage the mix and scale of work
- viii. There are enough Contractors in the market with adequate turnover to ensure good competition through a tendering process

The advantages and disadvantages of such a system are outlined in the following table:

Advantages and Disadvantages of a Single Contract	
Advantages	Disadvantages
Transfer of most contract co-ordination risk from Developer to Contractor	There is potential for an increase in discrepancies between contract packages
Developer can obtain better overall contract/project market-based cost estimate early in the progress of the project	The Developer carries the co-ordination and interface risk.
Better quality of Contractor could be available with a larger scope	The Developer may be encouraged to generate changes due to the flexible nature of the system and therefore increase project costs
Enhances expenditure control by the Developer	A lot more of the Developer's resources are required in preparation of documentation and administration
Allows staging with the opportunity to accelerate or delay work	The Developer is committed to construction prior to the knowledge of a firm bid price for the project
Provides a simpler and more economical method to control costs within budget, either by reducing standards or omitting work if a cost or time overruns is expected.	Scale may reduce number of qualified contractors and competition in bidding

Table 1 - Advantages and Disadvantages of a Single Contract System

Multiple Contracts

Within a multiple contract delivery system, the project is split into several work packages each requiring a contract system. The system is suitable for achieving project / program compression and staging and can provide more time for a Developer to control or influence the design process. It can permit design, construction, commissioning and occupation of a project to progress at the same time.

The system does not require design and contract documentation for the whole project before some contract work begins. It allows contracts to be let as papers (e.g. drawings, specifications and equipment schedules) for each component are prepared to suit a staged overall program for the project. A multiple contract delivery system requires additional management input (outside the contracts) to the interface between contracts and the time performance of all Contractors.

A Multiple Contract is the most appropriate choice if: -

- i. Risks can be apportioned in the various contract packages at later stages when they are more likely to be understood
- ii. Cashflow can be more readily manipulated
- iii. Any later changes to design requirements can be more economically and readily accommodated
- iv. The project can be fast tracked more readily
- v. There is a greater ability to react to technology changes and new opportunities
- vi. Design / Construction quality can be more readily influenced by the Developer

The advantages and disadvantages of such a system are outlined in the following table:

Advantages and disadvantages of a Multiple Contract	
Advantages	Disadvantages
<p>Project time compression is possible with the commencement of the construction phase ahead of completion of project design and documentation of all project components</p> <p>Direct early engagement of specialist Contractors and direct purchase of major items of plant and materials from suppliers is possible. There is no need for complex contractual arrangements with nominated sub-Contractors</p> <p>Retain more expenditure / cash flow control in the hands of the Developer</p> <p>Allows staging with the opportunity to bring forward or postpone or accelerate or decelerate some work to meet the Developer's cashflow</p> <p>Provides for better potential to control the quality of the finished product with a direct selection of particular work or trade Contractors</p> <p>Increase some flexibility with some changes because packages are let progressively</p> <p>Where the Developer's brief is initially imprecise, it gives</p>	<p>The Developer carries greater co-ordination and interface risk</p> <p>The Developer may be encouraged to generate more avoidable changes due to the flexible nature of the system and therefore increase avoidable project cost</p> <p>More management resources are required, and development costs incurred in the preparation of documentation, tender process management and in contract administration</p> <p>The need for commitment to contracts and some construction prior to the knowledge of contract prices for the whole project</p> <p>Increased cost potential with discrepancies and interface between contract packages</p> <p>The outturn cost of the project is not known until the last contract is awarded.</p>

Advantages and disadvantages of a Multiple Contract	
Advantages	Disadvantages
<p>more leeway for best prices with competitive tendering as the packages are developed</p> <p>Allows more choice with the quality and size of particular construction / contract terms</p> <p>Can facilitate more input of construction expertise into design</p>	

Table 2 - Advantages and Disadvantages of a Multiple Contract System

Implications for Overall Approach

If a multistage contract route is determined to be the best approach, the various individual contract packages will have to be identified at the initial stages of a project and the design approach, which offers the desired risk level to a Developer, should be selected for each identified contract package.

Typical list of packages	
<p>Demolitions</p> <p>Site Preparation</p> <p>Substructure</p> <p>Frame / Upper Floor</p> <p>Lift Shafts, Escalators & Stairs</p> <p>Main Roof</p> <p>External Envelope</p> <p>Internal Accommodation</p>	<p>Finishes</p> <p>Fixtures & Fittings</p> <p>Fit-Out</p> <p>M&E Services</p> <p>BWIC</p> <p>External Work</p> <p>Preliminaries</p>

Table 3 – Typical Breakdown of Construction Packages

The contract systems identified are examined in more detail in the next section.

Contract Systems

There are essentially four types of contract systems generally used with either the single contract or the multiple contract delivery systems. The following discussion provides background on the issues to be considered by a Developer when selecting a contract system and lists the advantages and disadvantages of each system.

- i. Traditional (Design, Bid, Build)
- ii. Design & Build
- iii. Management Contracting
- iv. Construction Management

Traditional

The Developer prepares detailed design for the whole of the works. This preparation can either be done in-house or by using consultants. It is essential then, because of the late involvement of the Contractor that the design team has sufficient knowledge and experience of build ability knowledge, risk allocation, materials and manpower availability, industrial relations and safety aspects. Contracts are then entered on the basis of a lump sum fixed price with or without a bill of quantities or schedule of rates.

A traditional type contract is appropriate for projects where the following requirements are substantially satisfied:

- i. The optimum design can be developed without involving the prospective Contractor or specialist Contractors
- ii. The Developer prefers to manage the interface between the detailed design / documentation and construction and to select and engage the consultants and have them directly responsible to the Developer
- iii. There is enough time available for the detailed design to be completed before construction commences so as to complete the project on or within time
- iv. The Developer prefers to have the design fixed prior to contract award.

Traditional	
Advantages	Disadvantages
Detailed design is available before construction contract is awarded	Inability to fast track the project
Design can be established without involving the prospective builder or specialist sub-Contractor	Long lead time taken to prepare tender papers
Design risks to the Developer are reduced with the design essentially complete prior to tender for construction	Duration of pre-contract is increased due to preparation of papers
Design is fixed prior to contract award	The greater complexity and volume of the documentation can lead to greater numbers of errors and omissions and increase the potential for contract claims and extra cost
Fully detailed design before tender award, generates the highest potential level of product quality	The Developer's direct design and project management resources, effort and costs are greater
The Developer is more likely to obtain appropriate and better prices for fully defined work	Greater potential for design and construction co-ordination and build ability
There is a larger pool of suitable tenderers, which increases the scope for competitive prices / tenders	
Provides a good basis for agreeing variations	
Full value of contract known at an early stage	
Fixed price contract	
Most commonly used in Ireland	

Table 4 - Advantages and Disadvantages of Traditional Approach

Design & Build

In this approach design is combined with construction in a contract which can be awarded in a competitive bidding situation. The Developer enters into a single contract with a design – builder who both designs and constructs the building with the design professionals being directly responsible to the Contractor and not the Developer.

At times the Developer appoints the design team to prepare the initial planning drawings. This design can be used as the basis for the building specification and award of design build contract with the design team who submit the planning drawings being ‘novated’ to the Design and build Contractor. However, in some instances the Contractor provided his own design team. The advantages and disadvantages of such an approach are detailed below:

Design & Build	
Advantages	Disadvantages
Project time can be reduced by starting construction prior to finalization of detailed design, at the Contractor's risk	The cost of preparing tenders for a Contractor is high, potentially, therefore potentially less interest and direct competition
There is a wider scope for innovation by the Contractor.	There is a risk to the Developer that contract design papers may not be specific enough or may be ambiguous, increasing quality, outcome and cost risk
The Developer can contribute substantially to conceptual design and nominate performance criteria required	The tender prices may carry a higher risk premium, as the Contractor bears more risk than with the traditional system
The Developer can transfer responsibility for detail design and co-ordination onto the Contractor, thus reducing risk	If the Developer requires a design variation it can be costly
There is reduced scope for claims for extension of time or variations, except where the Developer varies the contract	The number of competent potential tenderers is limited, especially on larger projects
Fewer Developer's resources are required	Quality of completed building may be compromised
Potential for cost savings due to faster and more efficient construction, with Contractor able to tailor design detail preferred construction methods	If the design brief is not precise, the Contractor can potentially justify claims for the ratification of work or produce work below the anticipated standard, where the requirements are unclear
Single point responsibility for design and construction.	

Table 5 - Advantages and Disadvantages of Design and Build Approach

Management Contracting

Management contract is a system whereby a main Contractor is appointed, either by negotiation or in competition and works closely with the team of design professionals. The management Contractor works alongside the design and cost consultants providing a construction management service and sub-contracts the physical site works. All physical construction is undertaken by sub-Contractors selected in competition. The Contractor is paid a fee to manage the building of a project on behalf of the Developer. The nature and scope of work is identified in a bid documentation to allow the Contractor to tender for the Management fee and site overheads, plant, contract insurance and preliminaries. The management Contractor does not undertake either design or direct construction works. The management Contractor provides common services to the sub-Contractors such as welfare facilities, any plant and equipment and sufficient management both on and off the site to undertake the planning and management, co-ordination and control of the project.

Management Contracting	
Advantages	Disadvantages
Contractors work as part of the design team (i.e. no conflict of interest)	Firm price not achieved until all sub-contract packages awarded often late in the project
Early start on site as sub-Contractors can be awarded on a phased basis	Developer takes risk of difference between est. cost and sub-Contractors tenders
Developer / Design team can influence the choice of Contractor of the Contractors / management team	Site supervision and plant charges may be more costly depending on sub-Contractor needs which may not always be fully defined in advance of bidding individual packages
Early advice on build ability and programme	This option would generally tend to be an expensive method of procurement

Table 6 - Advantages and Disadvantages of Management Contracting Approach

Construction Management

Under this option a Developer engages a construction manager to provide a service for the construction phase, particularly related to the control, management and co-ordination of the construction of the project. All work Contractors execute direct contracts with the Developer. i.e. All of the construction work, other than the design by the professional team, is contracted to trade specialists who in this method are called trade Contractors. The Developer enters into each trade contract with the trade Contractor himself.

There is a high degree of involvement of the Developer in managing the interface between design and construction and is not dissimilar to a Developer acting as a Main Contractor.

Construction Management	
Advantages	Disadvantages
Early start on site as sub-Contractors can be awarded on a phased basis	If the trade Contractor suffers some sort of problem in the execution of their work, his claim will be made directly against the Employer
Developer / Design team can influence the choice of Contractor of the Contractors / management team.	The Employer is exposed to the risk of multiple claim against him if things go wrong
Early advice on build ability and programme	The construction manager really has to have the skills of a competent main Contractor in managing the construction process

Table 7 - Advantages and Disadvantages of a Construction Management Approach

Pulling the Strategy together

The delivery system and the contract approach chosen becomes the procurement strategy – the approach which identifies the best way of achieving the objectives of the project and value for money, taking account of the project's risks and constraints. The aim of the procurement strategy is to achieve the optimum balance of risk, control and funding for the project. Deciding and delivering involves a number of steps.

1. Determine the Procurement Route

The procurement route (tactics) delivers the procurement strategy. It includes the contract strategy that will best meet a Developer needs. Having an integrated procurement route ensures that design; construction, operation and maintenance are considered as a whole and also that the delivery team work together as an integrated project team.

2. Contract Strategy

The contract strategy determines the level of integration of design, construction and ongoing maintenance for the project and should support the main project objectives in terms of risk allocation, delivery, incentivisation and so on.

Table 8 - Procurement Strategy and Procurement Route) below shows the relationship between the procurement strategy, procurement route and contract strategy. The procurement strategy determines the most appropriate procurement route, including the contract strategy, to fit the project objectives and current circumstances.

Procurement Strategy	Key objectives Constraints Funding mechanism Risk allocation
Procurement route: How to achieve the strategy	Funding Contract Strategy

Table 8 - Procurement Strategy and Procurement Route

3. Identifying the Project Constraints

As each development project has a set of associated risks and constraints these must be considered at its initiation in a structured manner.

The initial stage of a construction procurement strategy evaluation involves a detailed identification of the constraints, which surround the project and how such constraints impact on the risks associated with the procurement route chosen. These constraints can be broadly grouped as financial, physical, geographical, program functional or design constraints.

Factors that may affect the procurement strategy to be selected can thus be identified under the following broad headings

Developer Constraints	Physical constraints
Available budget and its flexibility Funding sources Cashflow restrictions Time for completion and its flexibility Need for staging Completeness, clarity and timing of brief Project profile Availability of appropriate resources Organisational objectives	Type of construction Building or civil engineering project Occupied premises Planning Complexity of design Location of project Size of project Infrastructure Sub - projects

Table 9 - Constraint Identification

Following this constraint identification process a project team must decide how such constraints impact on the risks associated with procurement route chosen and make the selection of the strategy, which exposes the project to least critical risks.

The risk profile of different delivery systems is given in Table 10 - Delivery System Risk Profile

4. Evaluate the risks

The main objective of the procurement strategy evaluation process will be to establish the risks dependent upon procurement route chosen for a project and to recommend a procurement route that will optimally allocate these risks between Contractor and a Developer.

The initial evaluation looks at a single v multi stage

delivery system approach. The first stage will be to identify the critical issues for a Developer so that the optimal delivery system can be chosen. The system should be chosen that offers the desired risk level to a Developer.

The approach then looks at each contract in detail and determines the optimal contract type that should be used.

To illustrate application of the approach using *Table 10 - Delivery System Risk Profile* and *Table 11 – Contract System Risk Profile* – if it is important that there is no cost impact if the project is re-designed during construction – in this stage a multistage contract should be used to minimise the risk.

The following gives an overview of the methodology that should take place in a formal (or informal) manner.

Risk to a Developer	Risk Identified as Critical	Single Contract	Multistage Contract
Cost and/or time impact due to co-ordination difficulties	Y/N	L	H
Inability to control cashflow	Y/N	H	L
Cost impact if project re-designed during construction	Y/N	H	L
Cost impact if project curtailed during construction	Y/N	H	L
Inability to economically fast track to achieve early commencement or completion	Y/N	H/M	L
Variability of end cost to preconstruction budget	Y/N	L	H
Inability to react to technological changes economically	Y/N	H	L
Cost and/or time impact of Contractor's failure to complete contract(s)	Y/N	H	L
Cost and/or time impact due to documentation errors between contracts	Y/N	L	M
Cost and/or time impact of individual documentation errors	Y/N	H	L
Inability to directly select subContractors/suppliers	Y/N	M	L
Inability to economically amend/impose changes in staging	Y/N	H	L
		Risk level associated with delivery system	

Table 10 - Delivery System Risk Profile

		Procurement Route			
Risk to a Developer	Risk Identified as Critical	Main	Design Build	Management Contract	Construction Management
Time impact of tender period	Y/N	L	H	M	M/H
Cost and/or time impact of individual design changes	Y/N	L	L	M	M
Impact of design changes on original contract price	Y/N	L	L	H	M
Cost and time impact of co-ordination difficulties during design/ documentation	Y/N	H	H	M	M
Overall cost impact of variations due to documentation errors	Y/N	H	H	M/L	L
Potential for lesser design quality	Y/N	L	M/H	M	L/M
High level of Contractor's contingencies which add to tender price	Y/N	L	L	L/M	M
Cost impacts due to latent conditions	Y/N	M	M	H	H
Potential for large time overruns	Y/N	M	M	L	M
Inability to fast track	Y/N	H	H	L/M	M
Large number of Contractor's claims	Y/N	H	M	L	M
		Risk level associated with contract system			

Table 11 – Contract System Risk Profile

5. Determine what is important to the project and pick the right contract approach to deliver

The final step in making the strategy live is to finalise the procurement objectives and to compare the ability of each contract approach to meet the objectives (for each package assuming a multiple contract approach).

The decision criteria used to make this choice are closely linked to the project objectives, both tangible, such as time and cost and intangible such as buildability and relationship. They can be established through reviewing previous projects, thinking about past experiences and then selecting those criteria that are relevant to a project.

A comprehensive list of a Developer's requirements could be as follows: -

- i. Certainty of cost and time.
- ii. Flexibility to change design in construction stage.
- iii. Desire to be actively involved
- iv. Innovative inputs consultants

These then can be expanded to give a set of decision criteria for use in a marking process:

- a. Speed: The time taken to complete the project
- b. Certainty: The certainty over the cost for completion of the project
- c. Flexibility: The ability and authority for the Developer to affect change
- d. Quality level: The quality level required of the completed project.
- e. Complexity: The suitability of the procurement method to tackle complex projects.
- f. Risk avoidance: The transfer of risk to the Contractor
- g. Price competition: The degree of price competition pertaining to the procurement options.
- h. Point of responsibility: The clarity of allocation of responsibility

Once established the relative importance of each decision criteria can be determined among a

development team². Based on this assessment each criterion is assigned a weighting which is then used in combination with each contract's risk profile to give an overall mark for each contract approach.

This marking process can be carried out through using a matrix such as that exhibited on the following page (*Table 12 - Procurement Strategy: Matrix for Evaluation of Alternative Approaches*). The highest scoring option will be the option that best meets the procurement objectives.

Conclusion

The optimal choice of procurement strategy for a project has a significant input to the probability of a project's overall success.

Time spent initially, using the structured approach described in this paper, considering stepwise the risks and constraints inherent in a project and their impact on a project can help determine the optimal mix of delivery system and contract approach for a project.

Project teams need to be aware of the advantages and disadvantages of each approach in order to best develop the optimal procurement strategy.

² There are several group decision making processes that can be used for this purpose.

Procurement Strategy Development Matrix										
Project Objectives	Objectives (project specific)	Weighting (importance)	Traditional		Design & Build		Management Contracting		Construction Management	
Parameter			Marks	Weighted Marks	Marks	Weighted Marks	Marks	Weighted Marks	Marks	Weighted Marks
Schedule	Early Completion									
Cost	Price certainty before construction starts									
Quality	Defined level in design and construction									
Variations	Avoid prohibitive cost of change									
Complexity	Technically advanced or high complex building									
Responsibility	Single contractual link for project execution									
Professional Responsibility	Need for design team to report to Developer									
Risk Avoidance	Desire to transfer complete risk									
Damage Recovery	Ability to recover costs directly from the Contractor									
Buildability	Contractor input to efficient design and construction to benefit Developer									
Total Weighted Marks										

Table 12 - Procurement Strategy: Matrix for Evaluation of Alternative Approaches

Further information and about Keogh Consulting

Individuals and organisations delivering projects face complex challenges from concept development, through feasibility assessment, delivery, to operation. Keogh Consulting provide specialist resources to assist and improve the development and delivery of capital projects. Through use of agile and lean approaches we ensure that the right projects are done in the right way on time and within budget.

Our consultants have practical industry experience in a range of sectors gained over 25 years in nearly every aspect of a projects life cycle and have advanced degrees in engineering, business administration, finance and corporate governance. We provide a broad range of integrated services touching upon almost every aspect of a project from idea generation to operation and have advised on projects ranging from business start-ups to major public capital projects and programmes.

For further information about this article or issues raised in the article or should you require further information on how Keogh Consulting can help your project please contact us at info@keoconsult.com.

