

RECONSIDERING PROCUREMENT CRITERIA AND PROCEDURES FOR MAJOR INFRASTRUCTURE PROJECTS

Why the Use of “Price” as the Determining Factor in Construction Procurement Decisions is Wrong

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The focus of this paper is to highlight the general lack of attention to schedules and operability in the bid preparation, evaluation, and contract award stages of major projects, and to suggest that a change in the way that bids are called for and prepared may lead to better project outcomes. If a project can be priced in detail for bid evaluation, why can it not be resourced and scheduled in detail for bid evaluation? Price is currently the dominant factor in bid evaluation, but lack of adequate scheduling leads to schedule overruns which are crippling, because “time is money”, and the Employer’s traditional legal remedies have little effect on mitigating the cost effects of lateness at that stage. The question may be asked: how realistic are current initial cost and time objectives? If they are indeed unrealistic, more effective criteria for procurement and management of projects are needed.

WHAT IS A “SUCCESSFUL PROJECT”?

Success is largely judged on whether a project has been completed on budget.¹ The budget usually referred to is the initial “price”, on which

¹ “LNG project cost blowouts:

Project	Operator	Original Budget, Schedule	Final, or current budget, Schedule
Pluto	Woodside	AUS\$12bn, late 2010	AUS\$15bn, April 2012
QCLNG, QLD	BG Group	US\$15bn, 2014	US\$20.4bn, Jan 2015
Gladstone LNG, QLD	Santos	US\$16bn, 2015	US\$18.5bn, Oct 2015
APLNG, QLD	Origin/Conoco Phillips	AUS\$23bn, mid-2015	AUS\$24.7bn, Jan 2016
Gorgon, WA	Chevron	US\$37bn, 2014	US\$54bn, first quarter 2016
Wheatstone	Chevron	US\$29bn, 2016	US\$29bn, mid 2017
Ichthys	Inpex	US\$34bn, 2016	US\$37.4bn, 2017”

Source: *The Australian Business Review* and *The Wall Street Journal*, Tuesday, 2 February 2016, p 9.

financing is frequently based, together with a contingency; hence the importance placed by the Employer and the project financiers on the “price”. But the basis on which the “price” was arrived at is often not explained or clearly understood, and the “price” may be inherently unrealistic and fundamentally flawed from the outset. Flawed because it is not sufficiently aligned with a realistically resourced schedule, is not based on an accurate scope of work or does not contain contingencies for the chosen risk allocation between the parties.

In addition, resourced contingency recovery plans frequently do not exist for “known-knowns” which will almost inevitably occur during the construction of a major project e.g. industrial unrest or cyclone events which will delay progress. Emphasis on “price” in reporting on the success or otherwise of a project is likely to be misleading, because data is not given at the same time in relation to the basis on which that price was arrived at. A price may be no more than an initial estimate on which the Employer bears all the risk of cost increases, or one on which the risk of cost increases falls mainly on the Contractor. Unless the basis of pricing is known, communicated and understood, a conclusion may be erroneously drawn that a project is not a success.²

Merrow³ gives five figures of merit in evaluating the success of projects: cost growth, cost competitiveness, schedule slippage, schedule competitiveness and production attainment.

WHY IS “PRICE” CURRENTLY USED AS THE MAJOR COMPARATOR IN THE DECISION TO AWARD CONTRACTS?

While searching for reasons for apparent cost and time overruns on major projects⁴ it has become obvious that insufficient work is done in preparation for the award of contracts. As we will see below, “price” generally tends to dominate the bid evaluation process. Bid evaluations made predominantly on the initial “price” are likely to create false expectations. Perhaps the reason that “price” is used as the leading comparator is because of the apparent convenience and simplicity of “price normalisation” in the bid

² “The enormous Gorgon liquefied natural gas project off Western Australia has taken its first step towards recouping its AUS\$55 billion price tag, with its maiden shipment of LNG setting sail yesterday. Gorgon, which ranks as the biggest ever project carried out in Australia, was originally expected to cost US\$37 billion and be in production by 2014 when it was first approved”: *The Australian*, 23 March 2016.

³ “Megaprojects failing to get off the ground”: *The Australian Business Review* and *The Wall Street Journal*, Tuesday, 2 February 2016.

⁴ Edward W Merrow, *Industrial Megaprojects* (2011) 37.

⁵ GASTEC Conference “Does \$50/bbl Oil Require a New Approach to Delivering Successful Projects?”: P Loots & D Charrett, Singapore, 29 October 2015; Yakubu Adisa Olawale and Ming Sun, “Cost and Time Control of Construction Projects: Inhibiting Factors and Mitigating Measures in Practice” (2010) 28 *Construction Management and Economics* 509.

evaluation process, and the ease of comparison of “normalised prices” offered by bidders.

A clear definition of the scope of work at the outset – the work that has to be done within the scope of the contract – is essential to certainty of “price” and schedule. But a clear definition of “what will be done when” is equally, if not more important to certainty that the end date will be met.

There have been numerous attempts to identify those factors that contribute to project success or failure, or reduce the incidence of disputes.⁵

Life cycle costs

Owners who procure constructed facilities are ultimately interested in maximising the economic return from their investment over the life cycle. A government procuring public infrastructure aims to obtain the best value for money in order to maximise the benefit to society from the limited funds available. The private sector invests in facilities in order to sell a product and make a profit.

The design and construction of a facility is only the start of an operating life that may span many years. There is increasing emphasis in modern society on sustainability and reducing the carbon footprint of human activities, and this is driving a trend to design facilities for longer life cycles.⁶ This focusses attention on the life cycle costs of a facility – the incremental costs of a longer design life may result in significantly lower lifecycle costs.

The life cycle of a typical facility can be divided into three distinctly different stages: design, construction and operations. The operations stage includes maintenance to sustain operations, refurbishment to restore operations and decommissioning and demolition after operations are not economically viable. Thus, lifecycle costs include the costs of design, construction and operations. The traditional method of project procurement is to focus on the cost of design and construction. However, this does not consider the major component of life cycle costs: the operations stage.

The design of a facility has a pervading influence, not just on the cost of construction, but even more importantly, on the life cycle costs. In many construction projects there is a well-known trade-off between the capital cost of construction, and the life cycle costs: cheaper construction costs, achieved by the selection of less durable materials or less robust equipment, often lead to significantly higher maintenance and operating costs and ultimately a higher life cycle cost.

⁵ Philip Loots and Dr Donald Charrett, *Practical Guide to Engineering and Construction Contracts* (2009), 333.

⁶ For example, the Australian Parliament House was designed (in the late 1970s) to have a 200-year life (Parliament House Construction Authority, Commonwealth, *Project Parliament: The Management Experience* (1990)), and more recently, the second Gateway Bridge over the Brisbane river was designed for a 300-year life (Leighton Abigroup Joint Venture, *Gateway Upgrade Project, Brisbane* (2012) <http://www.aaa.net.au/wp-content/uploads/2015/05/GATEWAY-UPGRADE-PROJECT.pdf>).

The significance of design and construction cost in relation to a project is succinctly encapsulated in the 1:10:100 “rule”:

“Over one typical ‘life cycle’ of a facility, for every one dollar \$1 spent on design, at least ten dollars \$10 are spent on construction and at least one hundred dollars \$100 are spent on OM&R [operation, maintenance and repairs/refurbishment].”⁷

Thus, inadequate time spent at the early design stage may not only result in a sub-optimal design with higher construction costs, it may also result in significantly higher life cycle costs during the operations stage. This is a further reason why allowing adequate time and resources at the conceptual stage (“front end loading”) are so fundamental to a successful project outcome.

Dr John Miller discussed reasons why Governments will be increasingly pushed to procure infrastructure on a lowest lifecycle cost basis, including:

“Near exclusive use of initial delivery procurement cannot succeed financially because design and construction is inexorably followed by the even more expensive operations, maintenance and repair stage;

Infrastructure properly procured on a lifecycle basis produces 30% - 40% savings.”⁸

Key findings from relatively recent research identified five leading “major pressure points” (obstacles that stand in the way) at all stages of a project’s life cycle. These are:

- a shortage of skilled resources;
- inadequate scoping;
- use of inappropriate delivery methods;
- poor risk allocation, and
- unrealistic time and cost objectives.⁹

The conclusion of this study is that these issues are also strong contributors to adverse outcomes such as delays in completion, cost overruns, and disputes.

But are we asking the right questions when trying to determine the main issues that constrain the success of construction and infrastructure projects?

THE COMMON PERCEPTION OF “PRICE”

“Why does ‘Contract Price’ not mean what you think it does?” “Price” for what quality? “Price” for what operability and productivity?

⁷ [http://www.barchanfoundation.com/index.php?option=com_content &view=article&id=47:life-cycle-methods-will-remain-after-the-gfc&catid=3:public-content&Itemid=9](http://www.barchanfoundation.com/index.php?option=com_content&view=article&id=47:life-cycle-methods-will-remain-after-the-gfc&catid=3:public-content&Itemid=9)

⁸ Dr John Miller, “Delivering ‘PPPs’ after the Global Financial Crisis – Do ‘They’ Have A Future?” (2010) *IBA Conference, Vancouver*.

⁹ *Scope for Improvement: A survey of Pressure Points in Australian Construction and Infrastructure Projects* (Blake Dawson Waldron, 2006).

“Price” may be defined in many different ways. The “price” might not be what it appears to be. How the “price” is defined – the allocation of risk, and whether it is a lump sum or remeasurable price needs to be clearly defined and understood, as well as what work is included and what is excluded from the scope, and what the mechanism is for change. For example, a bid “price” based on an Employer’s Bill of Quantities which contains underestimated quantities will result in a higher final “price” to be paid by the Employer without any directed change having taken place. Those increased quantities may also affect the schedule.

A well-known Australian example of a major infrastructure project commonly perceived to have suffered a major cost overrun is Parliament House in Canberra, opened in 1988. The initial budget cost was AUS\$151 million in May 1978, and the actual final cost was AUS\$1,076 million. However, no meaningful comparison can be made between these figures because of fundamentally different scopes and qualities of work, and no allowance in the initial budget for cost escalation, contingencies or scope changes. For example, 45% of the final cost was a consequence of escalation in building costs from inflation of 1978 prices.¹⁰

The contracting strategy will also have a profound impact on “price” and schedule risk; the differences in risk pricing options and allocation between EPC and EPCM contracts is often not fully appreciated.¹¹ A common assumption and misconception is that an EPC contract is a lump sum price. This is by no means always the case, and many EPC contracts contain fixed-fee cost reimbursable prices.

Aligning the contract delivery method with the scoping of the project has been identified as a key ingredient for success.

The primary focus at the early stages of a project is usually on the technical aspects of the bid. Commercial issues are often evaluated separately from the technical issues, without adequate communication and management of the interface. If the bid is technically acceptable, “Bid normalisation” adjustments to the bid “price” may be made by the Employer for the more obvious errors and omissions, but without fully understanding the effect of such adjustments on the bidder’s resources and execution strategy. The Employer assumes that having made a provision for such adjustments internally, adequate allowance has been made, without sufficient, if any, consultation with the Contractor. Little time and money is spent at this stage on developing and analysing the schedule and the resourcing of it. The excuse for this is often that until the contract is awarded, issues such as design details, quarantine requirements, access dates, permits and logistics are uncertain. Indeed, the baseline schedule is often provided by the

¹⁰ Dr Donald Charrett, “Managing Time, Cost and Quality: A Tale of Two Buildings” (2007) 28 *Building Dispute Practitioner’s Society Newsletter* 10.

¹¹ Philip Loots and Nick Henchie, “Worlds Apart: EPC and EPCM Contracts: Risk Issues and Allocation” [2007] ICLR 252.

Contractor for approval by the Employer only after award of the contract, and then sometimes after some of the most crucial delays to the Work have already occurred. The result is that in the haste to award contracts, many are awarded on an incorrect assumption as to “price” and schedule risk. Work is commenced with the Employer at a disadvantage, not being able to administer the contract adequately nor fully aware of its exposure to risks inherent in the Work. Once the contract is awarded, the Employer’s options are limited.¹²

The FIDIC Conditions of Contract for Construction (one of the most widely used standard forms of contract for international construction) recognises that the real “price” is unknown at the beginning of the contract. The “Accepted Contract Amount”, which is the amount accepted in the Letter of Acceptance for the execution and completion of the Works and the remedying of any defects,¹³ is by definition a different amount from the “Contract Price”, which is to be “*agreed or determined (by evaluation) and ... subject to adjustments in accordance with the Contract*” and which is the actual amount to be paid to the Contractor.¹⁴

It appears that “mixed” strategy contracts (engineering and procurement performed on a reimbursable basis, with fixed “price” fabrication and construction) appear to offer an opportunity for stronger Employer input during the design process. This leads to reduced changes that would otherwise increase lump-sum EPC costs, and provides a good opportunity for operator input into the design. It also results in fabrication and construction being based on nearly completed design, with fabrication and construction labour rates and productivity risks being borne by the fabricator/constructor. This “mixed” contracting approach has historically resulted in the lowest cost index and the lowest percent of projects with operability problems. Conversely, reimbursable with-cost-incentives approaches appear to have resulted in a significantly higher percentage of projects with operability problems, indicating that operability problems are driven by cost incentives.¹⁵

Reimbursable without-cost-incentives have led to the lowest percent of projects with operability problems. There is no clear relationship between incentives and project results in relation to cost or schedule. It has been found that the use of incentive contracting does not appear to have had any discernible effect on cost; schedule incentives have no independent effect on execution schedule; and the use of incentives, especially cost incentives

¹² Philip Loots and Dr Donald Charrett, “Being Held to Ransom or ‘Wielding the Whip or the Rod’ – How Unscrupulous Dealing, Illegitimate Pressure and Tough Negotiating Tactics can be overcome by the Legal Remedy of Economic Duress” [2014] ICLR 211.

¹³ FIDIC Conditions of Contract for Construction First Edition 1999 (Red Book), sub-clause 1.1.4.1.

¹⁴ FIDIC Conditions of Contract for Construction First Edition 1999 (Red Book), sub-clauses 1.1.4.2 and 14.1.

¹⁵ Philip Loots, “Construction of Major Infrastructure Projects in the Energy Sector: Controlling Spiralling Development Costs” *AMPLA Yearbook 2013* at 186.

significantly degrade operability. Incentives for cost performance may provide a very powerful motivation for contractors to inflate estimates and cut corners, magnified by declining Employer in-house cost estimating and analysis capability, and the desire to shift QA/QC to contractors.¹⁶

It has been said that Alliances have been producing no net effect on cost or schedule but have been delivering very poor operability. Alliances have been found to be a difficult contract approach which does not always yield the expected benefits, with the comment that most Contractors are better at the incentive scheme than Employers, and efforts to fundamentally reform contracting through incentives appear to have made matters worse.¹⁷

Merrow¹⁸ comments that:

“Most of the EPC contractors are engineering-centric organisations that have relegated construction to second-class status. Projects, however, are done better when engineering is construction-driven.”

“Price” is therefore unreliable as a measure of anticipated project performance.

That the lowest contract price is not a reliable comparator in bid evaluation has been long recognised in some sectors of the construction industry. In Denmark, for example, the two highest and the two lowest tenders are excluded and the closest to the average of the remaining bids is selected. A similar procedure is used in Italy, Portugal, Peru and South Korea, but with only the lowest and highest excluded. Schedule, however does not appear to be given prominence.

CONCERNS OVER “PRICE”: WHY TIME AND A RESOURCED SCHEDULE SHOULD TAKE THE PLACE OF “PRICE” AS THE PRIMARY COMPARATOR

Having seen how “rubbery” the “price” can be, if we are repeatedly getting the “price” wrong, is simply allowing for more money the answer? There are well documented examples of unsuccessful projects that have destroyed billions of dollars of capital, and evidence that more than a third of projects were completed over the forecast budget.¹⁹ Allowing more money is clearly not the answer. The answer is that a major shift in philosophy in procurement is required. A re-prioritisation of factors in evaluating bids is required. In the authors’ view, “price” should no longer be the prime determinant in bid evaluation. Inadequate scoping and incorrect project

¹⁶ Philip Loots, “Construction of Major Infrastructure Projects in the Energy Sector: Controlling Spiralling Development Costs” *AMPLA Yearbook 2013* at 186.

¹⁷ Philip Loots, “Construction of Major Infrastructure Projects in the Energy Sector: Controlling Spiralling Development Costs”, 37th AMPLA Annual Conference, *AMPLA Yearbook 2013* at 186.

¹⁸ Merrow, above n3, 296.

¹⁹ Merrow, above n3, 12.

delivery choices would be highlighted if detailed resourced schedules were required as part of the bidding and bid evaluation process. A resourced schedule would require and drive a clear and comprehensive definition of scope, provide more confidence to the planned completion date, which in turn will provide more certainty over the price. Labour productivity problems must be viewed solely as management problems.²⁰

LACK OF ADEQUATE DEFINITION OF SCOPE

In searching for better project outcomes, the lack of an accurate definition of the Scope of Work has been cited as one of the fundamental causes of time and cost overruns on major projects.²¹ The process of adjusting objectives must stop at some point (end of Scope Development).²² The most common problem is that some of the technical data, which is essential to correct design, is never fully developed. Incorrect basic data creates problems from which it is usually impossible to recover.²³

One reason given for Employers changing the scope of their project during the market request phase, is that unrealistic timeframes for their development are set: timeframes which allow insufficient time for proper documentation to be assembled before projects are released to the market are required to be implemented. Inaccurate definition of scope obviously leads to an unreliable “price”.

“Megaprojects are ... the most poorly prepared of projects on average ... This perverse state of affairs starts with lack of people to do the work, which is due to the massive downsizing of owner engineering organisations that started in the 1980s.”²⁴

Where a Contractor has been selected during a competitive tender process, consideration should be given to what the successful tenderer has promised in its bid, so the value is appropriately captured in the final contract. There can be no better way than to require a detailed resourced schedule, which must be reported on in detail and continuously updated to capture the value in the final contract.

The current FIDIC “rainbow suite” of contracts²⁵ incorporate some of these requirements, albeit that the Contractor only has to provide a

²⁰ Merrow, above n3, 33.

²¹ Dr Donald Charrett and Philip Loots, “Challenges in achieving successful megaprojects” (2015) 10(2) *Construction Law International* 21.

²² Merrow, above n3, 106.

²³ Merrow, above n3, 114.

²⁴ Merrow, above n3, 223.

²⁵ *FIDIC Conditions of Contract for Construction for Building and Engineering Works Designed by the Employer* (First Edition 1999) (Red Book); *FIDIC Conditions of Contract for Construction MDB Harmonised Edition for Building and Engineering Works Designed by the Employer* (MDB Harmonised Edition 2010) (Pink Book); *FIDIC Conditions of Contract for Plant and Design-Build for Electrical and Mechanical Plant and for Building and Engineering Works, designed by the Contractor* (First Edition 1999) (Yellow Book); *FIDIC Conditions of Contract for EPC/Turnkey Projects* (First Edition 1999) (Silver Book).

“detailed time programme” (“time programme” in the Silver Book) within 28 days after commencement. A revised programme is required to be submitted “*whenever the previous programme is inconsistent with actual progress or with the Contractor’s obligations*”. The programme is to be accompanied by a report which includes “*details showing the Contractor’s reasonable estimate (the approximate number of each class in the Silver Book) of the number of each class of Contractor’s Personnel and of each type of Contractor’s Equipment, required on Site for each major stage*”.²⁶ Each application for an Interim Payment Certificate²⁷ must be accompanied by a Progress Report which is required to include, inter alia, records of Contractor’s Personnel and Equipment, and comparisons of actual and planned progress, with details of any events or circumstances which may jeopardize the completion in accordance with the Contract, and the measures being (or to be) adopted to overcome delays.²⁸

The FIDIC Contracts Committee is currently in the process of updating the rainbow suite, and is proposing to impose further obligations on the Contractor in respect of the programme. The authors of this paper understand from FIDIC that such further obligations will include express requirements that the programme shows the Commencement Date and time for completion for the Works and each section, and dates of locally recognised days of rest and holiday periods. The Programme is to be prepared using specified or agreed programming software, and shall include, inter alia, all activities (to the level of detail specified in the Employer’s Requirements), logically linked and showing the earliest and latest start and finish dates for each activity, the float (if any), and the critical path(s). If the programming software is not specified by the Employer in the Contract, the Engineer (Employer’s Representative in the Silver Book) will agree the programming software with the Contractor.

Why should submission by the Contractor of a detailed, resourced schedule not be a fundamental requirement for ongoing assessment of the work, and a contract-compliant updated schedule not be a precondition to monthly payment? This is only a small step from the proposed revisions to the FIDIC rainbow suite.

A review of the “No Dispute”²⁹ recommendations highlights a number of broad principles applicable to Employers procuring a project, the most important for present purposes being that the Employer should adopt appropriate cost management and budgeting methods, and a realistic time should be allowed for project completion. Little is said about standardising the approach to schedule preparation and schedule analysis, its role in bid

²⁶ *Ibid*, sub-clause 8.3.

²⁷ *Ibid*, sub-clause 14.3.

²⁸ *Ibid*, sub-clause 4.21.

²⁹ NPWC/NBCC Joint Working Party, No Dispute: Strategies for Improvement in the Australian Building and Construction Industry, report, May 1990.

evaluation, contract administration procedures and embedding an agreed method of schedule analysis once the contract is under way.

The fifteen project related factors critical to project success identified in “Re-engineering the Construction Delivery Process”³⁰ incorporate many of the broad principles identified in “No Dispute”, and there are similarities in later research, however the presence or absence of “schedule” in bid evaluation, project management and contract administration is hardly mentioned.

ILLUSTRATION: CURRENT STANDARD BIDDING PROCEDURES

By way of example, the Procurement Guidelines of the Asian Development Bank³¹ which may be considered current best practice in procurement, illustrate the low priority given to schedule in bid evaluation. The scale and influence of such an organisation is clearly significant in global terms.³² The purpose of these Guidelines is to inform those carrying out a project that is financed in whole or in part by a loan from the Asian Development Bank (ADB), ADB financed grant or ADB administered funds, of the policies that govern the procurement of goods, works, and services (other than consultant services) required for the project.

Some of the basic principles that generally guide ADB are the need for economy and efficiency in the implementation of the project, including the procurement of the goods and works involved; ADB’s interest in encouraging the development of domestic contracting and manufacturing industries in the country of the borrower; and the importance of transparency in the procurement process in that the procedures to be used will fulfill the

³⁰ AC Sidwell, RJ Kennedy and APC Chan, *Re-engineering the Construction Delivery Process: Report* (Construction Industry Institute Australia, 2002).

³¹ Asian Development Bank, *Procurement Guidelines* April 2015.

³² **Members are:** Afghanistan, Armenia, Australia, Azerbaijan, Bangladesh, Bhutan, Brunei Darussalam, Cambodia, China, People’s Republic of, Cook Islands, Fiji, Georgia, Hong Kong, China, India, Indonesia, Japan, Kazakhstan, Kiribati, Korea, Republic of, Kyrgyz Republic, Lao PDR, Malaysia, Maldives, Marshall Islands, Micronesia, Federated States of Mongolia, Myanmar, Nauru, Nepal, New Zealand, Pakistan, Palau, Papua New Guinea, Philippines, Samoa, Singapore, Solomon Islands, Sri Lanka, Taipei China, Tajikistan, Thailand, Timor-Leste, Tonga, Turkmenistan, Tuvalu, Uzbekistan, Vanuatu, Viet Nam.

Non regional members: Austria, Belgium, Canada, Denmark, Finland, France, Germany, Ireland, Italy, Luxembourg, The Netherlands, Norway, Portugal, Spain, Sweden, Switzerland, Turkey, United Kingdom, United States.

Developing members: Afghanistan, Armenia, Azerbaijan, Bangladesh, Bhutan, Brunei Darussalam, Cambodia, Cook Islands, People’s Republic of China, Georgia, India, Indonesia, Fiji, Hong Kong, China, Kazakhstan, Kiribati, the Republic of Korea, Kyrgyz Republic, Lao People’s Democratic Republic, Malaysia, Maldives, Marshall Islands, Federated States of Micronesia, Mongolia, Myanmar, Nauru, Nepal, Pakistan, Palau, Papua New Guinea, Philippines, Samoa, Singapore, Solomon Islands, Sri Lanka, Taipei China, Tajikistan, Thailand, Timor-Leste, Tonga, Turkmenistan, Tuvalu, Uzbekistan, Vanuatu, Viet Nam.

borrower's obligations. The ADB aims to cause the project to be carried out diligently and efficiently, and that the goods and works to be procured:

- (a) are of satisfactory quality and are compatible with the balance of the project;
- (b) will be delivered or completed in timely fashion; and
- (c) are priced so as not to affect adversely the economic and financial viability of the project.³³

ADB reviews the borrower's procurement procedures, documents, bid evaluations and award recommendations:

"As part of the preparation of the project the borrower shall prepare and, before loan negotiations, furnish to ADB for its approval, a procurement plan acceptable to ADB setting forth: (a) the particular contracts for the goods, works, and/or services required to carry out the project during the initial period of at least 18 months; (b) the proposed methods for procurement of such contracts that are permitted under the financing agreement, and (c) the related ADB review procedures. The borrower shall implement the procurement plan in the manner in which it has been approved by ADB.³⁴

The bidding documents shall clearly state the type of contract to be entered into and contain the proposed contract provisions appropriate therefor. The most common types of contracts provide for payments on the basis of a lump sum or unit prices, or combinations thereof.³⁵

...

The bidding documents must specify any factors, in addition to price, which will be taken into account in evaluating bids, and how such factors will be quantified or otherwise evaluated. If bids based on alternative designs, materials, completion schedules,³⁶ payment terms, etc., are permitted, conditions for their acceptability and the method of their evaluation shall be expressly stated.³⁷

...

The contract documents shall clearly define the scope of work to be performed, the goods to be supplied, the rights and obligations of the borrower and of the supplier or contractor, and the functions and authority of the engineer, architect, or construction manager, if one is employed by the borrower, in the supervision and administration of the contract. In addition to the general conditions of contract, any special conditions particular to the specific goods or works to be procured and the location of the project shall be included. The conditions of contract shall provide a balanced allocation of risks and liabilities.

The purpose of bid evaluation is to determine the cost to the borrower of each bid in a manner that permits a comparison on the basis of their evaluated cost. Subject to certain qualifications, the bid with the lowest evaluated cost, but not necessarily the lowest submitted price, shall be selected for award.³⁸

³³ ADB, above n26, 1.5.

³⁴ ADB, above n26, 1.16.

³⁵ ADB, above n26, 2.2.

³⁶ A general requirement should be compliance by bidders with a comprehensive standard for the preparation and evaluation of schedules (e.g. a method of scheduling as recommended by the Society of Construction Law).

³⁷ ADB, above n26, 2.17.

³⁸ ADB, above n26, 2.49.

Bidding documents shall also specify the relevant factors, in addition to price, to be considered in bid evaluation, and the manner in which they will be applied for the purpose of determining the lowest evaluated bid. For goods and equipment, other factors may be taken into consideration including, among others, payment schedule, delivery time, operating costs, efficiency and compatibility of the equipment, availability of service and spare parts, and related training, safety, and environmental benefits. The factors other than price to be used for determining the lowest evaluated bid shall, to the extent practicable, be expressed in monetary terms in the evaluation provisions of the bidding documents. Bids shall be compared on the basis of base price without taking into account the provisions for price adjustments. Likewise, customs duties and import taxes on goods to be imported shall be excluded in comparing bids for the supply of goods.³⁹

Under works contracts, contractors are responsible for all duties, taxes, and other levies, and bidders shall take these factors into account in preparing their bids. The evaluation and comparison of bids shall be on this basis. Turnkey contracts shall be evaluated excluding taxes and duties for the goods component. *Bid evaluation for works shall be strictly in monetary terms.* Any procedure under which bids above or below a predetermined assessment of bid values are automatically disqualified is not acceptable. If time is a critical factor, the value of early completion to the borrower may be taken into account according to criteria presented in the bidding documents, only if the conditions of contract provide for commensurate penalties for noncompliance.⁴⁰ [emphasis added]

It should come as no surprise that bidders and evaluators are provided with so little guidance on scheduling, and that it is given so little weight in the International Competitive Bidding and National Competitive Bidding procedures of the ADB; this is not a criticism, as it is consistent with current international practice. However, the authors believe it is likely to be a fundamental cause of time and cost overruns currently seen on major projects, as is the case with major projects supported by other multilateral financial institutions.

Morrow highlighted the almost universal acceptance of the lowest price bids by governments, and the problems that ensue: “Governments almost always require that low bids be accepted. Acceptance of significantly low bids almost always triggers project failure.”⁴¹

HOW CAN THE SHORTCOMING OF USING “PRICE” AS A DETERMINING FACTOR BE OVERCOME?

Bankers use “cost” as a major factor in assessing the viability of a project. A significant component of the cost of a project is the estimates of “prices” to be received from bidders. Four successful and five unsuccessful major projects presented as case studies in “Practical Guide to Engineering and

³⁹ ADB, above n26, 2.52.

⁴⁰ ADB, above n26, 2.53.

⁴¹ Morrow, above n3, 272.

Construction Contracts”,⁴² illustrated different contractual approaches to the risks associated with cost, time and quality. One of the unsuccessful projects resulted in contractor’s claims in excess of £1.1 billion (in 1991), coupled with a demand that the lump sum element of the contract be converted into a cost plus arrangement, to be resolved by way of ICC Arbitration. History shows that claims of this magnitude and complexity (and demands for lump sum “prices” to be converted to cost plus arrangements) may be anticipated on major projects under the current project delivery models and practices. This should call into question the use of “price” as a reliable and determining factor in the appointment of Contractors, and encourage reconsideration of conventional bidding and contracting practices.

Adequate time and money must be allowed for comprehensive preparation of the scope of work, contract controls and procedures, contract documents, schedules and price. The project referred to above had a very short time available for preparation of bids, a common failing. Basic design parameters and the operating standards had not been established at the stage of contract award. This had a significant effect on the ultimate project cost and time outcome. In reviewing the cost and time performance on that project, Muir Wood⁴³ issued the following warning which is equally applicable to balancing the time and cost of today’s major projects:

“Bankers are their own worst enemies in relation to their attempts to control costs of major projects. The urge for quick results is directly contrary to the essential feature of determining beforehand what is to be done, what are the criteria for acceptability, internally and by external agents, and what are the uncertainties that lead to risk if not managed.”

EMPHASISING THE IMPORTANCE OF “PERFORMANCE ON TIME”

“When asking the Employer ‘which is more important – completion on time, operability, or completion on budget’ what would you expect the reply to be?”⁴⁴

“Good cost performance on EPC lump-sum contracts correlates strongly with good schedule performance and limited schedule slippage.”⁴⁵

The Scope for Improvement Survey⁴⁶ found that only 56% of projects were completed on time. Of those which ran late, 58% ran more than three months late. This result takes into account extensions of time granted under the respective contracts. It was noted that this is a disturbing statistic,

⁴² Philip Loots and Donald Charrett, *Practical Guide to Engineering and Construction Contracts* (2009) 358.

⁴³ Alan Muir Wood, *Civil Engineering in Context* (2004) 173.

⁴⁴ Safety is a given.

⁴⁵ Merrow, above n3, 269.

⁴⁶ Blake Dawson Waldron, “Scope for Improvement: A Survey of Pressure Points in Australian Construction and Infrastructure Projects” (2006).

particularly given that the resulting costs will need to be absorbed by one or more of the contracting parties. It is unlikely that an allowance will have been made for an overrun of this magnitude by any project participant.

The survey also revealed that the greater the project value, the less likely it was that the project would finish on time. For example, 66% of projects valued between AUS\$20 million and AUS\$50 million were completed on time, compared with only 50% of projects valued at over AUS\$500 million. The most used method of project delivery, D&C contracting, was most likely to achieve a project completed on time. About 63% of the D&C projects surveyed were finished on time.

Once product has been forward sold, the cost of being late can be quite substantial. That means that the downside of making delivery promises that cannot be met without substantially higher investment costs is very large.⁴⁷ Steps taken in avoiding schedule slippage may result in large cost overruns.

THE SOLUTION

In 2011, the UK Government published a construction strategy that postulated that the right model for public sector construction procurement in the UK is one in which, *inter alia*, “clients issue a brief that concentrates on required performance and outcome” and “value for money and competitive tension are maintained by effective price benchmarking and cost targeting, by knowing what projects should cost, rather than through lump sum tenders based on inadequate documentation”.⁴⁸

Reliance on contractual remedies to achieve contract performance will never provide a solution. What is strikingly absent from the research findings is the pivotal role of the resourced schedule and measurable commitment to the time for completion.

“The most difficult single aspect of execution planning is the development of a high quality schedule. Developing a good schedule is difficult not only because it takes a lot of work but also because too many companies no longer have the depth of scheduling expertise required or the data needed to properly resource load the schedule. Resource loading of the engineering and construction provides deep insight into whether the schedule you would like to meet is achievable by mere humans.”⁴⁹

The reason sponsors need to resource-load the schedule is to be able to evaluate whether the project is actually feasible as planned and whether the contractor they will be selecting to execute the project actually understands the job. Too many megaprojects fail before they ever start execution because the schedule put forth by the sponsor is not achievable, even in principle. When an honest procurement schedule and the labour resource requirements are included in many mega-project schedules it becomes apparent that the targeted schedule is unachievable.”⁵⁰

⁴⁷ Merrow, above n3, 109.

⁴⁸ HM Government Cabinet Office, “Government Construction Strategy” (2011).

⁴⁹ Merrow, above n3, 213.

⁵⁰ Merrow, above n3, 319, 320.

While price is obviously a factor, bid evaluation based predominantly on a resourced construction schedule will go much further to ensuring completion on time and on budget. In the authors' view, it is the resourced construction schedule in the first instance, not the "price", that should play the predominant role in bid evaluation. Even in the conventional sense of "schedule", schedule precedes "price" in importance. Time is money.

The rapidly evolving field of Building Information Modelling (BIM) using shared information will increasingly provide new tools that will assist more sophisticated use of resourced construction schedules in project procurement. One classification of the categories of BIM is to distinguish between:

- 3D – 3 dimensional Computer Assisted Design/Computer Aided Drafting/Computer Aided Design.
- 4D – A 3D model linked to time or scheduling data. Model objects and elements with this data attached can be used for construction scheduling analysis and management. It can also be used to create animations of project construction processes.
- 5D – The process of dividing the project into logical locations and sequence; and linking external data relating to resource (equipment and labour) and material rates to the objects within the aggregate models, for the purposes of cost and 4D planning.⁵¹

Thus, BIM 4D technology based on shared information allows integration of the project schedule so that team members can assess constructability, identify resource conflicts, and focus on various aspects of the model to see if construction is progressing as it should, head off delays, and develop work-arounds. BIM 5D allows project teams to better manage and improve cash flow, deliveries, labour, and materials quantities and costs.

There is no consensus as to what constitutes BIM 6D and 7D. One view is:

- 6D – allows information needed for start-up, handover and facility operations and management to be stored and easily accessible.
- 7D – provides project teams the ability to tag model components with physical and commercial risk levels, critical path systems and components, and long-lead-time items.

Such tools have obvious application in the post construction operations stage of a facility's lifecycle.

Completion on time brings with it constraints on increased cost because the greater part of construction costs are time-related, and delays bring with them additional time-related costs. The resourced construction schedule should include resourced and priced contingency actions if the work is delayed; although the contract "price" will usually be affected, it will be within the bracket of the anticipated contract price. The solution lies in

⁵¹ Consult Australia & RAI, *BIM in Practice* (2012) 4.

giving the schedule primacy as a comparator in drafting, bid evaluation, and contract award. If the contractor finishes on time, it is likely the contract “price” will not be far off the mark.

Merrow⁵² asks the rhetorical question:

“What is the antidote to the poison of a labour –short environment?” and answers it as follows:

“I have found only two practices, which are intimately related, that reduce the odds of (very poor productivity). The first is to set more realistic execution schedules that reflect the actual field and labour supply conditions. The projects that were successful in labour-short environments set schedules on average that were 23% longer than a benchmark schedule for projects of their type and size. The failed projects set schedules that were 9% faster than the benchmark schedule ... The second practice that counted was that the successful projects were much more likely to have developed detailed schedules as part of their Front-End Loading⁵³. More than 80% of the projects that succeeded in labour-short environments had resource-loaded their engineering and construction schedules as part of Front End Loading⁵⁴ versus 29% of the failures. None of the successful projects had only higher-level milestone-type schedule.”

The conclusion must be that current initial cost and time objectives are unrealistic, and more effective criteria for procurement and management of projects are needed. There is a better way, and the error of using “price” as the primary basis for evaluating bids must be overcome, as it is fundamentally misleading and wrong. In the authors’ view, it should at least be replaced by a resourced schedule as the dominant parameter in bid evaluation.

⁵² Merrow, above n3, 318–320.

⁵³ Front End Loading is described by Merrow, above n3, 202–206.

⁵⁴ The investment needed in Front End Loading is about 3% to 5% of the total capital cost and about 30% to 40% of the total project cycle time. Merrow, above n3, 202–206, 341.