Realising value for money through procurement strategy in the delivery of public infrastructure

Ron Watermeyer, DEng, PrEng, CEng, PrCM, PrCPM

Infrastructure Options (Pty)Ltd, Bordeaux, Randburg, South Africa

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Abstract

Value for money may be regarded as the optimal use of resources to achieve the intended outcomes. Underlying value for money is an explicit commitment to ensure that the best results possible are obtained from the money spent or maximum benefit is derived from the resources available. A key question that is most often asked whenever new public infrastructure is contemplated or delivered is “does the investment provide value for money?”

Optimism bias and strategic misrepresentation has frequently been cited as root causes for lack of project success. These two causes are however confined to the planning stages of a project which ends with a decision being made to proceed with a project. The question that begs asking is “what proactive action can be taken during implementation to minimise any gaps between achieved and projected outcomes?”

Procurement strategy relates to the choices made in determining what is to be delivered through a particular contract and the procurement and contracting arrangements. Procurement strategy has the potential to contribute to “efficiency” during implementation and to reduce the gap between achieved and projected outcomes by minimising time delays, scope creep and unproductive costs and in so doing maintain the value for money proposition formulated at the outset of the project.

The decision to proceed with an infrastructure project is typically taken when between 10 and 40% of the design is complete. It is therefore important to adopt procurement strategies in the implementation of project which enable projects to be delivered on time and within budget. It is important to integrate design with construction and to manage contracts proactively so that the risks associated with budget and schedule overruns are managed.

The University of the Witwatersrand changed its procurement strategy and approach to the managing of contracts to improve project outcomes relating to schedule and budget. Procurement strategies which integrated design and construction (develop and construct and design by employer with early contractor involvement) and the use of the NEC3 forms of contracts to manage contracts has resulted in the overall cost overrun (difference between outturn cost and control budget established at the time that a decsions was taken to implment the project) of not more than 5% on a R1,5 billion programme over a six year period . In addition, projects have been delivered on time.

The factors in the author’s experience inhibiting changes in procurement strategy in South Africa include transactional teaching at tertiary intuitions of forms of contract rather than educating students in contracting principles and the range of available strategies, guidelines fees published by built environment councils which entrench a single strategy to delivery infrastructure, the profession’s resistance to change, a lack of evidence based research to enable informed choices to be made, a one size fits all approach to procurement propagated by supply chain managers, a lack of standardised documentation and poor procurement skills.

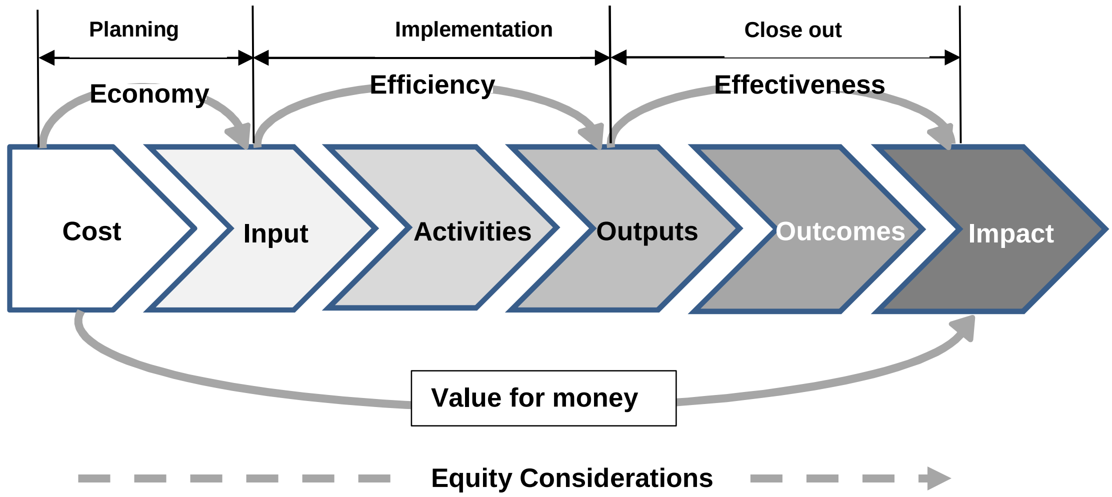
Procurement strategy has the potential to maintain the value for money proposition established at the time that a decision to proceed with a project is made. Its effective implementation, however, requires a culture change.

Keywords: public infrastructure, value for money, procurement strategy

Introduction

Public infrastructure, which is central to the economy of a country, has little inherent value, but creates value through the economic and social activities it supports. Public infrastructure which provides improvements or efficiencies in services, production or export capabilities and which is delivered and maintained in a manner which minimizes waste of materials, time, and effort in order to generate the maximum possible amount of value, is most likely to contribute to economic growth. A key question that is most often asked whenever new public infrastructure is contemplated or delivered is "does the investment provide value for money?" (Watermeyer, 2013)

Value for money may be regarded as the optimal use of resources to achieve the intended outcomes. Underlying value for money is an explicit commitment to ensure that the best results possible are obtained from the money spent or maximum benefit is derived from the resources available. It is a means for developing a better understanding (and better articulation) of costs and results so that more informed, evidence-based choices can be made. Value for money needs to be assessed during the delivery cycle using the so-called three "Es" − economy, efficiency and effectiveness at the end of the planning, implementation and close out stages of a project, respectively (see Figure 1). An overarching fourth "E" also needs to be considered when delivering infrastructure, namely equity (Watermeyer, 2013).



Cost	Sum of money required to fund the intervention
Input	Inputs cover all the materially significant financial, human and material resources used for a development intervention
Activities	Activities are used to deliver outputs
Outputs	Outputs relate to products, capital assets and services which result from a development intervention. Outputs are limited to the specific, direct deliverable of the intervention.
Outcomes	Outcomes are the likely or realised short-term/medium-term effects of the outputs of any intervention. Outcomes are used to identify (a) what will change, (b) who will benefit and (c) how it will contribute to poverty reduction and/or the Millennium Development Goals
Impact	Longer-term effects are produced, directly or indirectly, by a development intervention. Impact refers to higher level identified achievements that the intervention will contribute towards

Figure 1: Results chain framework (Watermeyer, 2013)

Optimism bias (the human mind's cognitive bias in presenting the future in a positive light) and strategic misrepresentation (behaviour that deliberately underestimates costs and overestimates benefits for strategic advantage usually in response to incentives during the budget process) has frequently been cited as root causes for lack of project success (Flyvbjerg *et al*, 2003). These two causes are however confined to the planning (economy) stages of a project which ends with a decision being made to proceed with a project and relate to the quality of the information upon which a decision is made. The question that begs asking is what proactive action can be taken during implementation (efficiency) to minimise any gaps between achieved and projected outcomes irrespective of whether or not optimism bias and strategic misrepresentation is present at the time that a decision was taken to implement a project?

Strategy in the delivery and maintenance of infrastructure may be considered as the skilful planning and management of the delivery process. It involves a carefully devised plan of action which needs to be implemented. It is all about taking appropriate decisions in relation to available options and prevailing circumstances in order to achieve optimal outcomes. Procurement strategy (see Figure 2) is all about the choices made in determining what is to be delivered through a particular contract, the procurement and contracting arrangements and how secondary procurement objectives are to be promoted during the implementation phase of an infrastructure project (Watermeyer, 2012). Procurement strategy has the potential to contribute to "efficiency" during implementation and to reduce the gap between achieved and projected outcomes.

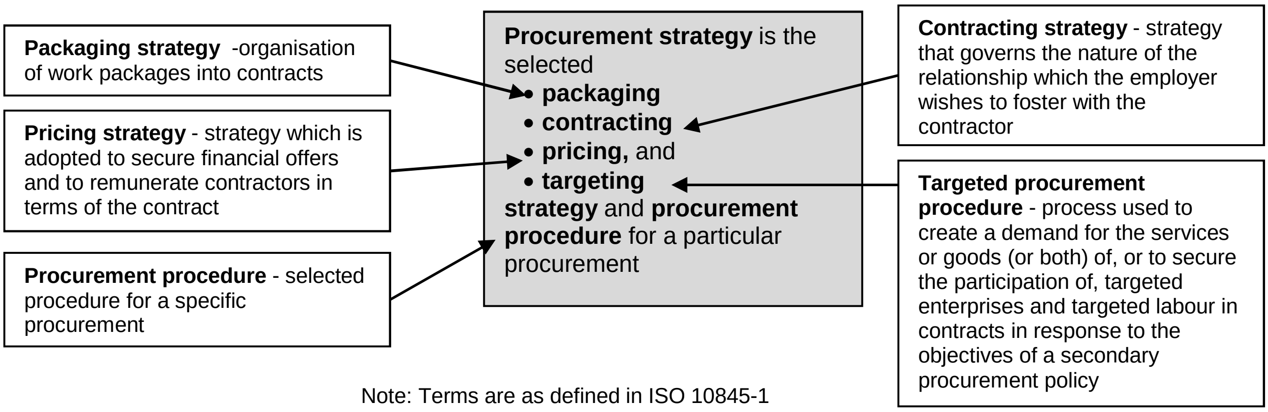


Figure 2 – Components of a procurement strategy according to ISO 10845-1 (Watermeyer 2012)

Locating the four "Es" associated with value for money within the stages of delivery

Value for money in the context of the delivery of infrastructure needs to be linked to a set of related activities in the infrastructure delivery cycle that culminates in the completion of a major deliverable i.e. a stage. Figure 3 outlines the stage of the CIDB Infrastructure Gateway System described by Watermeyer *et al* (2012). Figure 4 links the four "Es" associated with value for money to these stages.

The critical starting point in delivering value for money through projects is to clearly define objectives and expected outcomes for given inputs as well as parameters such as the time lines, cost and levels of uncertainty at the end of the planning stages. This frames the value for money proposition that needs to be implemented at the point in time that a decision is taken to proceed with the implementation of a project. It establishes "economy" and identifies opportunities for "equity" at the end of stage 4 (package definition) when design concepts or solutions have been sufficiently developed to establish the feasibility of the works or to select a particular conceptual approach to pursue. It is also the point where the scope of a project is frozen. Should the works not prove to be viable as conceptualised (e.g. insufficient budget, unacceptable risk profile, geotechnical / environmental / community constraints, poor return on investment etc.), the project is either consciously modified in order to satisfy "economy" considerations before proceeding with implementation or is terminated.

During the close out of a project (Stage 9) the projected outcomes are compared against the actual outcomes. This confirms the "effectiveness" of the project in delivering value for money. This typically involves the comparing of the scope, schedule and cost plan and, where relevant, the performance as documented at the end of Stages 4 and 9.

Portfolio planning processes

Stage 1	Infrastructure planning
End of stage deliverable	**Infrastructure plan** – a plan which identifies long term needs and links prioritised needs to a forecasted budget for the next few years
Gate 1	Approved infrastructure plan

Stage 2	Procurement planning
End of stage deliverable	**procurement strategy -** selected packaging, contracting, pricing and targeting strategy, and procurement procedure for the portfolio of projects
Gate 2	Accepted procurement strategy

Package planning processes

Stage 3	Package preparation
End of stage deliverable	**Strategic brief** - a document defining project objectives, needs, acceptance criteria and client priorities and aspirations and which sets out the basis for the development of the concept report for one or more packages
Gate 3	Accepted strategic brief

Stage 4	Package definition
End of stage deliverable	**Concept report** – a document which establishes the detailed brief, scope, scale, form and control budget and sets out the integrated concept for one or more packages
Gate 4	Accepted concept report

Project terminated

Implementation deferred

Implementation authorised to commence

Detailed design processes

Stage 5	Design development
End of stage deliverable	**design development report -** a document which develops in detail the approved concept to finalise the design and definition criteria, sets out the integrated developed design and contains the cost plan and schedule for one or more packages
Gate 5	Accepted design development report

Stage 6	**Stage 6A**	Production information
	End of stage deliverable	**production information: -** the detailing, performance definition, specification, sizing and positioning of all systems and components enabling either construction (where the contractor is able to build directly from the information prepared) or the production of manufacturing and installation information for construction
	Gate 6A	Completed and accepted production information for the works
	Stage 6B	**Manufacture, fabrication and construction information**
	End of stage deliverable	**manufacture, fabrication and construction information: -** information produced by or on behalf of the contractor, based on the production information provided for a package which enables manufacture, fabrication or construction to take place
	Gate 6B	Manufacture, fabrication and construction information accepted as being in accordance with the production information

Site processes

Stage 7	Works
End of stage deliverable	Completed works which are capable of being occupied or used.
Gate 6B	Completion certificate

Stage 8	Hand over
End of stage deliverable	Works which have been taken over by the user complete with record information
Gate 7	Record information Take over certificate

Close out processes

Stage 9	Package completion
End of stage deliverable	Works with notified defects corrected Outstanding monies settled
Gate 9	Defects certificate Final payment certificate Completion report

Note: a package is works which have been grouped together for delivery under a single contract or a package order issued in terms of a framework contract

Figure 3: Stages and gates within the CIDB Infrastructure Gateway System

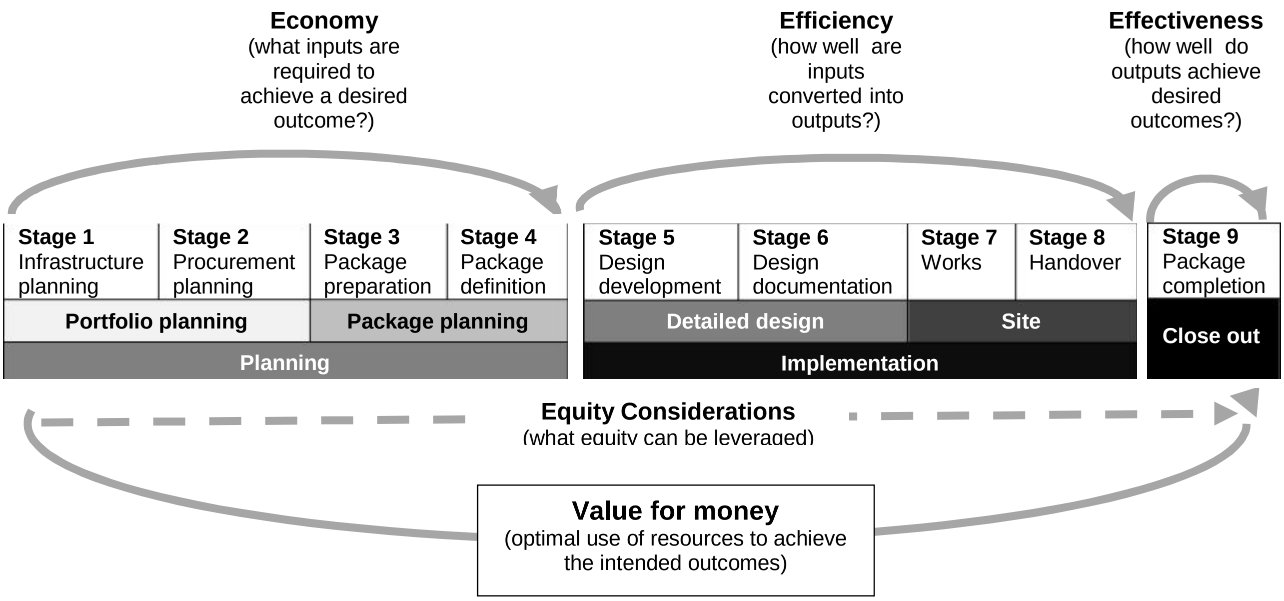


Figure 4: Value for money in the context of the stages of the CIDB Infrastructure Gateway System

The implementation of infrastructure projects needs to be responsive to the project objectives, deliver the expected outcomes and remain as far as possible within the confines of the parameters upon which the decision to proceed with the project was based. Implementation sits between the bookends of “economy” and “effectiveness” in the results chain framework shown in Figure 1 i.e. between Stages 4 and 9. It needs to be executed “efficiently” in order to minimise time delays, scope creep and unproductive costs and to mitigate the effects of uncertainty on objectives (risks) so as to maintain the value for money proposition formulated at the outset of the project. This necessitates that the implementer of the project exercise due care and reasonableness during implementation. Failure to do so may result in substandard or unacceptable performance which results in a gap between intended and achieved outcomes. This gap puts value for money for a project at risk.

The context within which “economy” is established

The value for money proposition at the time when the decision is taken to proceed with the implementation of a project is based on sets of assumptions and the available data. It is therefore important to understand the context within which the value for money proposition is established, particularly that relating to cost.

The degree of project definition as measured by the percentage of design completed at the end of stage 4 can be estimated from the fee apportionments contained in the guideline fees published by the South African Council for the Architectural Profession (SACAP) and the Engineering Council of South Africa (ECSA) as set out in Table 1. It is somewhere between about 20 to 40%, depending upon the nature of the works that are being designed.

The US Department of Energy uses the classification of estimates indicated in Table 2 to enable the quality of the cost estimate to be appropriately considered through the evolution of a project. Class 3, 2 and 1 estimates typically occur towards the end of Stages 4, 5 and 6, respectively. As a result, the decision to proceed with a project may be based on a class 3 estimate with a -20 to + 30% accuracy where the degree of project definition is between 10 and 40%. The value for money proposition upon which the “economy” of a project is based may also need to be viewed with some caution as Flyvbjerg *et a*l (2003) point out that it may be tainted by optimism bias and strategic misrepresentation.

Table 1: Apportionment of fees in the SACAP (2011) and ECSA (2013) guideline fees

CIDB Infrastructure Gateway Stages	SACAP and ECSA Work Stages	Apportionment of fees as per published guideline fees				
			Engineering fees			
		Architectural fees	Engineering and building projects - civil	Engineering and projects - structural	Building projects - structural	Mechanical, electrical and electronic projects
3 Package preparation	1 Inception	5%	5%	5%	5%	5%
4 Package definition	2 Concept and viability	15%	25%	25%	20%	15%
5 Design development	3 Design development	20%	25%	30%	30%	30%
6 Design documentation 6a (Production information)	4 Documentation and procurement	30%	15%	10%	15%	
6b (Manufacture, fabrication and construction information) 7 Works 8 Hand over	5 Contract administration and inspection	27%	25%	25%	25%	40%
9 Package completion	6 Close out	3%	5%	5%	5%	10%

Table 2: Generic Cost Estimate Classifications and Primary Characteristics (US Department of Energy, 2011)

	Primary characteristic	Secondary characteristic		
Estimate Class	**Degree of project definition (expressed as % of complete definition)**	**Typical purpose of estimate**	**Methodology**	**Expected accuracy range (typical variation in low and high ranges)***
Class 5	0% to 2%	Concept screening	Capacity factored parametric models judgment or analogy	-20 to – 50% +30 to +100%
Class 4	1% to 15%	Study or Feasibility	Equipment factored or parametric models	-15 to -30% +20 to +50%
Class 3	10% to 40%	Budget, Authorization, or Control	Semi-detailed unit costs with assembly level line items	-10 to -20% +10 to +30%
Class 2	30% to 70%	Control or Bid/Tender	Detailed unit costs with forced detailed take off	-5 to -15% +5 to +20%
Class 1	70% to 100%	Check Estimate or Bid/Tender	Detailed unit cost with detailed take-off	-3 to -10% +3 to +15%

* The state of process technology and the availability of applicable reference cost data affect the range markedly. The ± value represents the typical percentage variation of actual costs from the cost estimate after application of contingency (typically at a 50% level of confidence) for given scope.

Value for money will occur when what is achieved equals or exceeds what was expected provided that the assumptions and data upon which “economy” is based are valid. An assumption can, however be made that if the implementer exercises due care and reasonableness during implementation, value for money will be achieved. Put differently if due care and reasonableness is exercised during implementation and what is achieved is less than what was expected, the difference lies not in the efficiency of implementation but in the inherent project risks materialising or shortcomings in framing the value for money proposition at the start of the project. .

Project life cycles linked to the allocation of design responsibilities

Barnes (1999) in his Smeaton Lecture in 1999, pointed out that virtually no civil engineering was carried out in the UK, after the Romans left, until the 17th century, the two notable major works being the Exeter Ship Canal (1567) and the drainage the Fens. This all changed between the 1760s and the 1850s. John Smeaton, who is often regarded as the founder of civil engineering and whose largest project was the Forth and Clyde Canal linking the eastern side of Scotland to the western side, developed his approach to managing works. In 1768, he set down his management scheme for the construction phase with detailed tables of responsibility. His team comprised the engineer in chief, the resident engineer and the ‘surveyors’ for the various geographical sections working under him, and contractors (as opposed to direct labour). This ‘master – servant’ model has remained in use for the majority of civil engineering projects in Anglophone countries for more than 200 years and is still used on projects managed in the traditional manner.

The Royal British Institute of Architects’ (RIBA, 2000) Plan of Work and the stages currently contained in the South African Council for the Architectural Profession (SACAP, 2011) and Engineering Council of South Africa’s (ECSA, 2014) are based on this traditional master servant relationship (see first two columns of Table 3). The contractor is only procured after the design of the works has been completed.

The approach to construction in Europe has taken a different route as indicated in the third column of Table 3. The contractor is procured before the design is completed and documented. The contractor is responsible for finalising the design.

In 1998, Bath University carried out a study to examine the UK Government’s performance as a client of the construction industry. The study was carried out against the backdrop of major failures by the Government, as client, and demonstrated failings in areas such as poor management, poor project flow, a risk-averse culture, focus on low-cost rather than value for money, a lack of integration and short-term relationships. A benchmarking study of the same year showed that 73 per cent of UK Government client contracts were delivered over budget and 70 per cent delivered late. These studies highlighted the need for a cultural change in order to achieve the required level of improvement within Government’s delivery chain.

The Achieving Excellence in Construction (AEC) initiative was introduced in March 1999 by the Chief Secretary to the UK Treasury to improve the performance of Government as a client of the construction industry. In 2002, the initiative’s success was clear from evidence, which showed a significant improvement in the delivery of public sector construction projects to time and within budget. These key findings paved the way for the continuance of the initiative and the setting of new Strategic Targets against which departments should monitor their progress (OGC, 2003). Results of the Achieving Excellence in Construction Strategic Targets in 2005 demonstrated that significant improvements have been achieved since the introduction of the initiative in 1999. 65% of projects were being delivered on time and 61% within budget.

The UK Office of Government Commerce published Common Minimum Standards in 2006. These standards require that procurement strategies and contract types support the development of collaborative relationships between the government client and its suppliers and facilitate the early appointment of integrated supply teams. This Standard also states that “*traditional, non-integrated procurement approaches should not be used unless it can be clearly shown that they offer best value for money – this means, in practice they will seldom be used*.”

The Construction Industry Council in 2007 published the CIC Scope of Services for use on major building projects designed by a multi-disciplinary team, whatever the procurement route (see last column in Table 3). The CIDB Infrastructure Gateway System (CIDB, 2010), which is designed for any type of construction works, has been designed so that the deliverables associated with the end of a stage form the basis of the scope of work for taking the package forward in terms of the selected contracting strategy as shown in shown in Table 4.

Table 3: Comparison of life cycle stages

RIBA Enterprises (2000)	ECSA and SACAP (2011)	ISO 29481-1 (2010)	CIDB (2010)	CIC (2007)
		0 Portfolio requirements	1 Infrastructure planning	
			2 Procurement planning	
A Appraisal	1 Inception	1 Conception of need	3 Package preparation	1 Preparation
B Strategic briefing				
C Outline proposals	2 Concept and viability	2 Outline feasibility;	4:Package definition	2 Concept
D Detailed proposals	3 Design development	3 Substantive feasibility	5 Design development	3 Design Development
		4 Outline conceptual design;		
E Final proposals		5 Full conceptual design		
F Production information	4 Documentation and procurement	6 Co-ordinated design and procurement	6 Design documentation 6A Production information	4 Production information
		7 Production information		
G Tender documentation				
H Tender action				
I Mobilisation	5 Contract administration and inspection	6 Construction	6 Design documentation 6B Manufacture, fabrication and construction information)	5 Manufacture, fabrication and construction information)
J Construction to practical completion			7 Works	
K After practical completion	6 Close out		8 Hand over	6 Post practical completion
			9 Close out	

Integrating design with construction

The Euroscan facility, a new security scanning facility on either side of the Euro tunnel, presented researchers with a unique opportunity to compare project performance in the UK and France with a functionally equivalent building, a common design and a common client (Research Focus, 2000). A leading architectural practice was commissioned to design the facility on either side of the channel. Both project teams faced the same challenges largely generated by problems with the scanning technology. The French contractor was appointed after the RIBA stage D shown in Table 3 whereas the UK contractor was appointed after the RIBA stage H. Table 5 compares the UK and French performance.

The French team coped with the issues much more smoothly due to the differences in organisation of these two projects. The French contract included detailed design which enabled the project to be re-engineered - the design was simplified so that it was easier, simpler and cheaper to build. Under the French contract, the British architect could not object to these changes. In contrast, the professional indemnity considerations under the British contract meant that the architect refused to allow the British contractor to copy the French changes. Once the British contract began to run late, work on construction became even less effective as the team had to start working around the installation of the scanning equipment.

Research has indicated that in order to provide higher value and less waste the fragmentation in design needs to be addressed, preferably before 25% of the design is complete (Lichtig, 2006). Target cost contracts can be used to facilitate early contractor involvement in terms of the design by employer, develop and construct and design and construct contracting strategies. This is possible as contractors can be contracted on the basis of their cost parameters and a target price can be negotiated when there is sufficient production information available to agree a target price. Escape clauses can be inserted into design and construct contracts to enable the employer to use the designs and approach the open market in the event that agreement cannot be reached regarding the target price (Watermeyer, 2012).

Table 4: Key deliverables associated with the scope of work of a contracting strategy

Contracting strategy		Key deliverable which forms the basis of the scope of work associated with a contract	
Strategy	**Description**	**Stage associated with the deliverable**	**Deliverable**
Management contractor*	Contract under which a contractor provides consultation during the design stage and is responsible for planning and managing all post-contract activities and for the performance of the whole of the contract	3 Package preparation	Client accepted strategic brief*
Design and construct	Contract in which a contractor designs a project based on a brief provided by the client and constructs it	4 Package definition	Client accepted concept report
Develop and construct	Contract based on a scheme design prepared by the client under which a contractor produces drawings and constructs it	5 Design development	Client accepted design development report
Design by employer	Contract under which a contractor undertakes only construction on the basis of full designs issued by the employer	6a Design documentation (Production information)	Completed and client accepted production information

* A management contractor can also be appointed after Stage 4, 5 or 6A in which case the client accepted concept report, design development report or production information, respectively, can serve as the basis of the scope of work.

Table 5: Project performance comparison on a functionally equivalent building, a common design and a common client

Performance indicator	French performance	British Performance
Design costs	£ 323 523	£ 465 000
Contractor tender price	£ 3 852 754	£ 3 897 00
Contractor out-turn cost	£ 4 178 652	£ 4 482 375
Total acquisition cost	£ 4 502 178	£ 4 947 375
Contractor cost increase	8.5%	15%
Contract programme	equal	equal
Programme overrun	0%	28%
Site management staff	4	8
Procurement	Lump sum after stage D; bespoke contract	Approximate bill of quantities at stage H; full JCT 80
Strengths / weaknesses	Contractor's engineering capability means value engineering the norm	Architects liability insurance prevents value engineering Process complexity

NOTE: costs are converted at the 1992 Purchasing Power Parity

Different forms of contract

ISO 6707-2 (1993) defines conditions of contract as the "*terms that collectively describe the rights and obligations of contracting Parties and the agreed procedures for the administration of their contract*." A standard form of contract or standard contract, on the other hand, is a contract between two parties that is published by an authoritative industry body with fixed terms and conditions which are deemed to be agreed and are not subject to further negotiation or amendment.

The first standard form of contract in the UK was developed for the London Metropolitan Board of Works during the 1860s, based on a master servant relationship. Current forms of contract are drafted around significantly different objectives and principles e.g. master-servant relationships or collaboration between two experts, risk sharing or risk transfer, independent or integrated design, short-term relationships based on one-sided gain or long-term relationships focused on maximizing efficiency and shared value, etc. (Watermeyer, 2012).

There are, however, two international families of standard contracts that are used in many jurisdictions including sub-Saraha Africa, namely those published by the International Federation of Consulting Engineers (FIDIC) and the Institution of Civil Engineers (NEC3). These standard forms of contract cover a range of procurement types, service responsibilities and contracting and pricing strategies that are drafted to cater for a wide spectrum of objectives and methods of managing risks.

The FIDIC and NEC3 forms of contract cover engineering and construction works and professional services. The NEC3 forms of contract, however, also include supply, term service and framework contracts. The FIDIC forms of contract are based on the traditional approach to drafting and administering contracts, assessing variations to the contract and effecting payment to contractors in terms of standard price-based pricing strategies (i.e. lump sum or bill of quantities). The NEC3 forms of contract on the other hand, facilitate the implementation of sound project and risk management principles and practices in a flexible manner. They also offer a wide range of price-based (activity schedule, price list and bill of quantities) and cost-based pricing strategies (i.e. time based contract, cost reimbursable contract and target contract). They are drafted on a relational contracting basis, based on the belief that collaboration and teamwork across the whole supply chain optimises the likely project outcomes and are therefore based on "discussion at the time" rather than "argument later." They contains clear procedures with defined time limits for actions to be taken, and provide for effective control of change, speedy agreement of time, quality and cost impacts of change, improved forecasting of end costs and end dates. They assess compensation events (events for which the employer is at risk) which entitle the contractor to more money on the basis of cost, as defined in terms of the contract, uplifted by any percentages for overheads and profit or fees provided for in the contract for work already done, or a forecast for the work not yet done.

Delays and disruptions need to be managed. Extensions of time caused by events which are beyond the contractor's control are necessary to relieve the contractor of delay damages and to establish a new contract completion date. The Society of Construction and Law's Delay and Disruption Protocol (2002) contains 21 core principles to provide a means by which the parties can resolve these matters and avoid unnecessary disputes. These core principles suggest that delays and disruptions be handled in terms of the following principles:

- The contractor should prepare a programme showing the manner and sequence in which the contractor plans to carry out the works and have such a programme accepted by the contract administrator. The programme should be updated to record actual progress and any extensions of time granted. Applications of extensions of time relating to events or causes of delay for which the employer has assumed risk and responsibility should be made and dealt with as close in time as possible to the event that gives rise to the application for an extension of time.

- The parties should attempt so far as possible to deal with the impact of employer risk events to mitigate its effect on the works as the work proceeds, both in terms of extension of time and compensation.

- The extension of time should be granted to the extent that the employer risk event is reasonably predicted to prevent the works being completed by the agreed completion date, taking into account the float other than terminal float (difference between planned and contractual completion) that is available on the activity paths affected by the delay.

- The granting of an extension of time does not automatically lead to entitlement to compensation. Where practicable, the total likely effect of variations should be pre-agreed to arrive if possible at a fixed price of a variation based not only on the direct costs (labour, plant and materials) but also the time related costs, an agreed extension of time and the necessary revisions to the programme.

- Compensation for prolongation should be based on the actual additional cost incurred by the contractor and evaluated by reference to the period when the effect of the employer's risk event was felt and to the extended period at the end of the contract.

Points can be assigned to each of the 21 core principles to a particular form of contract to gage where each of these forms of contract sit with respect to these principles i.e. -1 for non- compliance; 0 for some compliance; 1 for partial compliant and 2 full compliant. Based on this rating, the FIDIC Red Book has a moderate correlation (> 0,5 but ≤ 1,5), while the NEC3 ECC has an excellent fit (>1,5).

The NEC3 family of contracts also embrace the recently published DFID's *Statement of Priorities and Expectations for Suppliers* in the areas of reduction of waste and efficiency, the engagement of subcontractors, collaborative working, an open book approach to the cost of change and the application of pricing structures that align payments to results and reflect a more balanced sharing of performance risk.

A comparison between the international and local families of standard contracts which are endorsed for use in South Africa is shown in Table 6.

Table 6: Comparison of different forms of engineering and construction works contracts endorsed by the Construction Industry Development Board

Criteria		**FIDIC**	**GCC 2010**	**JBCC 2000**	**NEC3**
1	Correlation / fit with respect to Society of Construction and Law's Delay and Disruption Protocol (2002)	Moderate	Poor	Poor	Excellent
2	Potential for collaborative working	Moderate	Poor	Poor	Excellent
3	Target contract option for application in framework contracts, collaborative working and early contractor involvement	No	No	No	Yes
4	May be used for both engineering infrastructure and building projects	Yes	Yes	No	Yes
5	The main contractor may be required to assume responsibility for the design or the works or the finalisation of the design	Yes (yellow and silver)	Yes	No	Yes
6	The main contractor may be required to operate as a management contractor	Yes (silver)	No	No	Yes
7	Cost based pricing strategies, including target cost contracts	No	No	No	Yes
8	Back to back subcontracts	Yes	No	Yes	Yes
9	Short forms of contract suitable for use where risks are low and there is no requirement for sophisticated management techniques	Yes	None	Same management requirements as for principal contract but no subcontracts	Yes
10	An open book approach to the cost of change	No	No	No	Yes
11	Pricing structures that align payments to results and reflect a more balanced sharing of performance risk	No	No	No	Yes

Recent South African experience at the University of the Witwatersrand

The University of the Witwatersrand's Capital Projects Program (CPP) was established in 2008 to direct a project portfolio exceeding R1 billion by 2012. The building environment at the University is a complex one due to the multiplicity of client users and competing requirements, noise and disruption to academic programmes, the health and safety of not only workers but also students and the public, the mix of new buildings, extensions and refurbishments, the limited or no space for decanting staff and students and the complex operational requirements within Wit's management systems. The Department of Higher Education and Training had stringent cost norms attached to their grant funding conditions linked to the delivery of teaching spaces. Loans were taken out against income streams for the new residences. The University's ability to fund capital expenditure was limited. As a result, cost overruns had to be funded primarily through fund raising initiatives. The academic calendar also dictated the time for completion. Simply put, the University environment was sensitive to cost and time overruns. (Hodgson *et al*, 2009)

Those responsible for the Capital Projects Programme took a conscious decision to move away from the pre-planned traditional contracting approach ("them-and-us") towards an integrated project team approach following initial experiences in the early phase of the programme where projects overrun budgets by as much as 30% with a significant portion of the overrun only becoming apparent after practical completion. This was done to improve project performance during implementation. A decision was taken to change over to the NEC contracting system in order to stimulate a culture shift towards collaboration, efficiency and greater certainty (Watermeyer, 2010) as indicated in Table 7.

Table 7: Culture change sought at Wits to improve project outcomes (Hodgson *et al,* 2009)

From	**To**
Master-servant relationship of adversity	Collaboration towards shared goals
Fragmentation of design and construct	Integration of design and construct
Allow risks to take their course	Active risk management and mitigation
Meetings focused on past - what has been done, who is responsible, claims. etc.	Meetings focused on "How can we finish project within time and budget available?"
Develop the project in response to a stakeholder wish list	Deliver the optimal project within the budget available
"Pay as you go" delivery culture	Discipline of continuous budget control
Constructability and cost model determined by design team and Quantity Surveyor <u>only</u>	Constructability and cost model developed with contractor's insights
Short-term "*hit-and-run*" relationships focused on one-sided gain	Long-term relationships focused on maximising efficiency and shared value

R 1.5 billion of works was completed in six years. The overall cost overrun (difference between outturn cost and control budget established at the time that a decisions was taken to implement the project) has been less than 5% (Hodgson, 2013). This includes scope changes during implementation to accommodate late changes to the design. Projects were also generally completed on time or ahead of time.

This remarkable acheivement has been achieved through a combination of proactive project management, the application of the NEC3 contracting system, the adoption of the develop and construct and design by employer contracting strategies with early contractor involvement, the use of appropriate procurement strategies including framework agreements which enabled long term relationships to be developed and the use of priced based and target contracts with activity schedules, and the culture change that underpinned the programme.

The programme was delivered using public sector procurement rules and endorsed forms of contract. The successful implementation of the programme has resulted in the Department of Higher Education and Training appointing the Univerity of the Witwatersrand as its implementing agent to develop two new univerities – the Sol Plaatje University in Kimberly and the University of Mpumalnag in Nelspruit.

Factors inhibiting changes in procurement strategy

The author has not only been intimately involved with the Wits Capital Project Programme since 2008 but also in the development of the National Treasury and Construction Industry Development Board's Delivery Management Guidelines, *Practice Guide 2 - Construction Procurement Strategy* (2010) and its promotion within provincial government. Very few public sector clients are satisfied with project outcomes in terms of schedule, performance or budget and the quantum of delivery. Project budget overruns and late delivery and portfolio underspending are the order of the day. In the face of this, many clients and their professional advisers are attempting to fix the traditional preplanned approach to delivery in the hope of a better outcome rather than taking a step back and developing an appropriate procurement strategy.

The factors in the author's experience which inhibit the adoption of strategies other than the traditional pre-planned approach are:

1) Most South African universities, particularly the departments of construction economics, teach contracts in a transactional manner in that they instruct students in the application of a single local form of contract, based on a design by employer contracting strategy with a bill of quantities and fail to educate them on contracting principles and the range of strategies that are embedded in different forms of contract.

2) The guideline fees published by the various built environment councils which provide stage payments based on the traditional preplanned approach to construction entrench a single predetermined strategy and a rigid culture in the delivery of infrastructure.

3) The resistance of built environment professionals, particularly the architectural and quantity surveying professions, to make any departure from the "time honoured" traditional approach to the delivery of infrastructure.

4) A lack of broad minded project and programme managers who are prepared to change the culture in order to improve project outcomes..

5) A lack of evidence based research which enables participants in projects to make informed choices in the development of a procurement strategy.

6) A one size fits all approach to procurement propagated by supply chain managers. (The supply chain for goods typically involves the procurement of off the shelf products or readily available commodities which once purchased are taken into inventory while that for general services involves standard well defined and scoped services. On the other hand, the supply chain for infrastructure involves the planning and production of a product on a site (Watermeyer *et al*, 2013))

7) A lack of standardised procurement documentation to support the implementation of alternative contracting and pricing strategies.

8) Poor procurement skills amongst those responsible for conceptualising and executing procurement processes.

Conclusions

Procurement strategy has the potential to maintain the value for money proposition established at the time that a decision to proceed with a project is made. Its effective implementation, however, requires a culture change.

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