

T16 Infrastructure Delivery for Capital Projects 5 – appropriate procurement strategies



Identifying appropriate procurement strategies for public infrastructure delivery – a developing country perspective



Ron Watermeyer

DEng, FSAICE, FIStructE, FICE



Civil engineer's contribution to sustainable development

Design of works

Design for:

- fitness for purpose
- contribution to sustainable development

Design choices

Procurement of works

Procurement strategy

Structure to

- attain primary procurement objectives
- promote secondary procurement objectives

In order to develop a procurement strategy one needs to understand

- The evolution of the construction procurement system
- The work flow for a construction works project
- The options available

Hammurabi's Code of Laws

the sixth king of Babylon , 1780 BC



If a builder build a house for some one and complete it, he shall give him a fee of two shekels in money for each sar of surface.

Fixed rate contracts?

If a builder build a house for some one, even though he has not yet completed it; if then the walls seem toppling, the builder must make the walls solid from his own means.

Specification?

Civil engineering in the UK

There were no civil engineering works of significance in the UK after the collapse of the Roman Empire until 1768

John Smeaton started the construction of the Clyde canal in 1768 providing a route for sea-going vessels between the Firth of Forth and the Firth of Clyde at the narrowest part of the Scottish Lowlands

This 35 mile canal was completed in 1790

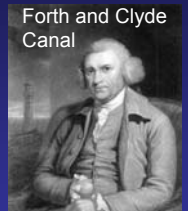


Managing time and cost overruns

John Smeaton wrote the following on cost estimates in 1772:

"The longer I live I every year see more into the reasons why estimates are generally exceeded in the execution and how impossible it is, without repeated proofs from experience, to conceive how this can happen in so great a degree"

Forth and Clyde Canal



Administration of contracts

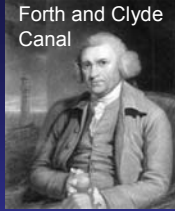
Smeaton in 1768 he set down his management scheme for the construction phase with detailed tables of responsibility for:

- the engineer in chief,
- the resident engineer and
- the 'surveyors' for the various geographical sections working under him.

This provides a model which is still used today – master servant

He favoured using contractors rather than directly employed labour, provided the contractor was not selected on the basis of the lowest tender.

Forth and Clyde Canal



Bills of quantities and variation orders

Recommendations made to Louis XIV's Department of Works

(from possibly the first government enquiry into the financial control of civil engineering works)

"In the name of God: re-establish good faith, give the quantities of the work and do not refuse a reasonable extra payment to the contractor who will fulfill his obligations"



Sun king
1638 -
1735

Bespoke contracts

Brunel had his own conditions of contract as there were not yet any standard forms.

He modified his form of contract as he gained experience during his career.

A contemporary writer commented:

'The result of each successive edition of the printed form was to place the contractor more and more at the absolute mercy of the Engineer. Bilateral rights were, as far as careful language could go, extinguished.'

- many disputed claims which were subsequently taken up by the contractors through the courts
- towards the end of his career he had great difficulty in getting contractors to tender for his schemes

Power of the engineer

Extracts from Joseph Locke's one sided contracts 1840 (Paris to Le Havre Railway)

The parties engage from this time to refer any contested points to Mr Locke, Engineer, who will decide thereon as sovereign arbitrator, from whose decision there shall be no appeal or recourse to cassation and also as an amicable judge dispensing with the forms and delays of procedure.

Standard form of contract

Sir Joseph Bazalgette's standard form of contract for London's major sewer projects and the embankments on the Thames 1860s was adopted by the Metropolitan Board of Works

Model for first edition of the ICE contract published in 1945

Based on master servant relationship

(Most contracts in developing countries are based on a master servant relationship)

Collaborative contracts

The basic interaction between Engineer and Contractor has mutated over the last hundred and fifty years from 'master and servant' to a simple collaboration between two specialist contributors.

Dr Martin Barnes, CBE




NEC family of contracts

Endorsed
by



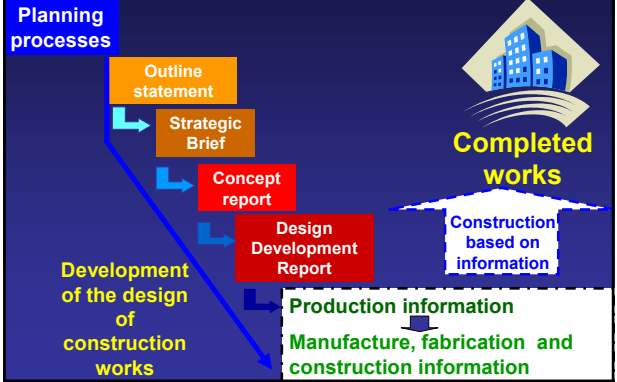
Project definition

A project (what is to be constructed) is defined at any stage in the project delivery stage by the:

- project brief
- project programme
- design
- project cost

Work flow for a construction works project

Project Brief is progressively developed from



Work flow for the design of the works

Stage	Deliverable at end of stage	Principal actions
1 Preparation	Client accepted Strategic Brief setting out the project Stage 1 definition information	Define the project objectives, business need, acceptance criteria and client priorities and aspirations Establish project criteria, including the function, mix of uses, scale, location, quality, value, time, safety, health, environment and sustainability Identify procedures, organizational structure, key constraints, statutory permissions and strategies to take the project forward Establish the control budget
2 Concept	Client approved Concept Report setting out the integrated concept for the Project	Establish the detailed brief, scope, scale, form and cost plan for the project, Obtain site studies and construction and specialist advice, as necessary Determine the initial design criteria, design options, cost plan, and the selection of the preferred design option

Stage	Deliverable at end of stage	Principal actions
3 Design development	Client accepted Design Development Report setting out the integrated developed design for the Project	Develop in detail the accepted concept to finalise the design and definition criteria. Establish the detailed form, character, function and cost plan, defining all components in terms of overall size, typical detail, performance and outline specification.
4 Production information	Completed and Client accepted Works Information	Produce the final 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.

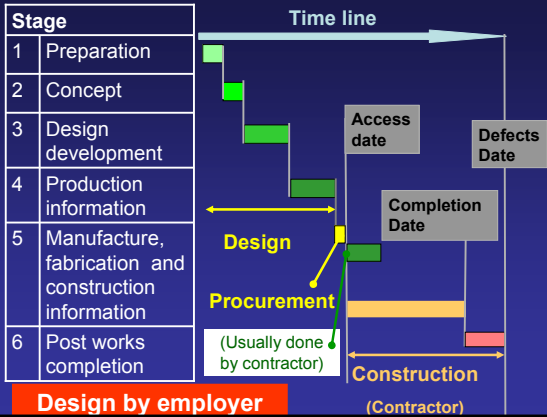
Stage	Deliverable at end of stage	Principal actions
5 Manufacture, fabrication and construction information	Client accepted manufacture, fabrication and construction information	Review the manufacture, fabrication and construction information prepared by others, based on the production information for design intent.
6 Post Works Completion	Client accepted record information	Finalise and assemble record information Conduct post-project review Finalise outstanding services

Structure of a contract (ISO 10845-2)

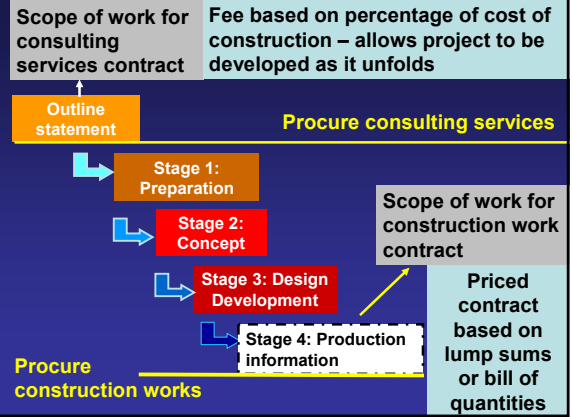
Form of offer & acceptance	Formalises the legal process of offer and acceptance
Contract data	Establishes the risks, liabilities and obligations of the contracting parties and the procedures for the administration of the contract.
Pricing data	Records contractor's prices
Scope of work	Specifies and describes what is to be provided and any other requirements and constraints relating to the manner in which the contract work is to be performed
Site information	Describes the site as at the time of tender to enable the tenderer to price his tender and to decide upon his method of working and programming and risks.

Also known as works information or specifications

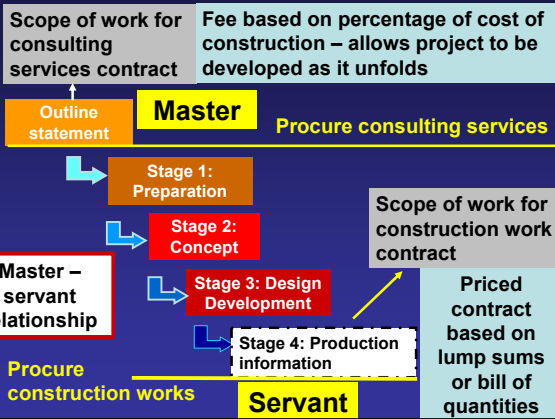
Traditional preplanned approach



Scope of work



Scope of work



Traditional forms of contract

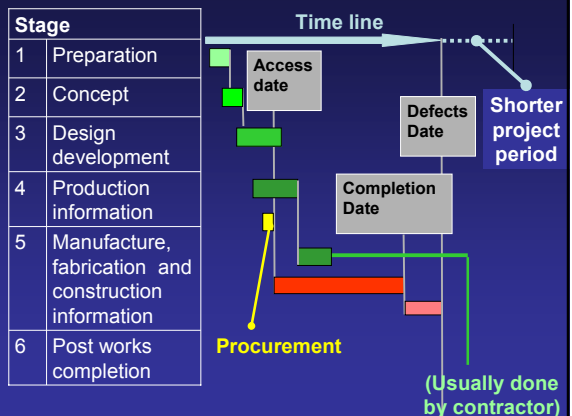
- framed around
 - the **design by employer** contracting strategy
 - lump sum** contracts or **bills of quantity**

Design by employer	Contract under which a contractor undertakes only construction on the basis of full designs issued by the employer
Lump sum	The Contractor undertakes to break the scope of work down into activities and price each activity as a lump sum, which he is paid on completion of the activity.
Bill of quantities	The Contractor is paid an amount for the item of work in the bill which is the rate for the work multiplied by the quantity completed

Considerations re percentage fees for professionals

- This method implicitly lacks incentives to produce an economical design or service
- The cost of construction is largely a function of the market and bears no relation to the cost of professional services
- The final cost of construction (and therefore the final fees) is not established until after the construction is complete, whilst most professional costs are expended much earlier and even before construction starts

“Fast track” preplanned approach

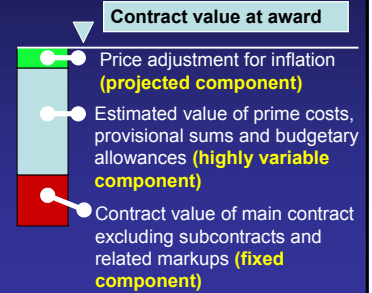


“Fast track” projects

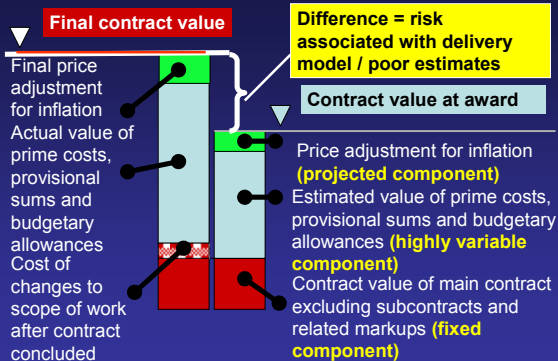
What happens if all the work cannot be identified at the time when the contract is concluded ?

- **Prime costs** – amounts stated which the contractor is to assume for materials or plant when building up his prices (adjusted when actual cost is known)
- **Provisional sums** for
 - work items not designed but identified including work by nominated and selected subcontractors
- **Budgetary allowances** for risk (uncertainty) and unforeseen items

Fast track projects



Cost overruns on fast track projects



PAY AS YOU GO SYSTEM BUT FASTER DELIVERY

SA 2010 World Cup soccer stadia (10)

All 6 new stadia –traditional preplanned approach using local form of contract

Bid awarded to South Africa – R2,0 billion estimate

Government put aside R3,0 billion

October 2006 – National Treasury made R8.4 billion available

Nov 2006 – A Procurement Task Team led by National Treasury and Dept of Sport interviewed the Host City Project Teams on the 6 new stadia

All Project Teams confirmed that their project designs were within budget and that they had sufficient contingencies to accommodate cost overruns

Two weeks later, tenders came in 30% above estimate

Costs have continued to escalate (final cost more than R16 billion)

Office of Government Commerce (UK)

Common Minimum Standards for Procurement of Built Environments in the Public Sector

Procurement strategies and contract types must support the development of **collaborative relationships between the government client and its suppliers and shall facilitate the early appointment of integrated supply teams (each part of which should incorporate an integrated supply chain)**

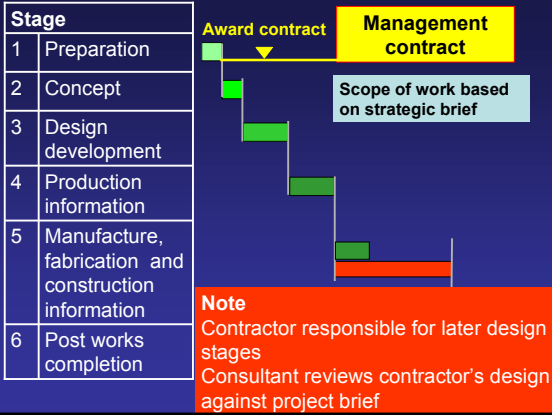
Guidance states:

Traditional, nonintegrated 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**

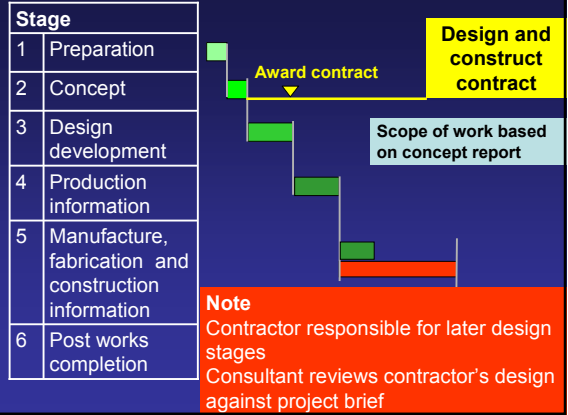
Alternative contract strategies

Management contract	Contract under which a contractor is responsible for planning and managing all post-contract activities and for the performance of the whole of the contract
Design and construct	Contract in which a contractor designs a project based on a brief provided by the client and constructs it
Develop and construct	Contract based on a scheme design prepared by the client under which a contractor produces drawings and constructs it

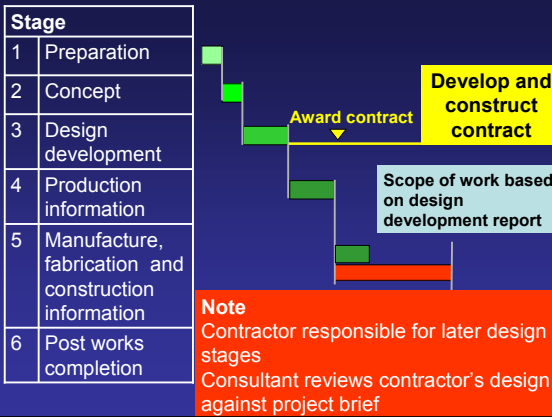
Alternative contract strategies



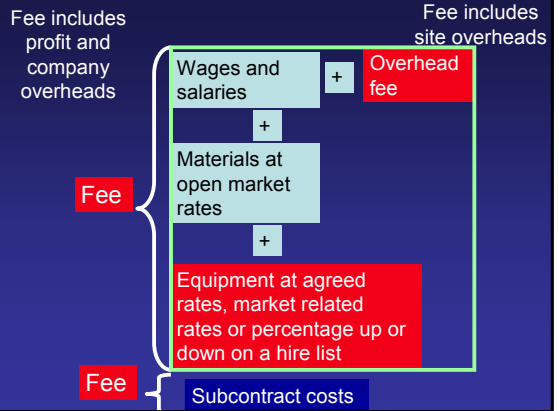
Alternative contract strategies



Alternative contract strategies



Cost reimbursable contract



Target contract

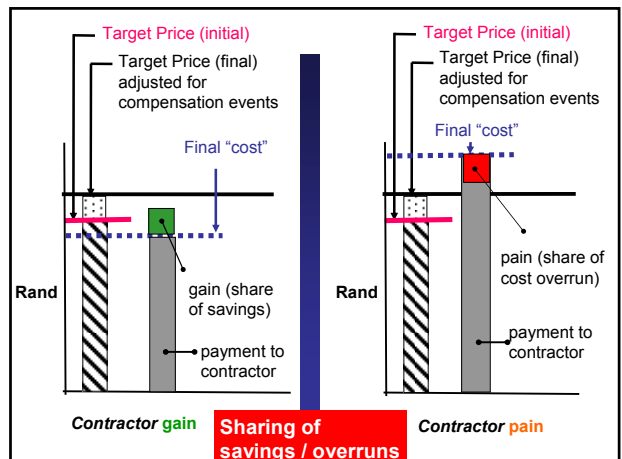
Used where the client wishes to share the cost risk

Total of tendered prices is the 'target'

- controls productivity
- kept equitable by adjusting the target to accommodate scope changes and events that are the Employers risk etc
- target not reduced where changes to the scope of work proposed by the contractor are accepted by the employer

Paid on a cost reimbursable basis

Over-run (pain), under-run (gain) is shared per an agreed formula



Pain and gain proportions

Share range	Contractor's share			
	20%	15%	100%	100%
>120 %	20%	15%	100%	100%
111 - 120	70%	75%	75%	100%
106 - 110	60%	60%	75%	100%
101 - 105	50%	50%	50%	100%
96 - 100	50%	45%	50%	50%
91 - 95	40%	30%	50%	50%
80 - 90	30%	15%	40%	40%
< 80%	20%	15%	30%	20%

Contractor loses profit but not "put out of business"

Guaranteed maximum price

Little incentive / not much likelihood of bringing costs to below this level

Gain / pain calculated for each increment separately

What is a framework agreement?

ISO 10845-1, Construction procurement – Part 1: Processes, methods and procedures,

A framework agreement is an agreement between an organization and one or more contractors, the purpose of which is to establish the terms governing contracts to be awarded during a given period, in particular with regard to price and, where appropriate, the quantity envisaged

Framework agreements allow the employer to procure work on an as-instructed basis over a set term without necessarily committing to any quantum of work

Principles

Framework agreements are entered into following a competitive selection process

Framework contracts may be entered into based on a framework agreement either by

- applying the terms of agreement or
- reopening competition between the framework contractors, based on the terms, by inviting quotations

Parties may not make substantial changes to the terms laid down in that framework agreement.

Framework agreements are not to be used improperly or in such a way as to prevent, restrict or distort competition

Essential elements of a framework agreement

A **task/ package** is work within the scope of work of a framework agreement which is instructed to be carried out within a stated period of time

A **task / package order** is an instruction to carry out a **task / package** and may only be issued within the term of the agreement

Any work commenced before the end of the term may continue until the end date provided in the task order

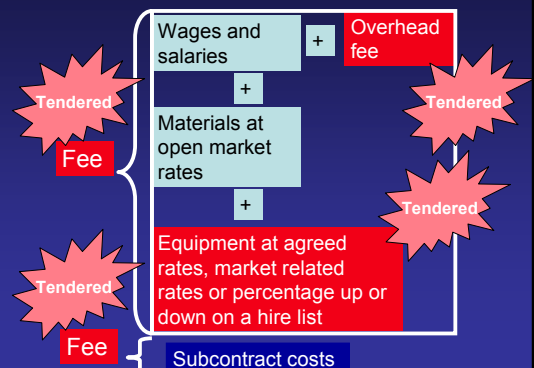
A framework agreement is a contract where the terms of payment are agreed in the absence of a detailed scope of work

Pricing strategies

Lump sum	} use to develop target when scope of work is known	not suitable
Bills of quantities		
Activity schedule		
Cost reimbursable	} suitable	
Target cost		

Early contractor involvement possible with cost reimbursable and target contracts using design by employer or design, construct or develop and construct contracting strategy

Tender margins, overheads and equipment and be paid on this basis



nec 3 schedule of cost components		
#	Component	Basis of cost
1	People	cost of people according to time worked in the Working Area
2	Equipment	agreed, competitive tendered or market related prices
3	Plant and Materials	competitive tendered or market related prices
4	Charges	payment for water and electricity, payments to local authorities, and overhead charge for overheads in Working Areas (percentage x people cost)
5	Manufacture and fabrication	hourly rates for categories of staff plus percentage overhead
6	Design	hourly rates for categories of staff plus percentage overhead
7	Insurance	amounts paid by insurers (deducted)

Procurement of contractors

Financial Offer + Quality + (Preference)

Evaluate Financial Offer based on:

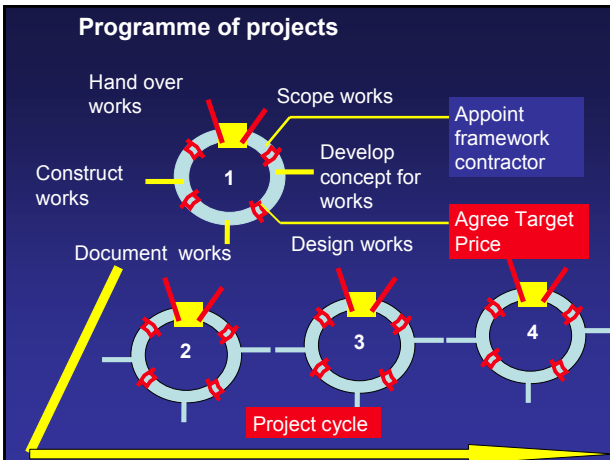
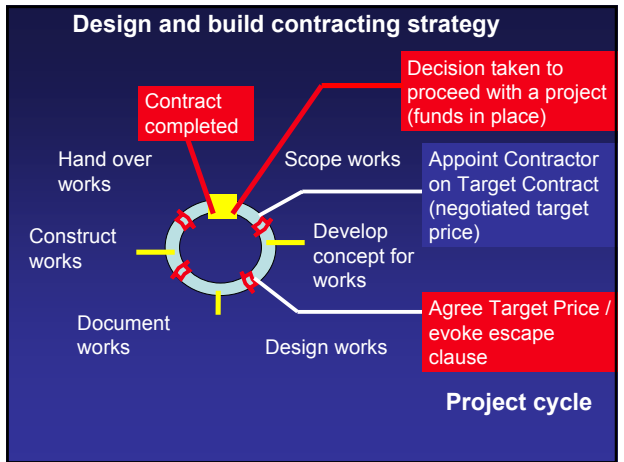
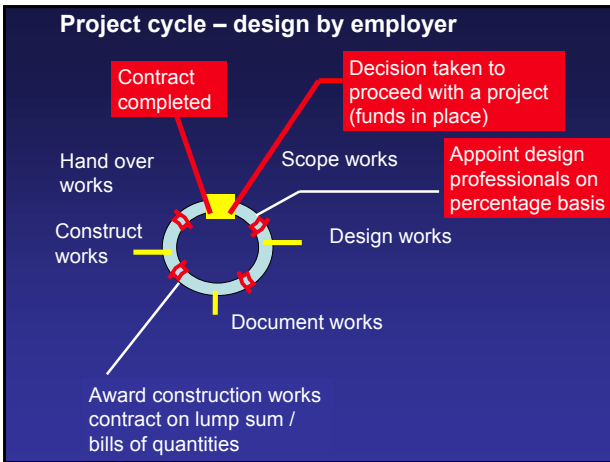
- tender assessment schedule with assumed costs and tendered parameters
- tendered target price tender assessment schedule with assumed costs

Option 1 Negotiated target price

Option 2 Tendered target price

Quality evaluation is very important

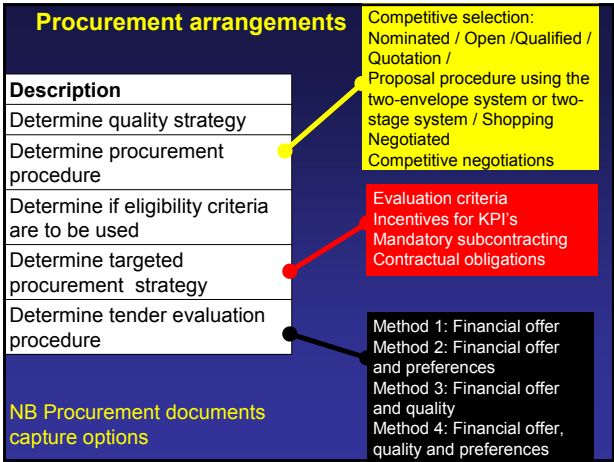
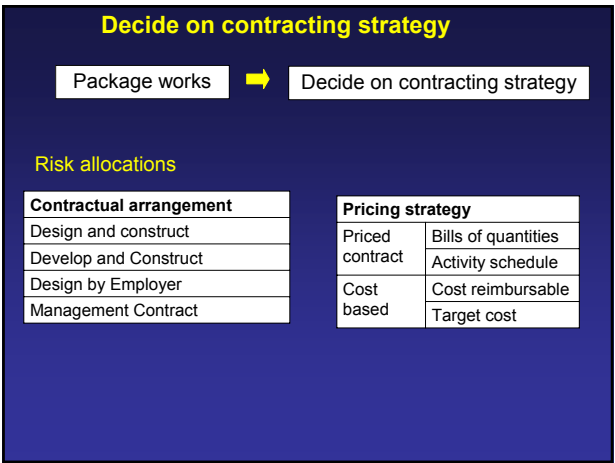
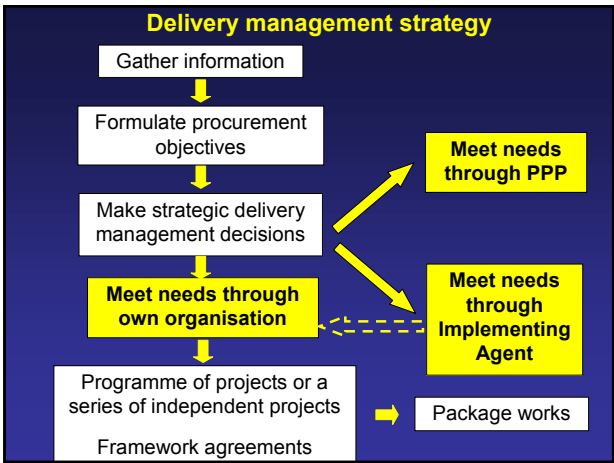
Open book accounting



Procurement strategy

The selected packaging, contracting, pricing and targeting strategy and procurement procedure for a particular procurement

The procurement strategy identifies the best way of achieving objectives and value for money, taking into account prevailing risks and constraints



Current delivery system in many developing countries

- Delivered using a traditional preplanned approach to construction (design by employer) with priced contracts
- Public sector clients don't have internal design staff and outsource the design to consultants with poor controls over the design
- Projects are commonly broken down into small contracts to provide access to local contractors and to encourage labour based technologies

Results

A consultant driven, stop / start mode of delivery, often with disappointing outcomes

Conditions of Contract for **CONSTRUCTION** FOR BUILDING AND ENGINEERING WORKS DESIGNED BY THE EMPLOYER

Multilateral Development Bank Harmonised Edition March 2006

Commonly encountered international forms of contract

FIDIC Conditions of Contract for Construction and Building and Engineering Works Designed by the Employer (Red Book)

MDG (based on FIDIC) and FIDIC Red Book only support bills of quantities and the traditional pre-planned approach to projects

NEC3 Engineering and construction contract

Supports all contracting strategies and has options for **priced contracts** based on activity schedules or bill of quantities and **target contracts** based on activity schedules or bill of quantities, **cost reimbursable contracts** and **management contracts**

Africa infrastructure country diagnostic

Overhauling the engine of growth: Infrastructure in Africa by Vivien Foster – September 2008

Focuses on 24 countries that together account for 85 % of GDP, population and infrastructure aid flows of Sub-Saharan Africa

Getting more out of current spending

- Countries typically only manage to execute about two thirds of the budget allocated to investment in infrastructure

Observation contained in World Bank report:

- public investment can increase by 50% by simply addressing institutional bottlenecks that inhibit capital budget execution including better planning of investment projects, earlier completion of feasibility studies, more efficient procurement processes and multi-year budgeting

SA distribution of employment of engineers over time

Employer	Percentage distribution (%) of engineers and technologist	
	1967	2005
State owned enterprises	12	6
Government including provincial	12	4
Local government	15	10
Consultants	31	51
Industry or business	28	23
Academia	2	6

Migration from public sector to consulting sector



Stable

Analysis of SA's EPWP programme (2006)

SA national cabinet raised concerns about the small size, limited impact and limited visibility of Expanded Public Works Programme (EPWP) projects

Why?

4478 municipal infrastructure grant projects

- total value of R13,2 billion
- the average size of projects was a mere R 2,8 million
- 2% of the projects exceeded R 20 million.

Provincial departments

- average size of projects was R1,9 million
- 1,4% of projects exceeded R20 million

n + y + z contracts on building projects

n = one contract for construction works

n

+ 1 x contract for

- architect
- Qs
- structural engineer
- civil engineer
- electrical engineer
- mechanical engineer
- fire engineer
- wet services engineer

y

+ contract for project manager

z

Multiplier effect

$$(n + y + z) \times \text{no of projects}$$

Example (Limpopo Department of Education)

5 year programme with 2406 projects (748 maintenance) with an average value of R 2,3 m

Assume 1 x Qs, 1 x Architect and 1 x Civil / structural engineer plus 0,1 project managers for non maintenance and 0,5 for maintenance projects

$$\text{No of contracts} = (1 + 3 + 0,1) \times 1658 + 748 \times 0,5$$

$$= 7172 \text{ contracts}$$

How do you manage this?

Alternative approach through the appropriate choice of procurement strategy:

Total 74 contracts (plus professional service providers)

Advantages in using large contractors:

- access to expertise in contract management, technical skills, quality assurance and financial capacity;
- rapid delivery on a large scale;
- economies in scale;
- reduced management burden on employer;
- reduced contractual risk;
- reductions in professional fees
- better utilization of scarce skills

Targeted procurement procedures can be used to secure the participation of smaller enterprises

Questions