

Innovative construction procurement at Wits University

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Abstract

Many construction projects end up with a wide gap between achieved and expected outcomes, which puts value for money for a project at risk. A root cause of this problem may lie in the development of an appropriate procurement strategy for projects. Wits University in South Africa has used a mixture of innovative procurement and contract strategies to deliver a portfolio of capital projects within 6% of the control budget over a period of six years (2008-2013). The research aim was to examine the procurement strategies and project organization techniques adopted to deliver projects successfully. The strategic procurement approach has been based on the philosophy of collaboration, shared risk and integrated project teams which is different from the conventional approaches in South Africa. A discussion of strategies including framework agreements, NEC3 Contracts, target cost contracts and early contractor involvement is presented to demonstrate how the use of collaborative procurement methods and integrated supply chains provides a key to deliver successful outcomes and value for money. Organisations intending to adopt similar approaches will require a team of experts to lead a change from traditional procurement cultures to more collaborative and integrated procurement methodologies.

Keywords: framework agreement, innovative procurement, NEC3 contract, procurement strategy, South Africa, target cost contract, Wits University

INTRODUCTION

A frequent problem when it comes to construction procurement is the ability to deliver the intended outcomes of a project within the agreed budget and time estimates. Many projects end up with a wide gap between achieved and expected outcomes, which puts value for money for a project at risk. A root cause of this problem may lie in the development of an appropriate procurement strategy for projects. The purpose of a construction procurement strategy is to identify the best way to achieve the intended objectives of a project and value for money (OGC, 2007). If this strategic exercise is competently executed, the deviation between expected and achieved outcomes should be as small as possible. However, construction clients often experience the problem of delivery outcomes that significantly exceed the planned budget and time specifications (see, for example, Nkado 2010).

The current study relates to a successful case of construction procurement in South Africa. In 2008, the University of the Witwatersrand (Wits) in Johannesburg, South Africa embarked on a capital projects programme. The purpose of the programme was to provide infrastructure to match the university's increasing enrolment figures and academic aspirations. Approximately 1.5 billion Rand has been invested in more than 40 projects comprising of new buildings and refurbishments across the university's campuses. One notable observation is that the procurement and contract strategies adopted (see Table 2) have proved very successful in reducing the difference between expected and achieved outcomes to less than 6%. In other words, the total cost overrun (that is the difference in price between final amount paid to contractor and contract price when the contractor was instructed to execute a contract) in the programme has been less than 6%. Most projects have been delivered within the contract amount and on time using a mixture of innovative procurement strategies (see Table 2). This is not the norm in South Africa where the established construction procurement methodology is based on a traditional model that separates the design and construction process, making the design consultants responsible for the design, specifications and bills of quantities, which are then used to invite tenders from prospective contractors. Tenders are then awarded, often to the lowest bidder, setting the scene for adversity, claims, budget overruns and poor performance (FitzGerald and Hodgson, 2010).

Therefore the research aim was to develop a better understanding of the procurement and contract strategies which enabled projects to be delivered on time and within budget. In particular the research seeks to examine the procurement innovations and project organization techniques adopted to deliver projects successfully.

The example presented here demonstrates how the adoption of appropriate and innovative procurement strategies provides a key to achieve intended outcomes and value for money. There is a universe of options available for dealing with the different variables of construction procurement, i.e. funding, selection, pricing, responsibility for design, responsibility for management and supply chain integration (see BS8534: 2011 and ISO 10845: 2010). This universe of options should be well understood and considered by the members of a procurement team in every exercise of construction procurement to decide on the most appropriate combination of strategies for a particular procurement.

LITERATURE REVIEW

To provide a context for the research, this section presents an overview of existing literature on the Wits capital projects programme and a review of the components of a construction procurement strategy and concept of innovative procurement.

Existing literature on the Wits capital projects programme

Published documents relating to the Wits capital projects programme were identified and reviewed to provide some contextual understanding (summarized in Table 1).

Table 1: Published documents on Wits capital projects

Author(s)	Date / Year of document	Title of document	Type of document
University of Witwatersrand	the 2013	Campus Development and Planning Website (project portfolio, government support, strategic organisation, executive team, campus future, planning strategies)	http://www.wits.ac.za/aboutwits/witstoday/capitalprojects/3097/home.html
Murray and Roberts Group	Mar. 2012	A meeting of minds	Report in Murray and Roberts Group Magazine – Robust, March 2012 edition, page 14-15
Oldenkotte, G.	Sept. 2011	The challenge of providing accommodation	Publication in “Hefmania” September 2011 (Journal of the Higher Education Facilities Management Association)
Hansen, Ludwig	6 May 2011	Spatial concepts for Wits Parktown Campus Development	Presentation to the Campus Planning and Development Working Group, 42 pages
Hodgson, S.	24 May 2011	Delivering Capital Projects at Wits	Presentation, 34 pages
University of Witwatersrand	the Mar. 2011	Narrative report to the Department of Higher Education and Training	Report, 31 pages
Piet Louw Architects, Planner and Urban Designers in assoc. with Dave Dewar. Ludwig Hansen Architects and Urban Designers	20 Apr. 2011	A Preliminary Development and Design Framework for the University of Witwatersrand	development framework prepared by the design team, 78 pages
Creamer, T (Editor)	Aug. 2011	Concrete Intellectualism (section on Academic Infrastructure – R1.2 billion build programme core to Wits top-100 global varsity goal)	Publication in Engineering News, 12 August 2011, p. 10
University of Witwatersrand	the Feb. 2011	Naming Framework: Erf 815 Residence Development	Report on naming framework for Wits Junction project, 16 pages
University of Witwatersrand	the 31 Mar. 2010	DHET Progress report 2009/10 (Synopsis of report submitted to Department of Higher Education and Training)	Report to the DHET, 3 pages
FitzGerald, P.	Aug. 2010	Higher Education Infrastructure Expansion: The Case of Wits	Presentation at SARUA HE Executive Programme, Dar Es Salaam, Tanzania, 36 pages
FitzGerald, P. and Hodgson, S.	2010	Funding Higher Education Infrastructure Investment: The Case of Wits University	Paper in SARUA Leadership Dialogue Series, Vol. 2 No. 2
Hodgson, S., Prinsloo, E., Watermeyer, R. and Barnes, D.	25 Aug. 2009	Project management – a client perspective “The learning curve for Wits’ Capital Projects Program”	Presentation at Construction Symposium at Wits School of Civil and Environmental Engineering, 28 pages
University of Witwatersrand	the 31st March 2009	DHET progress report 2008/2009 (Synopsis of report submitted to DOE)	Report to DOE, 3 pages

One of the useful sources identified was a paper by FitzGerald and Hodgson (2010) which discusses the construction procurement culture change and nature of the funding for projects at Wits University. It was understood from the review of documents summarized in Table 1 that previous construction procurement models used by the university often resulted in projects being delivered late and over budget. Hence, the university required an alternative approach that would lead to more successful delivery of projects driven by a complex funding regime which requires fund raising to finance cost overruns, and help build rapidly and deliver projects with greater certainty and within academic teaching time frames.

In the first instance, a Campus Development and Planning (CDP) Department was established to create permanent capacity for campus planning and the delivery of a large portfolio of construction projects (<http://www.wits.ac.za/aboutwits/witstoday/capitalprojects/aboutus/3128/overview.html>).

This involved the recruitment of a team of experts to lead and manage the business of construction procurement on behalf of the University. Spencer Hodgson, Director of the Capital Projects Programme, explained in the March 2012 edition of “Robust” Magazine, pages 14-15: “An important part of mobilising these projects has been to ensure that we adopt the best practices I was part of developing at the Construction Industry Development Board (CIDB). We introduced the New Engineering Contract (NEC) to the Wits projects which put us on a learning curve with our consultants and contractors. But, it is paying off. We have been able to activate projects quickly, as well as involve contractors in design and value engineering and complete projects within budget.”

Procurement Strategy

Procurement is the process through which contracts are created, managed and fulfilled (ISO 10845: 2010). In specific relation to construction procurement, BS 8534: 2011 (page 13) identifies six variables of construction procurement. These are: source of funding, selection method, price basis, responsibility for design, responsibility for management, and the extent of supply chain integration. There are various options available for dealing with each variable, the combination of a client’s choices forms the procurement method, each of which can result in different outcomes even for the same project (see Watermeyer, 2012).

The British Standard on Construction Procurement (BS8534: 2011) defines a construction procurement strategy as a “plan of action for funding, organization, management, selection and payment of supply chains for the design, fabrication and which may include the operation of constructed facilities to achieve a desired objective”. A publication on Procurement and Contract Strategies by the Office of Government Commerce (Achieving Excellence in Construction Procurement Guide 6) (2007) explains that a procurement strategy identifies the best way of achieving the objectives of the project and value for money, taking account of the risks and constraints, leading to decisions about the funding mechanism and asset ownership for the project. The aim is to achieve the optimum balance of risk, control and funding for a particular project. Watermeyer (2012) explains that procurement strategy is 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.

The five components of a construction procurement strategy as outlined in ISO 10845 (2010) are packaging (organisation of work packages into contracts), contracting (nature of the relationship between the parties), pricing (how to secure financial offers, build up tender prices, and remunerate contractors), targeting (procedures for promoting secondary procurement objectives) and procurement procedure (how tender offers are solicited). The various options available for dealing with each of the components of a construction procurement strategy are outlined in ISO 10845: 2010 and Watermeyer (2012).

The contracting strategy, which forms part of the strategic procurement approach, determines the level of integration of design, construction and maintenance, which should support the main project objectives in terms of risk allocation, management and incentivisation (OGC, 2007). It seems clear that the contracting strategy may be influenced or limited by the specific standard form of contract employed in the project delivery. That is one reason why the choice of a standard form contract should be carefully approached. In South Africa, the Construction Industry Development Board's (CIDB) Standard for Uniformity in Construction Procurement permits the use of two international forms of contract (FIDIC suite of contracts and NEC3 family of standard contracts) and two local forms of contract (SAICE's General Conditions of Contract for Construction Works (GCC) and the JBCC suite of contracts)).

Innovative Procurement

Since one aspect of the research aim was to examine innovative aspects of the Wits procurement strategy, it was important to examine the research literature on the concept of "innovative procurement". A detailed search in Scopus (March 2014) revealed 23 publications with "innovative procurement" in the article title. These articles were systematically reviewed for a better understanding of the concept. The earliest of the 23 articles was published in 1982 meaning that innovative procurement is not a new concept.

Three interesting observations emerged from a review of the papers on innovative procurement in construction. First, none of the papers with 'innovative procurement' in the paper title actually provide a comprehensive definition of innovative procurement'. Second, in all cases where papers alluded to 'innovative procurement' there seemed to be particular needs or exigencies that normal procurement procedures seemed inadequate to be able to deliver and for which reason an alternative (or supplementary) approach was needed. Third, all of the papers reviewed allude to something new being introduced into the procurement process. Given these contextual observations in the research literature, it can be summarized that innovative procurement involves the use of new or alternative approaches to address emerging procurement needs or exigencies (see also Lu *et al.*, 2013).

RESEARCH DESIGN AND METHODS

The research aim was to develop a better understanding of the procurement strategies and project organization techniques used to deliver projects in the Wits capital projects programme. A comprehensive method was needed to probe deeply and reliably to ensure construct and ecological validity of the findings. According to Saunders *et al.* (2012) and Gill and Johnson (2010), construct validity defines how well a study measures up to its claims. Ecological validity is the degree to which things observed in a study reflect the natural settings (Schmuckler, 2001). The need to ensure construct and ecological validity of the research findings led to the formulation of a two-stage research approach.

In the first stage, it was decided to gather published documents on the Wits capital projects and review them to develop a contextual understanding (see Table 1). This provided some background knowledge for the second stage which was to interview respondents from both employer and contractor sides; and examine documents relating to various projects. Two research methods were thus used, that is, documentary analysis and interviews.

The details relating to specific application of the methods are reported as part of the presentation of results generated from each method. The choice of documentary analysis helped to examine project organization structures; and the semi-structured interviews helped to capture a detailed narrative knowledge about the whole capital projects programme.

DATA COLLECTION AND RESULTS

The first stage of the data collection involved an examination of information in published documents about the Wits Capital Projects programme (see Table 1). The second stage involved semi-structured interviews with five people involved in the programme delivery and examination of project-related documents. Each interview lasted for a minimum of two hours and notes were written as respondents supplied the relevant information.

Results from Documentary Analyses

The published documents identified and examined are summarized in Table 1. The documents in Table 1 provided much information about the capital projects programme and its governance structures. The Campus Development and Planning division coordinates project development, ensuring consultation between the design team and relevant University clients throughout the project delivery cycle. Their responsibility also includes the development and implementation of project management, contracting and delivery management strategies.

Table 2 summarizes the portfolio of projects and the mixture of procurement and contract strategies in delivering projects including design allocations, type of standard form contract, procurement procedure, targeting strategies and if a package order or not.

Table 2: Summary of procurement and contract strategies

Project Name	Control budget (Project amount approved for expenditure) (Rand)	Design allocations (Responsibility for design)	Contract and pricing strategy	Procurement procedure (selection method)	Targeting strategies [Preferences for B-BBEE (a), contract participation goals (b), bursaries for students (c)]
Aletta Sutton Refurbishment	2,200,000	DBE	JBCC	Closed tender	a
Astro Hockey Fields at Wits Education Campus	8,277,793	D and C	ECSC	Open tender	a
Bohlaleng Classroom Extension	3,529,522	DBE(e)	ECC-C	Call off –F2	a, b, c
Campus Centre Extension	17,661,490	DBE(e)	ECC-C	Call off –F2	a, b, c
Campus WayFinding and Signage: West Campus	2,200,000	D and S	SC	Open tender	a
Chamber of Mines 4th Quad	68,400,000	DBE	ECC-C	Qualified procedure for FA + 1 st order	a, b, c
Chamber of Mines Refurbishment	56,303,195	DBE(e)	ECC-C	Call off – F1	a, b, c
Chamber of Mines: Mine Design Tunnel	2,362,000	DBE(e)	ECC-C	Call off – F1	a, b, c
FNB Building: Large class room holdings	80,131,220	DBE	JBCC	Open tender	a
FNB Roof Upgrade	1,500,000	DBE	JBCC	Open tender	a
Generators Installation (standalone and campus generators)	65,880,629	DBE	ECC-B	Open tender	a
Health Sciences Teaching and Support Centre (29 Princess of Wales Bldg.)	1,140,000	DBE(e)	ECC-C	Call off – F2	a, b, c
Institute of Human Evolution (Van Riet Louw Building)	15,176,751	DBE(e)	ECC-C	Call off – F1	a, b, c
John Moffat: New Building; (Relocate School of CEM)	25,000,000	DBE(e)	ECC-C	Call off –F1	a, b, c
Lesideng Lecture Theatre	32,574,147	DBE(e)	ECC-C	Call off –F3	a, b, c
Milpark Stadium Flood Lights	3,460,000	DBE	JBCC MWA	Open tender	
Modernisation of teaching venues	4,569,901				
New Health Science Building: Furniture	5,150,000	DBE	SSC	Open tender	a

New Health Sciences Building (School of Public Health)	125,000,000	DBE	ECC-C	Qualified procedure for FA + 1 st order	a, b, c
Physics Building Phase 1 - New Mezzanine Floor Addition	3,500,000	DBE	ECSC	Closed tender	a
Radmaste (Relocation to WEC)	4,000,000	DBE	JBCC	Open tenders	a
Refurbishment of Humphrey Raikes (Chemistry)	10,800,000	DBE(e)	NEC-C	Call off –F3	a, b, c
Refurbishment of Oppenheimer Life Science Building + Insectary	5,400,000	DBE(e)	ECC-C	Call off – F3	a, b, c
Relocation: School of Journalism and Media Studies	3,900,000	DBE	JBCC	Closed tender	a
Research Equipment	8,000,000	D and S	negotiated	Sole source	
Richard Ward Modernisation Project (Chemical and Metallurgical Engineering)	14,400,400	DBE(e)	ECC-C	Call off –F3	a, b, c
Senate Room Refurbishment	9,733,104	DBE(e)	ECC-C	Call off –F1	a, b, c
Sunnyside South Extension	26,896,000	DBE(e)	ECC-C(e)	Call off – F1	a, b, c
Swimming Pool Heating System	1,200,000	DBE	SSC	Open tender	a
Undergrad Life and Physical Sciences - Mathematical Sciences Building	78,000,000	DBE	ECC-C	Qualified procedure for FA + 1 st order	a, b, c
Undergraduate Science Centre	179,259,044	DBE(e)	ECC-C	Call off – F1	a, b, c
University Corner 5th Floor Refurbish	4,150,000	DBE	ECSC	Closed tender	a
Upgrading and Repairs of Roads and Parking Areas around campus	6,500,000	DBE	ECSC	Call offs – F4 established it to open tender	a
USC Lecture Venues AV Enhancement	2,200,000	Supply	SCC	Quotations	-
USC North-South Pedestrian Walkway	3,850,000	DBE(e)	ECC-C	Call off – F1	a, b, c
Voice of Wits/Wits Radio Academy	4,000,000	DBE	JBCC	Closed	a
WEC Khanya Block Refurbishment Relocation of OT	8,000,000	DBE	JBCC	Open tender	a
WEC Marang Block – Open Student Computer	2,500,000				
West Campus Stormwater Upgrade	7,771,561	DBE(e)	ECC-C	Call off – F1	a, b, c
Wits Art Museum Phase 1	39,500,000	DBE(e)	ECC-C	Call off – F1	a, b, c
WAM Fit, Equipment and Move	3,000,000				
Wits Club Refurbishment	3,950,000	DBE	JBCC	Tender	a
Wits Junction Parkade Structure	22,000,000	DC	NEC-A	Negotiated	-
Wits Junction Student Residence	443,960,033	DC	ECC-A	Negotiated	-
Wits Professional Development Hub	96,000,000	DBE	JBCC PBA	Open tender	a
TOTAL	1,548,086,791				

Notes:

F1 = first framework contract

F2 = second framework contract

F3 = third framework contract

F4 = fourth framework contract

FA= framework agreement

ECC = NEC3 Engineering and Construction contract

ECC-A = Main Option A (Priced contract with activity schedule)

ECC-B = Main Option B (Priced contract with bill of quantities)

ECC-C = Main Option C (Target contract with activity schedule)

SC = NEC3 Supply contract

SCC = NEC3 Short Supply Contract

ECSC = NEC3 Engineering and Construction Short Contract

JBCC = Joint Building Contracts Committee (local form of contract which makes use of a bill of quantities)

Quotation threshold = R 1 000 000 including VAT

Sources of funding: The funding sources are the Department of Higher Education and Training (DHET) (40%) and Wits (60%). About 30% of the Wits contribution came from donations by individuals and organisations.

Design allocations (Responsibility for design): DBE – Works designed by the employer (Employer’s design consultants prepare design which is built by a contractor) – DBE(e) – Works designed by the employer with early contractor involvement. D and C – Design and construct (Contract in which a contractor designs a project based on a brief provided by the client and constructs it). DC – Develop and construct (Contract based on a scheme design prepared by the client under which a contractor produces drawings and constructs it). D and S = design and supply

Contracting and pricing strategies: The contracting strategies is mostly based on NEC3 contracts (35 out of the 45 projects summarized in Table 2). 19 of the projects are based on NEC3 ECC-Main Option C which is target cost with activity schedule. 10 of the projects were based on JBCC contracts.

Selection method (Procurement procedures): A mixture of procurement procedures were used for supplier (contractor) selection (Table 2 shows eight different methods of selection)

Responsibility for management: Projects were managed by client’s in-house team of project managers appointed following a competitive tendering process.

Table 2 shows projects built using traditional approaches in the initial stage and then changing from this approach to a more collaborative and integrated approach based on framework agreements and target cost contracts. The European Union (EU) Public Sector Procurement Directive 2004/18/EC Article 32 defines a framework agreement as: “an agreement or other arrangement between one or more contracting authorities and one or more economic operators which establishes the terms under which the economic operator will enter into one or more contracts with a contracting authority in the period during which the framework agreement applies”. A framework agreement is defined in ISO 10845-1 as an agreement between an employer 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 enable the Employer to procure work on an as-instructed (call-off) basis over a set term without necessarily committing to any quantum of work (Watermeyer, 2012). A target cost contract is one in which the financial risks of a project are shared between the employer and contractor in agreed proportions (Watermeyer, 2009). This contracting strategy lies between cost reimbursable and fixed price contracts in terms of risk allocation between the parties.

The examination of information relating to the funding of projects indicates a total expenditure of around R1.5 billion between 2008 and 2013. The total portfolio of projects are

partly funded by the Department of Higher Education and Training (DHET) (approximately 40% of the total amount) and Wits (60% of the total amount). A significant proportion of Wits' contribution (approximately 30% of the university's contribution to the funding for projects) came from fundraising efforts (i.e. donations by individuals and organisations).

The data relating to design allocation for projects shows that 16 of them (35%) have early contractor involvement (ECI). This practice entails bringing the framework contractor on board at the end of the concept / preliminary design stage to work with the team in value engineering the work prior to the package order being given to proceed, and also during the works e.g. alternative proposals. The data relating to packaging strategies and procurement procedures shows that 21 of the projects (48%) are based on framework contracts. The additional data relating to contracting and pricing strategies, design allocations, methods of selection and targeting strategies are summarized in the Table 2 notes.

Results from Interviews

Five semi-structured interviews were conducted in September and October 2013. The interviews were designed to be semi-structured in nature so that a couple of specific questions could be explored in a flexible way that allowed respondents to also express the views they considered important from their perspective (Gill and Johnson, 2010).

Respondents were selected on the basis of their involvement in the procurement process and need for insights from different sides of the supply chain. This led to a selection of employer's representatives and framework contractors. The fact that data was collected from respondents across both sides of the supply chain allowed for a balanced analysis of results. The unit of analysis was the story of what has transpired since 2008 in relation to procurement strategy and project organization structures for the Wits capex programme.

The approach taken was to commence with a general commentary by respondents on the capex programme. This lasted for about 30 minutes in each case, which helped to obtain a broad perspective of the capex programme. This was then followed with specific questions about the packaging, contracting, pricing, targeting, tendering, and funding strategies.

The interviews were fully recorded, transcribed and analysed using content analysis. The general observations narrated by respondents were brought together to identify common themes and salient points. The responses to specific questions were analysed by comparing the content of the views expressed by each of the respondents for a qualitative interpretation. The interview findings from the employer's perspective are summarized in Fig. 1.

The findings from contractor's perspective is summarized as follows: "In this approach we are a team – employer, architect, engineer, contractor – we look at various options and come out with the right one". Eight points were specifically mentioned as procurement innovations.

First, "engaging the contractor at design stage. Unless people are doing turnkey contracts, I have never come across early contractor involvement in the design stage".

Second, "educating the whole design team on how the contract works. This provided understanding and eliminated a whole lot of areas we could have had conflict".

Third, "safety awareness. They were very emphatic on their safety issues. Normally you don't get the sense that the client is on your side to get health and safety right. They were quite happy in subsequent contracts for us to price health and safety right. Some clients won't accept it but Wits were very aware...".

Fourth, "when there was a problem, it was dealt with – safety, quality, financial. In some forms of contract, there is nothing to compel you. But in NEC compensation events you keep track of everything on a monthly basis and people don't like surprises."

Fifth, “framework packages – normally we get repeat work from clients. But you never have certainty of knowing you have three years of work which enables you to dedicate a team...the team know each other...you know what each other wants...and you have a shared understanding.”

Sixth, “you know you will be paid on time. Very important for a contractor. You can never run a construction company paying out before you are paid. The margins are too small.”

Seventh, “an absolute adherence to the projected cost. It is not something they have as a vague target. That is it. If something goes up, we have to find savings from elsewhere whereas with other contracts you go over sometimes.”

Eight, “this system works well if you have a good contractor. If you had this arrangement and had a bad contractor, what will happen? It is a relationship that requires confidence and trust. Wits has managed to get that out of all of us. But if you did not have the right contractor, you could have the same problems as you would have in a normal contract. With the right team, it is a good arrangement. So having the right team is key. Everyone has been interested in making it work and everybody has benefitted. It is rewarding for a contractor who performs because you will not have any work if you don't perform. If it works, it saves a huge amount of money”.

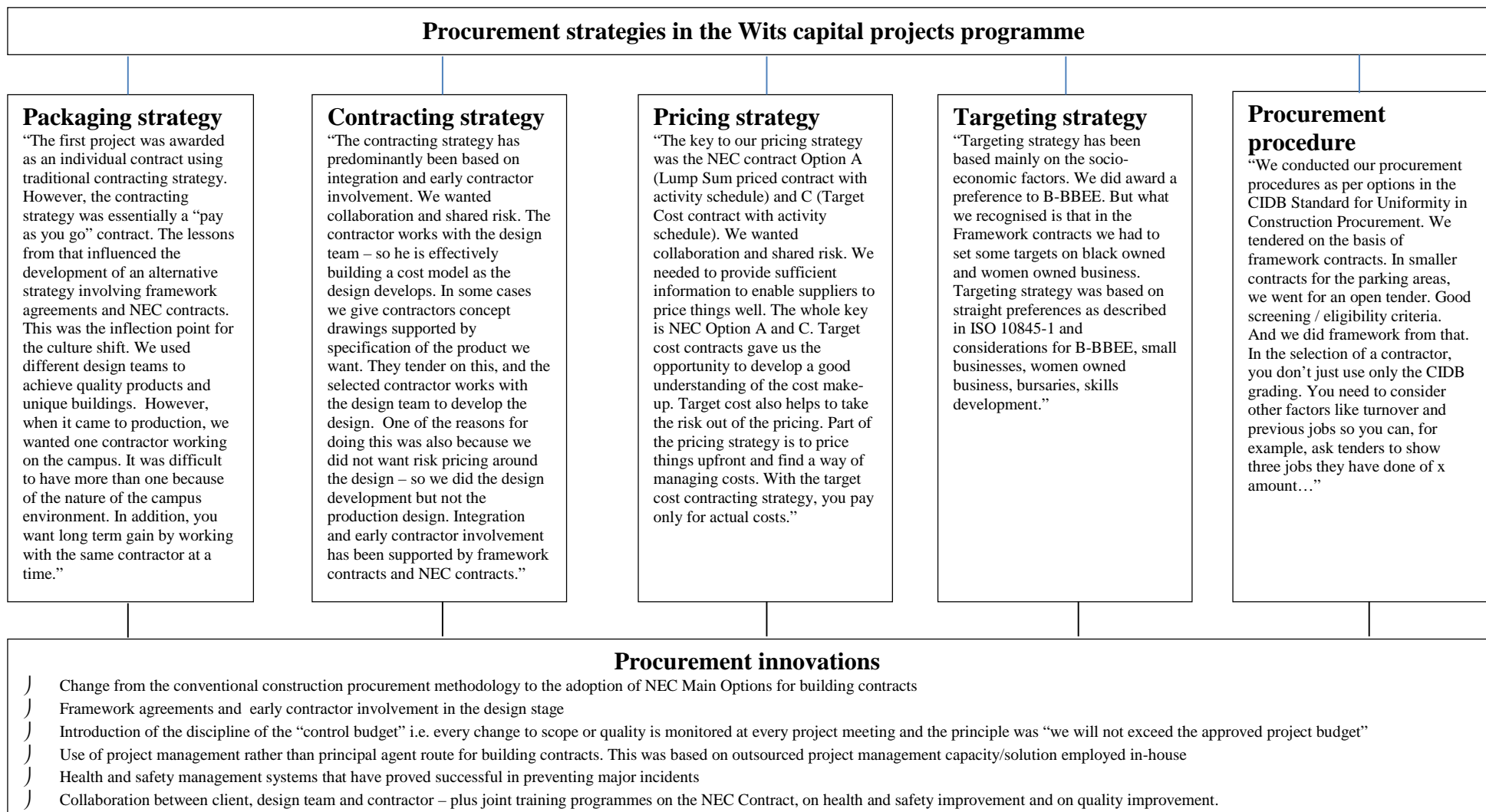


Figure 1: Summary of interview findings

DISCUSSION OF RESULTS

The discussion of results is structured into five sections that align with the five components of a construction procurement strategy outlined in ISO 10845: 2010 which are packaging, contracting, pricing and targeting strategies and procurement (selection) procedures. This is summarized in Figure 1

Packaging strategies

The first discussion point relates to packaging strategy. The packaging of works into contracts can be done by awarding individual /stand-alone contracts or package orders within a framework agreement (ISO 10845: 2010). The adversarial and “pay as you go” culture of traditional master-servant contracting involving remeasurable bills of quantities influenced the decision by Wits to adopt more collaborative and integrated procurement approaches. This led to the adoption of framework agreements, the adoption of the NEC3 family of contracts and the integration of design through either early contractor involvement or the allocation of design responsibilities to contractors (see Table 2).

One framework agreement was created for the works to be done on each campus including new build, maintenance, refurbishments or a combination of these. For architects, the contracts for design services were awarded to different firms. Different design teams were appointed for each project. The reason was to achieve quality products and unique buildings. However, when it came to production, it was thought that it will be advantageous to have one contractor, operating within the terms of a framework agreement, moving from one project to another provided they perform to the employer’s satisfaction. This aligns with the philosophy of collaboration and relational contracting as explained in Kwawu (2009).

To quote from an interview transcript: “you want long term gain by working with the same contractor at a time because you get value. We really went for a long term relationship with collaborative working. We had one framework contract for each campus. Subject to satisfactory performance, more work was given to the same framework contractor during the framework duration of three years. After some time we go back to the market and new contractors can enter into the framework”. The framework approach was also suitable to the busy and complex nature of the campus environment. It would have been practically difficult to have too many contractors working on a university campus at the same time.

Contracting strategies

Second, contracting strategy relates to nature of the relationship between the parties in a construction contract (ISO 10845: 2010 and OGC, 2007). Traditionally projects teams are fragmented and design is separated from construction (Murdoch and Hughes, 2008). The approaches that developed in the UK following Egan (1994) and Latham (1998) are meant to address such problems and foster collaborative working practices and integration in the production process for construction projects.

As demonstrated in Table 2, the contracting approach adopted by Wits was based primarily on integration, early contractor involvement (ECI) and target cost contracts which is an incentive contract (see Badenfelt, 2008). To quote from one interview transcript: “We wanted collaboration and shared risk. We were aware that the structure of traditional forms of contract and procurement contributes to antagonism and antagonistic relationships. Because of the procurement practices, ours is a very claims driven industry and budget overruns are the norm. A determination was made to change that norm. Because collaborative working

practices had been tried and tested in the UK, there was an opportunity here to adopt innovative procurement models, that is, something that is different from the conventional way of doing things. Not just different, but it has to address the problems experienced with known procurement models that tend to create an adversarial relationship. The determination was to address that problem by working together to find solutions so that it is a win-win situation”.

Through framework contracts, an opportunity was created to have early contractor involvement . The way this worked was that concept designs are prepared, and then contractor is brought in to assist with the design development and production drawings. The contractor works with the design team – so he is effectively building a cost model as the design develops. This is similar to practices in many European countries where the contractor finishes off the design. Integration and early contractor involvement has been supported by framework agreements and NEC contracts.

Another important feature of the contracting strategy was the decision to employ project managers (PM) rather than principal agents (PA). The need was to employ people who could manage projects, and provide support relating to programme management, project management, cost control and management of health and safety. One reason for procurement failure is late information which makes it difficult for contractors to work effectively and once the contractor is late, the contract runs late (Laryea, 2009). One innovation adopted was an alteration of the traditional balance of power in project teams by appointing PMs instead of PAs. As projects were based on a target cost contract, there was a need to give more power to the contractor, so that they have what they need to deliver within the pain-share/gain-share contracting strategy. This was particularly important in a case where the project consultants carry no pain for overruns in terms of their remuneration.

Pricing strategies

Third, the pricing strategy was based mostly on NEC Option A (lump sum priced contract with activity schedule) and NEC Option C (target cost contract with activity schedule) (see Table 2). The employer wanted collaboration and shared risk so in a sense, every decision carried financial consequences for either of the parties. 19 of the projects are based on NEC3 ECC-Main Option C which is target cost with activity schedule.

According to Brook (2008) “An activity schedule is a list of the activities which the Contractor expects to carry out in completing his obligations under the contract. When it has been priced by the Contractor, the sum for each activity or each group of activities is the price to be paid by the Employer for that activity or group. The total of all the activities and groups is the Contractor's price for providing the whole of the works.” The Engineering and Construction Contract uses an activity schedule in Option A and Option C. The contractor explained that: “We do activity schedules in detail. An activity schedule links costs with the programme. it spreads the cost in discrete packages and gives everybody a better picture of how the job is progressing when we move to the site.” The fact that the NEC contract provides an option for such detailed linkage of programme with costs seems a more useful approach than traditional bill of quantities that fail to link costs with programme and quantities with position of the materials.

Respondents agreed that target cost contracts gave an opportunity to develop a good understanding of the cost build-up. From an employer's perspective, target cost contracts also helped to minimize risk pricing in bids. There was a determination to specify work clearly right from the outset, price it as detailed as possible, and then find a way of controlling the cost. With a target cost contracting strategy, the client only pays for actual costs incurred (Watermeyer, 2009). Therefore, there are no issues of automatic expenses arising from time-

related preliminaries and general items (such as is the case when it comes to the JBCC form of contract) which incentivises contractors to claim for extensions of time.

Targeting strategies

The fourth discussion point relates to targeting strategy. Targeting strategies relate to the promotion of socio-economic factors (ISO 10845). Preferences were awarded in the tender evaluation for Broad-Based Black Economic Empowerment (B-BBEE) ratings, black owned and women owned business, small business, bursaries and skills development initiatives (see Table 2). Details of the B-BBEE requirements can be found in The Broad-Based Black Economic Empowerment Act (53/2003) of South Africa). There is also an explanation in ISO 10845:2010 on the straight preferences approach used as well as contract participation goals. Some of the targeting strategies used by Wits are similar to the ones reported by Alli *et al.* (2012) on innovations in the procurement of civil works for the Gauteng freeway improvement project, which enabled the involvement of firms owned by black South Africans and prevented the consolidation of large firms into joint ventures.

Procurement procedures

The fifth discussion point relates to procurement procedures. Table 2 shows the range of selection methods used for soliciting tender offers. These include open tender, closed tender, call-offs, negotiated tenders, and qualified procedure. Wits has also used the “Restricted Competitive Negotiations” which is defined in CIDB (2010) and ISO 10845 (2010) as: “A call for expressions of interest is advertised and thereafter only those tenderers who have expressed interest, satisfy objective criteria and who are selected to submit tender offers, are invited to do so. The employer evaluates the offers and determines who may enter into competitive negotiations.” For the first framework contract, expressions of interest were used in some cases. Open tenders have also been used recently for smaller projects such as car parks. So there has been a balanced use of options.

To quote from an interview transcript: “The selection procedure depend on the project and what you are procuring. There is no one size fits all approach. You procure generators differently from a Faculty building. You have to know what you want. Then the next question is how are you going to move from specifying that to delivery? What is the kind of contractor that can get you there?” Clearly, an important objective in selection procedures is to ensure good screening and eligibility criteria that enables the recruitment of capable contractors. That require just more than a contractor grading. Criteria such as turnover and previous work done should be examined.

CONCLUSIONS

The research aim was to gain a better understanding of the procurement innovations and project organization techniques adopted to deliver a programme of projects successfully at Wits University. Through a series of interviews with members of the project teams and documentary analysis, a series of findings have been generated to develop a better understanding of innovative aspect of the Wits construction procurement strategy.

The primary innovations relate to the establishment of a capital projects office and an effective delivery management team and systems of reporting; development of effective policies and systems to deliver value for money in the form of fit for purpose and quality buildings and infrastructure within time and budget; use of project management rather than principal agent route for building contracts; educating the project team and others in the supply chains on how the contracting approach works; building of sustainable partnerships with framework contractors; health and safety management systems that have proved

successful in preventing major incidents; and disciplined cost control. These procurement innovations and project organization techniques were enabled by factors such as client leadership and expertise including the outsourced project management capacity/solution employed in-house, philosophy of collaboration, integration of project teams, early contractor involvement, framework agreements and NEC contracts.

The main project organization techniques include the integration of project teams and use of target cost contracting which encourages collaboration and an open book approach between the contractor and employer proved beneficial. A target cost contract alters the balance of power in project teams in a way that is different from the traditional approach where the architect controls the project and the contractor is in a master-servant relationship. To some extent, the target cost contracts created the power for contractors to demand what was needed; and act proactively within the pain-share/gain-share contracting arrangement. In future, it may be beneficial to extend the philosophy of shared risk to the appointment of consultants as this can help to fully integrate the interests and motivation of the project team, and create an incentive for consultants to also fulfil their duties collaboratively.

The procurement strategy adopted by Wits has been different from conventional approaches in South Africa where building contracts are not typically procured using such strategies. The success of the capex programme and the innovations in procurement practice seems set to diffuse into the wider construction industry in South Africa. Client organisations intending to adopt procurement innovations that deliver value for money will require a team to provide the leadership and expertise, adaptation to a procurement culture change, and a paradigm shift away from traditional procurement cultures and methodologies that tend to be adversarial rather than collaborative; principal agent-led rather than project management-led; and fragmented rather than integration of project teams and construction supply chains.

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Discussion: Innovative construction procurement at Wits University

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Contribution by Richard Patterson

The contributor congratulates the authors (Laryea and Watermeyer, 2014) on a fine piece of research and very clear explanation of what was clearly a successful programme of procurement, innovative against the background of what was 'normal' in the market in South Africa. The paper shows clearly how the use of NEC can support a range of procurement strategies when properly managed.

The strategy of using (for some) a new form of contract (NEC) AND using the target cost option AND using 'early contractor involvement' represents three bold steps, similar to those of the UK's Highways Agency some time ago. Could the authors please explain a little of the following

How was the 'early contractor involvement' stage managed? (e.g. Was the contractor paid for this and if so using what contract? Was it NEC Professional Services Contract or a two-stage Engineering and Construction Contract (ECC)?)

How was the development of the target cost controlled in the 'early involvement' stage when the commercial incentive on the contractor is inevitably to push the target upwards?

If there were more space, it would have also been good to have seen some high-level indicators for the contracts – for example, outturn price compared with price at award.

On the off chance that someone is reading this having read the paper, the contributor warns about the unfortunate jump in Section 5.3. After a note in the first paragraph that 19 contracts used Option C, the immediately following quote is about activity schedules under the very different Option A (lump sum) form of the contract – in which, of course, the payment mechanism is very different. Of course, under Option C, there is a priced activity schedule to set, justify the target, but payment is based on the contractor's costs and not the prices in the activity schedule.

Authors' reply

To answer the contributor's questions, it is necessary to outline the procurement strategy that evolved as this project unfolded, to briefly present a case study to illustrate the approach and outcomes and to sketch out the culture change that took place.

The employer adopted a design by employer contracting strategy for a number of reasons. As a result, the contractor was required to undertake construction only on the basis of full designs issued by the employer.

The NEC3 ECC can be converted into a framework contract by simply introducing a Z clause modelled along the lines of secondary option X17 (task order) contained in the NEC3 Term Services Contract. The contract data that is entered into using an NEC3 ECC can then make references to package orders that are to be issued in terms of the aforementioned Z clause. Package orders can, in this manner, be issued through the standard NEC3 ECC during the term of the contract. Accordingly, the NEC3 ECC becomes a framework contract that sets out the generic terms, conditions and works information for the 'call offs' over the term while the package orders contain the package-specific data and information. The 'contract' for a work package is therefore the package order read together with the NEC3 ECC contract that is entered into. The contract that is entered into has no value in the absence of a package

order and does not commit the university to the issuing of any package orders beyond the first package order.

The total of the prices for a package order is based on a target price. For the first package order, the tendered target price is used. For the second and subsequent package orders, the target price is negotiated, based on the tendered pricing parameters and the extended pricing data gleaned from the tender process and the execution of the first package order.

Early contractor involvement is possible in the second and subsequent package orders and usually takes place once the concept or preliminary design has been completed. The contractor does not have to tender the target price as he will be awarded the package order if it provides value for money and he has performed satisfactorily on the previous order. The contractor is not paid for his participation in the design development process as he is using the interactions with the design team to develop his programme and activity schedule in the expectation of being issued a package order. He is not required to tender against his competitors in an open tender process where he has no assurance of being successful in the tender process. As a result, the costs of his early involvement with the design team are covered in his company overheads included in his tendered fee percentages.

The University of the Witwatersrand's Undergraduate Science Centre (UGSC) project involved the conversion of the western grandstand of the historic former agricultural showground of the Rand Easter Show on the West Campus into large teaching auditoria linked to a new three-storey laboratory building to accommodate approximately 3500 students at any one time. This project involved the construction of three laboratories (chemistry, physics and biology) with a total of 1100 bench spaces, all with supporting services, storage and preparation facilities; five large lecture venues accommodating 1570 students with capacity ranging from 250 to 450 seats and 20 tutorial rooms providing a total capacity for 830 students.

The cost estimates upon completion of the concept/preliminary design by the design team, inclusive of contingencies, cost escalation, professional fees and VAT was R204 million. The university, however, only had R178 million available for the project.

A framework contractor was assigned to work with the university's design team during the design development stage with a view to delivering the project within a control budget of R178 million. A cost model was developed between the cost consultants and the contractor following extensive value engineering which indicated that this was possible.

The UGSC had to be completed ahead of the start of the academic year. In order to fast-track the project to meet the academic programme, the contractor was instructed to proceed with construction of the reinforced concrete frame with a target price of R41 million. The target was increased when the production information became available. The project was completed on time for an amount of R179 million. The contractor and the employer both enjoyed a small share gain as the project came in just under the target price.

Clients are the drivers of change. Those responsible for delivering 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 in order to improve project outcomes. The decision taken to change over to an NEC contracting system was done so in order to stimulate a culture shift towards collaboration, efficiency and greater certainty. Table 3 sets out the culture change that accompanied the aforementioned approach to improve performance and deliver optimal outcomes within budget.

In section 5.3, the authors were merely highlighting the use of activity schedules, which is very different from the current practices in South Africa, which merely provide for lump-sum contracts and bills of quantities. The largest project on the campus was the Wits Junction Student Residence (R440 million), which accounted for approximately 30 per cent of the expenditure. This project was executed under a negotiated option A on a develop-and-construct basis.

Activity schedules are not used simply to 'justify the target' under option C. They are extremely useful tools for setting a target, reducing risk pricing when negotiating a target and managing changes to the target, particularly in fast-track construction. They also allow earned value (the value of the work

performed expressed in terms of the budget assigned to that work) and planned value (the authorised budget assigned to the scheduled work to be accomplished) to be monitored against the prices for work done to date (defined cost uplifted by the fee) under option C. This enables projects to be more tightly managed.

Table 3: Culture change introduced to improve project outcomes

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 cost consultant (quantity surveyor) only	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

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