

# Close out Report

of the New Universities Project Management Team on the

Development of New Universities in  
Mpumalanga and the Northern Cape

01 NOVEMBER 2011 - 31 JULY 2017



UNIVERSITY OF  
MPUMALANGA



SOL PLAATJE  
UNIVERSITY



WITS  
UNIVERSITY



higher education  
& training

Department:  
Higher Education and Training  
REPUBLIC OF SOUTH AFRICA

# Chapter 14

Review of expenditure and value for money



## **14. Review of Expenditure and Value for Money**

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This chapter provides a management review of project performance based on project records and the Programme Management Information System (PMIS) maintained by the New Universities Project Management Team (NUPMT). All PMIS values were extracted from the PMIS on 31 July 2017.

This management review spotlights expenditure recorded against the various programmes and endeavours to link expenditure to four identified phases of the development:

Phase 1 – Feasibility and Establishment (2012 – 2013)

Phase 2 – Mobilising for Construction (2014)

Phase 3 – Delivering Construction (2015)

Phase 4 – Handover and Close out (2016 – 17)

The **first phase** (2012 – 2013) focused on the establishment of the two universities. The records indicate expenditure for these two calendar years in the amount of R57.1m. This phase focused on preparation for the proclamation of both universities, which required that each university have an address, a name, an interim governing council, an academic vision and a set of institutional guidelines. The land had to be secured and the development feasibility established. All of this involved academic and spatial planning, feasibility studies and stakeholder consultation. This phase culminated in the launch of both universities in the last quarter of 2013, coinciding with the announcement of the architectural competition outcomes. Renovation work on existing buildings and the appointment of an interim head of each university enabled a start of the first academic year in 2014.

The **second phase** (2014) adopted a firm focus on mobilising for the construction of new buildings to start on site by October 2014 in order to complete in time for the third academic year in 2016. With this construction start, NUPMT records indicate expenditure of R271.6m during 2014. Architects commenced design work. Several rounds of procurement focused on the appointment of all the design professions, the project managers and, following a three-phase procurement process, the main building contractors (three contractors at Sol Plaatje University and two at University of Mpumalanga). All appointments were three-year framework contracts designed to enable handover of the contracts to the new universities.

The **third phase** (October 2014 – March 2016) focused on construction delivery and the completion of some 16 new buildings and associated infrastructure at both universities in time for the 2016 academic year. During this year of intensive construction delivery, NUPMT records indicate a total expenditure of R925m.

The **fourth phase** (March 2016 – July 2017) has focused on the handover of infrastructure responsibility to each university and a process to close out the project as defined in the Memorandum of Agreement (MOA) between Wits and the DHET, including back up support, settlement of final accounts and final reconciliation, archiving of records and this close out report.



## 14.1. OVERVIEW OF PROJECT DEVELOPMENT PHASES & EXPENDITURE

Table 14.1: Approximate development phases and expenditure per phase

<b>Phase 1: FEASIBILITY AND ESTABLISHMENT</b>			
<p><b>2012 – 13</b> <b>GETTING STARTED</b></p> <ul style="list-style-type: none"> <li>- Site selection &amp; land assembly</li> <li>- Record of intention securing the land</li> <li>- Academic &amp; institutional planning</li> <li>- Spatial Planning</li> <li>- Establishment of universities</li> <li>- Architectural Competitions</li> <li>- Implementation Plan</li> <li>- Procurement for renovation work</li> <li>- Renovations for 1<sup>st</sup> academic year</li> <li>Procurement of Furniture, Fittings and Equipment (FFE) for 2<sup>nd</sup> academic year</li> </ul>	<b>Phase 2: MOBILISING FOR CONSTRUCTION</b>		
<p><b>2014</b> <b>1<sup>ST</sup> ACADEMIC YEAR</b></p> <ul style="list-style-type: none"> <li>- Procurement of professional team</li> <li>- Procurement of project managers</li> <li>- Procurement of main contractors</li> <li>- Design development</li> <li>- Construction start in October to complete for 3<sup>rd</sup> academic year</li> <li>- Renovations for 2<sup>nd</sup> academic year</li> <li>Procurement of FFE for 2<sup>nd</sup> academic year</li> </ul>	<b>Phase 3: DELIVERING CONSTRUCTION</b>		<p><b>2015</b> <b>2<sup>ND</sup> ACADEMIC YEAR</b></p> <ul style="list-style-type: none"> <li>- Continue first phase build for start of 3<sup>rd</sup> academic year</li> <li>- Procurement of FFE for new buildings for 3<sup>rd</sup> academic year</li> <li>- Establish delivery management capacity at each university</li> <li>- Complete and furnish new buildings for start of 3<sup>rd</sup> academic year</li> </ul>
<b>Phase 4: HANDOVER AND CLOSE OUT</b>			
<p><b>2016 -2017</b> <b>3<sup>RD</sup> &amp; 4<sup>TH</sup> ACADEMIC YEARS</b></p> <ul style="list-style-type: none"> <li>- Finalise furnishing and handover of new buildings</li> <li>- Start of 3<sup>rd</sup> academic year in February 2016</li> <li>- Start 2<sup>nd</sup> phase build for 4<sup>th</sup> academic year (2017) managed by each university</li> <li>- Handover capacity and infrastructure responsibility</li> <li>- Finalise close out process</li> <li>- July 2017</li> </ul>	<p><b>No of Students</b></p> <p>UMP 169 SPU 127</p> <p><b>Expenditure</b> R 57 171 599</p>		
<p><b>No of Students</b></p> <p>UMP 169 SPU 127</p> <p><b>Expenditure</b> R 57 171 599</p>		<p><b>2016 -2017</b> <b>3<sup>RD</sup> &amp; 4<sup>TH</sup> ACADEMIC YEARS</b></p> <p>UMP 828 SPU 337</p> <p>R 925 341 707</p>	
<p><b>No of Students</b></p> <p>UMP 1255 (3<sup>rd</sup> academic yr) SPU 700 (3<sup>rd</sup> academic yr)</p> <p><b>Expenditure</b> R370 365 758</p>		<p><b>Total Expenditure: R 1 624 500 495</b></p>	

Table 14.1 provides an approximate representation of the main project phases, though these overlap in places and do not align exactly with the academic years as shown.

## 14.2. EXPENDITURE AGAINST MAIN COST CENTRES

Since inception of the project in 2012 until closeout in 2017, a total of R1,624 billion has been spent on the establishment of two new universities. All expenditure has taken place within the three main cost centres, namely

- a) HET P001 – Overall Programme Costs linked to both universities including the cost of the New Universities Project Management Team (NUPMT) responsible for overseeing the development of both universities
- b) HET M001 – Direct project costs linked to the establishment of the University of Mpumalanga (UMP)
- c) HET N001 – Direct project costs linked to the establishment of the Sol Plaatje University (SPU)

**Table 14.2: Expenditure against the three main cost centres (Source PMIS)**

Expenditure against three main cost centres	2012 Rand	2013 Rand	2014 Rand	2015 Rand	2016 Rand	2017 Rand	Total Rand
HETP001 - Overall Programme Costs	9 887 694	24 224 750	29 631 051	42 801 503	28 951 808	6 350 571	141 847 377
HETM001 - University of Mpumalanga	566 001	9 197 651	97 601 019	307 041 480	115 602 557	9 816 464	539 825 172
HETN001 - Sol Plaatje University	681 778	12 613 725	144 389 361	575 498 724	189 737 510	19 906 847	942 827 946
<b>Total</b>	<b>11 135 473</b>	<b>46 036 127</b>	<b>271 621 431</b>	<b>925 341 707</b>	<b>334 291 876</b>	<b>36 073 882</b>	<b>1 624 500 495</b>

**Note: All Rand values are VAT inclusive and are recorded per calendar/ academic year**

As evident from the calendar years referenced above, a modest expenditure of R 11,1 million was incurred on planning and feasibility work during 2012, rising to a maximum annual spend of R925 million (over R2,5m per day) during 2015 when detailed design and construction activities peaked at both universities.

In 2012 the Overall Programme Costs, which included start-up, client management and oversight costs of R9,88m, represented 88% of total cost and decreased to 4.6% of total cost in 2015 as construction reached highest intensity at both universities.

### 14.2.1 HETP001 – Overall Programme Costs

The main distinction in the classification of expenditure between the project codes of HETP001 Overall Programme Costs and the direct costs linked to either HETM001 University of Mpumalanga (UMP) or HETN001 Sol Plaatje University (SPU) is that the expenditure against HETP001 has been incurred on behalf of both the universities from a planning, co-ordination and delivery management perspective. This category of expenditure was the first to be initiated at the outset of the project and covered a range of general costs, particularly the delivery management team, formally established as the New Universities

Project Management Team (NUPMT) in the Memorandum of Agreement (MOA) between the Department of Higher Education and Training (DHET) and the University of the Witwatersrand (Wits).

### 14.3. OVERVIEW OF EXPENDITURE AGAINST HETP001 - PROGRAMME COSTS

The overall expenditure against programme costs is indicated in Table 14.3

**Table 14.3 Expenditure against overall programme costs (Source PMIS)**

	2012 Rand	2013 Rand	2014 Rand	2015 Rand	2016 Rand	2017 Rand	Total Rand
Academic planning	704 204	1 932 363	369 727		11 550		3 017 845
Feasibility	293 152	824 126	206 116		2 784		1 326 178
General Office & Management Fee	195 584	959 071	6 543 214	20 753 181	18 090 410	2 642 104	49 183 564
Infrastructure planning	160 307	3 338 694	4 309 071	1 348 460	378 317		9 534 850
Institutional planning	1 796 130	1 665 607	2 325 554	2 870 930	746 009	128 403	9 532 634
Delivery Management	6 738 317	15 504 888	15 877 368	17 828 932	9 722 737	3 580 065	69 252 307
<b>Total</b>	<b>9 887 694</b>	<b>24 224 750</b>	<b>29 631 051</b>	<b>42 801 503</b>	<b>28 951 808</b>	<b>6 350 571</b>	<b>141 847 377</b>

**Note: All Rand values are VAT inclusive and are recorded per calendar/ academic year**

#### 14.3.1 Delivery Management

The biggest cost item in this category has been the cost of the delivery management team whose role was to initiate, plan and oversee the development of the two new universities, which included the resources comprising the client delivery manager and client team consisting of a project manager, project assistant and administrative staff, professional team of architect/ urban planner, architect, civil engineer, procurement specialist, information and communication technology (ICT) and furniture, fitment and equipment (FF&E) professionals, management accountant, development professional as well as all travel related costs to the delivery team. This outsourced team, established by Wits University, has constituted the client's planning and delivery management arm and, during the peak infrastructure delivery period of 2014, 2015 and 2016, has cost approximately 4.5 – 5% of total expenditure (see Table 14.4). This 'delivery management' cost excludes the Wits University management and support functions.

**14.3.2 Academic Planning and Institutional Planning:** The NUPMT initially comprised a range of planning and delivery management skills from the built environment disciplines. However, the team was soon expanded to include specialist service providers to address the academic and institutional planning necessary to establish the two new universities.

**14.3.3 Feasibility** studies included socio economic assessments, environmental assessments, spatial planning, costing and database information systems.

**14.3.4 The General Office & Management Fee:** The General Office portion consisted of all General office expenditure including cleaning, catering, stationery, venue hire, document storage, auditing activities, printing, telephone costs and insurance. The Management Fee portion of this expenditure has amounted to R39,6 million (2.5% of total expenditure, VAT inclusive) paid to the University of the Witwatersrand as per the MOA to cover the cost of the university's internal resources and facilities to support the project, risk, etc.

**14.3.5 Infrastructure planning:** This category is mainly linked to the early spatial planning, in particular the architectural competition, ICT consulting, cost consulting and town planning.

**14.3.6 Delivery Management Costs as a percentage of total spend**

Table 14.4 provides a breakdown of delivery management costs.

**Table 14.4 Delivery management costs as a percentage of spend (Source PMIS)**

	2012 Rand	2013 Rand	2014 Rand	2015 Rand	2016 Rand	2017 Rand
<b>Total expenditure</b>	11 135 473	46 036 127	271 621 431	925 341 707	334 291 876	36 073 882
<b>* Total Delivery management expenditure</b>	6 738 317	15 504 888	24 516 679	28 171 172	18 108 684	3 580 065
<b>Total expenditure less Delivery management expenditure</b>	4 397 156	29 627 081	247 104 752	897 170 535	316 183 192	32 493 817
<b>Delivery management expenditure as % of project spend</b>	153.00%	52.33%	9.92%	3.14%	5.72%	11.01%
<b>Average delivery management % for main infrastructure years</b>			<b>4.84%</b>	<b>4.84%</b>	<b>4.84%</b>	

**Note: All Rand values are VAT inclusive and are recorded per calendar/ academic year**

Analysis of annual expenditure shows that during the three active years of construction (mobilisation and commencement in 2014, delivery in 2015 and completion in 2016) the Overall Programme Cost, namely the client's delivery management costs, average out at just 4.84% per annum. This percentage excludes project management and design team fees, which form part of the construction costs described in section 14.9. The total delivery management expenditure for 2014 - 2016 was increased with a portion of the SPU and UMP project manager's fees incurred for future phases of each university not under the control of Wits but necessary for forward planning.

#### 14.4. EXPENDITURE AGAINST UNIVERSITY OF MPUMALANGA

Table 14.5 provides a breakdown of expenditure incurred for the University of Mpumalanga

**Table 14.5: Expenditure against HET M001 – University of Mpumalanga (Source PMIS)**

	2012 Rand	2013 Rand	2014 Rand	2015 Rand	2016 Rand	2017 Rand	Total Rand
Academic planning		617 812	299 045				916 856
DHET infrastructure book			284 887				284 887
Feasibility	566 001	1 296 875	232 414				2 095 289
General office & Management Fee		37 400	458 820	90 141	92 441		678 802
Infrastructure provision		4 436 291	65 359 317	283 260 779	97 851 886	8 882 767	459 791 040
Institutional planning		2 744 235	1 203 105		3 197		3 950 536
Movable (FF&E)		65 040	23 414 606	12 961 381	16 348 296	758 642	53 547 965
Project management services			6 348 826	10 729 178	1 306 737	175 056	18 559 797
<b>Total</b>	<b>566 001</b>	<b>9 197 651</b>	<b>97 601 019</b>	<b>307 041 480</b>	<b>115 602 557</b>	<b>9 816 464</b>	<b>539 825 172</b>

**Note: All Rand values are VAT inclusive and are recorded per calendar/ academic year**

Classifications of the direct costs linked to project HETM001 - University of Mpumalanga (UMP) in Table 14.5 indicate a total spend of R539,8 million over the project lifespan. The classifications are similar to those for Overall Programme Costs, except for the addition of two new categories, namely “Movable”, which includes, furniture, fittings and equipment, and “DHET infrastructure book”.

The University of Mpumalanga had a modest start in 2012 with limited expenditure on feasibility and the major infrastructure spend of R283 million during 2015 resulting in the annual peak expenditure of R307 million during the 2015 academic year. Expenditure on the Academic and Institutional categories was largely concluded in 2014 when these responsibilities were handed over to the newly established university. The category of “DHET infrastructure book” comprises expenditure to assist the Department of Higher Education and Training to publish a book titled “Woza sizokwakha” based on research done by the project architects on university buildings constructed in post-apartheid South Africa. The category, “General Office and Management Fee”, consisted mainly of insurance fees related to the infrastructure activities as well as the endorsement of the architectural competition.

The “Infrastructure provision” category consisted of renovations as well as new buildings, and includes the costs of consultant fees (town planning, geotechnical engineering, architects, traffic engineering, civil engineering, quantity surveyors, mechanical engineering, electrical engineering, security, acoustic engineering, environmental investigations and monitoring, landscaping, interior design, wet services, structural engineering, fire engineering, health and safety and land surveying) as well as the actual construction costs.

The “Movables” category consisted of Furniture Fittings and Equipment, ICT, Laundry, Audio Visual Equipment. The category for project management services included project and



contract management services incorporating project integration, project reporting and documentation control activities as well as travel expenses. This also includes project management services relating to the forward planning and design processes for new projects.

#### 14.5. EXPENDITURE AGAINST SOL PLAATJE UNIVERSITY

Table 14.6 provides a breakdown of expenditure incurred for the Sol Plaatje University.

**Table 14.6: Expenditure against HETN001 – Sol Plaatje University (Source PMIS)**

	2012 Rand	2013 Rand	2014 Rand	2015 Rand	2016 Rand	2017 Rand	Total Rand
Academic planning		446 160	682 493		641		1 129 295
DHET infrastructure book			546 055		38 853		584 909
Feasibility	681 778	1 857 319	436 637	196 622	85 500		3 257 855
General office & Management Fee		34 200	881 414	108 249	329 177		1 353 040
Infrastructure provision		7 688 463	110 881 088	543 833 709	155 421 045	19 303 165	837 127 471
Institutional planning		2 544 155	270 751				2 814 906
Movable (FF&E)		43 429	27 127 168	13 882 981	31 244 318	527 330	72 825 226
Project management services			3 563 754	17 477 164	2 617 976	76 352	23 735 245
<b>Total</b>	<b>681 778</b>	<b>12 613 725</b>	<b>144 389 361</b>	<b>575 498 724</b>	<b>189 737 510</b>	<b>19 906 847</b>	<b>942 827 946</b>

**Note: All Rand values are VAT inclusive and are recorded per calendar/ academic year**

Classifications of the direct costs linked to project HETN001 – Sol Plaatje University (SPU) in Table 14.6 indicate a total spend of R942,83 million over the project lifespan. The classifications are similar to those for HETP001 - Overall Programme Costs, except for the addition of two new categories, namely “Movable”, which includes, furniture, fittings and equipment, and the “DHET infrastructure book” researched by the project architects and titled “Woza sizokwakhe” as described under 14.4 Expenditure against University of Mpumalanga.

Sol Plaatje University had a modest start in 2012 with limited expenditure on feasibility and the major infrastructure spend of R543 million during 2015 resulting in the annual peak expenditure of R575.4 million during the 2015 academic year. Expenditure on the Academic and Institutional categories was largely concluded in 2014 when these responsibilities were handed over to the newly established university.

The category “General Office and Management fee” consisted mainly of insurance fees related to the infrastructure activities as well as the endorsement of the architectural competition. The Infrastructure expenditure category consisted of renovations as well as new buildings and includes the costs of consultant fees (town planning, geotechnical engineering,

architects, traffic engineering, civil engineering, quantity surveyors, mechanical engineering, electrical engineering, security, acoustic engineering, environmental investigations and monitoring, landscaping, interior design, wet services, structural engineering, fire engineering, health and safety and land surveying) as well as the actual construction costs.

The “Movables” category consisted of Furniture Fittings and Equipment, ICT, Laundry, Audio Visual Equipment. The category for “Project management services” included project and contract management services incorporating project integration, project reporting and documentation control activities as well as travel expenses. This also includes project management services relating to the forward planning and design processes for new projects.

#### **14.6. THE CLIENT’S QUEST FOR PROJECT VALUE**

There are several definitions of project value. For the purpose of this review the following definition is both brief and apposite: *Project value is the outcome of client decision making to achieve an optimised balance of the project benefits, risks and costs.*

Underpinning the proposal to build new South African universities was the business case for expansion of university enrolments from 937 000 student in 2011 to about 1.6 billion by 2030 as set out in South Africa’s National Development Plan (see Chapter 2). Two of South Africa’s nine provinces, did not have a university and this determined their selection as hosts for the first new universities in South Africa’s democratic era.

In the fast track planning and delivery of the two new universities, the client’s value proposition was shaped through a process of progressive elaboration from the outset in 2012 through to final handover of responsibility on 31 March 2016. The client value proposition was continuously explored at Technical Integration Committee meetings that brought together the client (DHET) and the client delivery management team (NUPMT). The value equation was further tested at quarterly Project Steering Committee meetings, which included significant stakeholders.

After the proclamation of the two universities in August 2013, the “client” role was expanded by including representatives of both universities on the governance structures of the project. This expanded understanding of the “client” was formalised in the 4<sup>th</sup> Addendum to the MOA between DHET and Wits that was signed in September 2014, and in a new MOA between DHET, Wits, UMP and SPU that was signed a month later (See Chapter 3 – Project Inception and Evolution).

One of the early manifestations of the client decision making process to achieve project value was the search for the best site for each university as described in Chapter 6. To avoid any challenge of bias, the recommended sites were carefully motivated in a report that set out key criteria for the hosting city and for the site itself. This report<sup>[14-1]</sup> enabled announcement of the selected sites by the President of South Africa in July 2012. Whilst not necessarily the decisive factor, the selected sites in both Mpumalanga and the Northern Cape were primarily on publicly owned land, significantly reducing the cost of the required land.

Coinciding with the President’s announcement of the selected sites was the publication of a vision<sup>[14-2]</sup> for both universities, also published in July 2012 and inviting public comment. This

vision was formulated in the Project Steering Committee and has inspired the unfolding conceptualisation of project value.

Aspects of the client value proposition and their realisation are set out in the sections that follow, and cover the competing priorities of time, cost and quality, together with the important secondary goals of broad-based black economic empowerment (B-BBEE), local (provincial) participation in the construction process and skills development.

## **14.7. VALUE AND THE PRESSURE OF TIME**

### **14.7.1 The challenge**

The required pace of enrolment and infrastructure delivery was a driving factor in the project's development (see Table 14.7). Following the proclamation of both universities in August 2013, the pressure was on to enrol the first cohort of students in February 2014 (see Table 14.8). In terms of the required infrastructure, this pressure necessitated an urgent programme of renovation together with expansion plans calling for the construction of new buildings by 2016.

### **14.7.2 Urgent renovations and infrastructure upgrading for February 2014**

At the University of Mpumalanga, the renovation focused on existing buildings of the former Lowveld College of Agriculture and some facilities at the Mpumalanga Regional Training Trust to enable a diploma in hospitality management.

At Sol Plaatje University, the challenge was greater. With regard to the required academic and administrative facilities, the renovation focused on existing government buildings, namely the former Provincial Legislature Building for academic and administrative purposes, plus the former William Pescod School for classrooms and laboratories. However there were no existing residence buildings and it was necessary to purchase a hotel (Diamond Lodge) and a nine-storey block of flats (Whiteways) after appropriate due diligence assessments to confirm that the prices were market related. These purchases enabled a programme of renovation for student residence accommodation.

**Table 14.7: Delivery Timeframes**

<b>Delivery timeframes – a driving priority</b>	
<b>Nov 2011</b>	DHET appointed Wits to establish New Universities Project Management Team
<b>Aug 2013</b>	Minister proclaimed the two universities in terms of the Higher Education Act
<b>Feb 2014</b>	Both Universities commenced their first academic year in renovated buildings
<b>Feb 2016</b>	16 new buildings delivered within budget, together with a range of renovated buildings , providing academic and residence space for the 2016 enrolment of 1255 students at UMP and 700 at SPU

**Table 14.8: Annual student enrolment**

University	Total student population per academic year		
	2014	2015	2016
<b>SPU</b>	127	337	700
<b>UMP</b>	169	828	1255

Between July and October 2013 at both SPU and UMP, the NUPMT invited tenders and contracted for the refurbishment, extension and alteration of existing buildings based on three-year framework contracts and using the NEC3 Engineering and Construction (F Management Contract). This cost-plus contract, enabled the immediate mobilisation of the successful contractor under the supervision of the NUPMT with costs monitored by the appointed cost consultant (QS). The same contract and management team was used to complete the required renovations for the 2015 and the 2016 academic year.

At SPU there was also an urgent need for the upgrading of infrastructure, including roads in Kimberley. The first priority was completion of the Central Campus square that was used for the launch of the university on 19 September 2013. Tendering took place between June and August culminating in a three-year framework contract using the NEC3 Engineering and Construction Short Contract (ECSC) based on a tendered price list.

These procurement methods enabled rapid gearing in order to complete the urgently required renovations and infrastructure works for the 2014 academic start and enabled the same contractors to be used over a three-year period.

#### **14.7.3 Construction services and new buildings for February 2016**

The 2016 enrolment required a range of new academic facilities including residences, large lecture venues, laboratories, offices, large-scale kitchens and dining rooms – all accommodated in a total of six projects (three at SPU and three at UMP) comprising over 16 new buildings. The imperative was to commence construction by September 2015 in order to complete buildings for occupation by late January 2016.

Following the commission of architects at the start of 2014 (four at UMP and five at SPU), the pressure was on to procure professional services in order to establish several design teams for each university, comprising project management, cost consulting, various engineering services, health and safety and environmental services and others.

The next critical priority was the procurement of construction services, two contractors at UMP and three at SPU. At UMP this involved rapid design development of a portion of Building L006, used to develop the necessary tender documentation. At SPU, the architects assigned to the three prioritised buildings were not in a position to fast track the design for tender purposes and one of the other architects produced fast-track, detailed designs of a fourth building that was used for tendering and the award of contracts – but would only be built at a much later stage in 2017. The procurement of construction services was undertaken between June and September of 2014 resulting in the appointment of two contractors at UMP and three at SPU. However, construction commenced only in October, a

month later than planned. This placed significant pressure on the planned completion dates (see Tables 14.12 and 14.13).

At UMP, the planned residence complex of L001 (six times four-storey buildings) and the laboratories and library complex of L006 - (six multi-storey buildings comprising laboratories, library and academic buildings) were completed just in time to enable the planned enrolment. Building L004 – a four storey office building started much later, and completion was not a critical factor as the building was not required at the start of the 2016 academic year.

At SPU, because of the delayed start and difficulties during construction, buildings C001 and C002 were accelerated to enable the planned enrolment. Only C001 - residence building was completed on time. Completion of building C002 – mixed use facility, was delayed by three months due to the structural design defect reported in Chapter 4, and full completion of C003 - academic building was marginally delayed. However, with the cooperation of the University leadership, it was possible to accommodate the enrolling students on time in partially completed buildings with great care taken to ensure their safety while outstanding facilities were finalised.

**Table 14.12: SPU planned and actual completion**

Work package	Starting date for order	Completion Date		Planned calendar days	Actual calendar days	Percent variance
		Planned	Actual			
C001- Residential Offices / Retail / Laundry	13 October 2014	15 January 2016	2 March 2016	460	508	+10.4%
C002 – Residential / Offices / Academic	13 October 2014	15 January 2016	5 July 2016	460	602	+30.9%
C003 – Classrooms / Study / Health Care / Auditoriums	13 October 2014	15 January 2016	8 April 2016	460	544	+18.3%
CX01 – Site infrastructure for C001, C002 and C003	27 April 2015	15 January 2016	20 May 2016	264	390	+47.8%

**Notes:**

- In order to enable the academic programme to commence at the beginning of 2016, work had to start before the designs and production information was complete. Assumptions had to be made regarding the amount of work not priced at the time that the Package Orders were issued. There was accordingly an uncertainty in the pricing of the three buildings of between 69 and 74% of the target price included in the Package Orders issued to contractors.
- The schedule for completion was always optimistic given that there were in several instances two December / January industry shut downs and a late start to construction following the procurement processes. Acceleration was paid for on building C002 to advance the Completion Date on the academic facilities. All academic teaching spaces were nevertheless capable of being used at the start of the term despite the Package Orders not achieving the original Completion Dates.
- The office spaces on Building C002 were completed late due to a design error arising from the failure to connect a beam in a stairwell to a column. This resulted in excessive deflection of a floor slab and damage to the staircases in the stairwell. Remedial works were required to jack up the floor slab, connect the beam to the column, demolish and rebuild a portion of the stairs and to install hangers to tie the floor slab that sagged to the floor above to reduce deflections – a delay of 2,5 months.
- No delay damages for late completion were applied as the Completion Dates were revised in accordance with the contracts and these revised dates were achieved.



An additional delay factor at SPU was the intense activity of three contractors on four concentrated projects including the site infrastructure (project CX01) servicing the three buildings. At peak intensity, this involved five cranes in close proximity so that none could complete a 360° rotation without encroaching on the other.

**Table 14.13: UMP planned and actual completion**

Work package	Starting date for order	Completion Date		Planned calendar days	Actual calendar days	Percent variance
		Planned	Actual			
L001 - Residential	1 November 2014	15 December 2015	5 February 2016	410	462	+13%
L004 - Auditorium	27 June 2014	18 February 2016	24 March 2016	237	272	+15%
L006 – Laboratories	27 October 2014	17 November 2015	2 February 2016	387	464	+20%
<b>Notes:</b>						
<ul style="list-style-type: none"> <li>In order to enable the academic programme to commence at the beginning of 2016, work had to start before the designs and production information was complete. Assumptions had to be made regarding the amount of work not priced at the time that the Package Orders were issued. There was accordingly uncertainty in the pricing of the three buildings of between 23 and 44% of the target price included in the Package Orders issued to contractors.</li> <li>The schedule for Completion was always optimistic given that there were in several instances two December / January industry shut downs and a late start to construction following the procurement processes. All academic teaching spaces were nevertheless capable of being used at the start of the term despite the Package Orders not achieving the original Completion Dates.</li> <li>No delay damages for late completion were applied as the Completion Dates were revised in accordance with the contracts and these revised dates were achieved.</li> </ul>						

## 14.8. VALUE AND QUALITY

### 14.8.1 General considerations

ISO 8402 – 1986 standard defines **quality** as “*the total of features and characteristics of a product or service that bears its ability to satisfy stated or implied needs*”.

In construction as in other areas of production, the term **quality** has a pragmatic interpretation captured in the term: “fitness for purpose”, which embraces a balance of features such as the architectural aesthetics and functionality, material and functional robustness, maintainability, user comfort, environmental sustainability and lifecycle costs, all of which are generally benchmarked against the cost of the built product.

### 14.8.2 Quality and the Architectural Design Competition

Despite the pressure to meet the tight construction timeframes described above, the client opted from the outset to hold a two-stage architectural design competition for each university (see Chapter 8). The competitions were geared at identification of the best architectural design capacity that South Africa had to offer – and to generate fresh design thinking on the concept of iconic, 21<sup>st</sup> century, African universities that enhance the democratic project. The DHET committed to the two architectural competitions in full appreciation of government’s role in promoting high calibre design of prominent public buildings.

The design competitions successfully attracted the attention of 111 and 179 architects for the University of Mpumalanga and the Sol Plaatje University respectively, from across the country, and key aspects of design quality were highlighted in the competition criteria for both competition stages (Chapter 8) including, inter alia, environmental responsiveness, design and construction methodology, memorable landmarks, sense of place, identity, dignity, architectural language, variety of use and form, efficiency and sustainability. These and other key principles of design quality, including the use of local materials where possible, were pursued and elaborated throughout the subsequent design development process (see Chapter 10).

The combined cost of the two competitions is set out in Table 14.14.

**Table 14.14: Combined cost of the architectural design competition for the two new universities**

<b>Approximate Cost of the Two-stage Architectural Competitions at SPU &amp; UMP</b>	<b>RANDS</b>
Competition Administration, including organisation	1 484 757
Endorsement of both competitions by the South African Institution of Architects	68 400
Costs including Honorariums for the two Jury panels (6 per jury)	389 549
Honorariums allocated to 10 finalists in each completion (R400 000 per competition) with 7 qualifying in Mpumalanga (R57000 each) and 8 qualifying in Northern Cape (R50 000 each)	799 000
<b>Total combined cost of both universities</b>	2 741 706
<b>Approximate competition cost per university</b>	1 370 852

The competition benefits far outweighed the cost. Because of the intensity of focus demanded of them during the three month competition period, the nine appointed architects, four at UMP and five at SPU, were able to move swiftly into the design process.

Led by prominent independent architects, the competition juries enabled participation of the client, including a representative from the DHET and one from the Interim Council of each university. The competition juries<sup>[14-3], [14-4]</sup> further included a representative appointed respectively by the Sol Plaatje and Mbombela municipalities. The value of this shared participation cannot be underestimated in terms of its role in forging a joint appreciation of the design priorities. The competition results were put on public display, further enabling the communities of the two provinces to appreciate the scale and potential of the impending developments.

### **14.8.3 Designing to a budget**

From the outset of the design process, the NUPMT advised the architects and the other design professionals that fundamental to the client's concept of "*superior quality*" was the principle of "*design efficiency*" in relation to construction cost. Several workshops were held to brief the design teams and contractors on the DHET space and cost norms for universities, against which the designs would be continuously benchmarked. The concept of design efficiency required continuous team reflection on the choices made in terms of space, structure, materials and environmental comfort, sustainability and a sensitive attention to artwork in the context of the local environment and history. The cost outcomes are elaborated in the next section.

### **14.8.4 Quality, Time and the Design Process**

The shaping of quality design was supported by joint briefing and work sessions with the architects to discuss the visioning frameworks, architectural guidelines and expected spatial qualities for each university. These sessions explored new approaches to higher education architecture, a joint visualisation of campus development and architectural integration as well as the collective selection of key materials supporting a university identity. Importantly, this collective approach subjected unfolding architectural design decisions to the appraisal of a collective of some of South Africa's best architects.

The acute time pressures highlighted in the previous section, placed unusual demands on the design process at both universities. For example, at UMP the award of framework contracts to two contractors for L001 Student Residence (six separate buildings) and L006 Science Laboratory Building (six separate buildings) was based on a tender detailing only one building of the L006 complex. At SPU the situation was even more severe and the award of framework contracts to three contractors for C001 Student Residence Building, C002 Mixed-use Building (residence, dining and offices) and C003 Academic Teaching Building was based on the fast tracked design and tender documents for a completely different building.

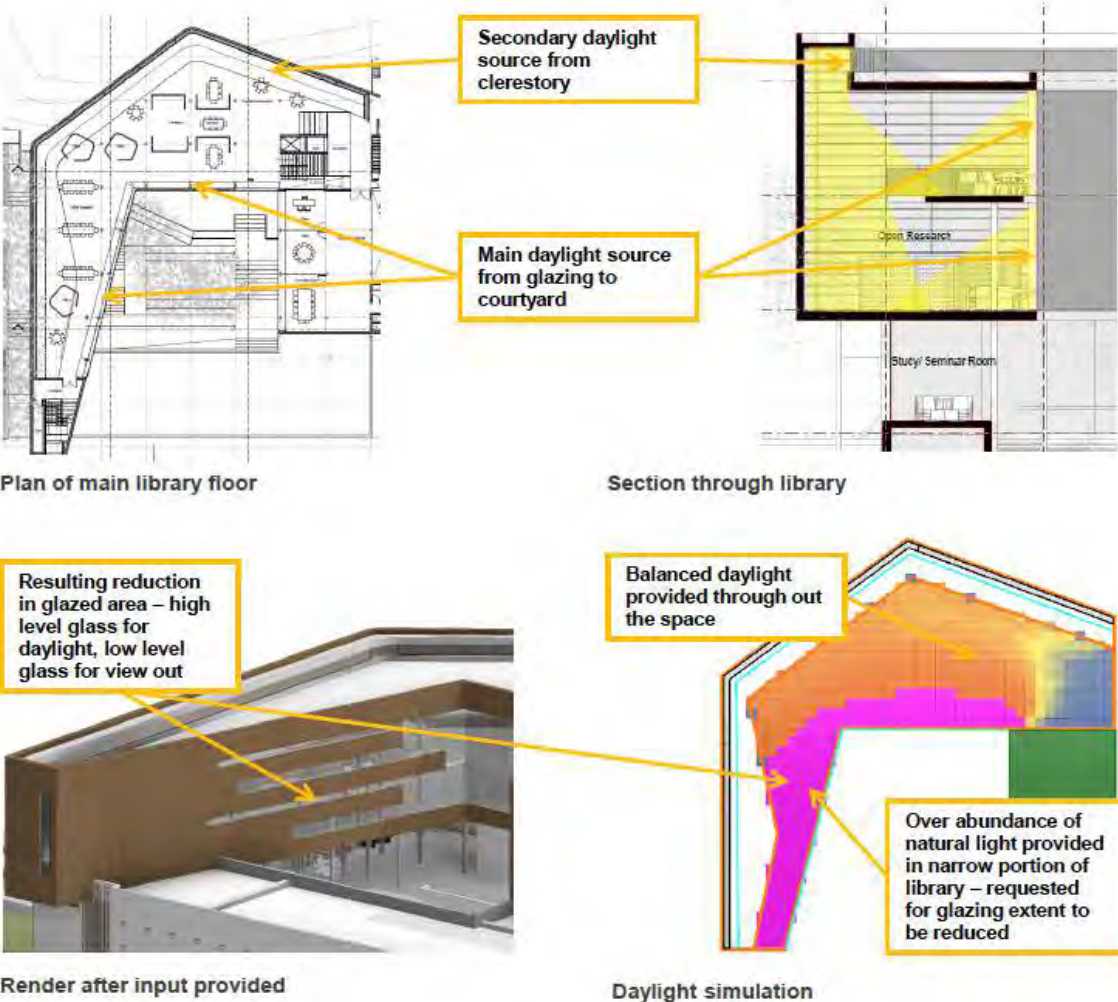
Such were the demands of time that the first Package Orders for these initial buildings were based on detailed designs for the concrete structure of the buildings and an elemental estimate for the completion of the buildings. This strategy allowed time for the designs to be completed before issuing a second package order detailing the rest of the work. While far from ideal, these delivery tactics enabled the design teams to keep pace with the programme and to ensure that quality was not compromised. The evolution of costs resulting from this approach is described in the next section.

### **14.8.5 Quality Design for Environmental Sustainability and Lifecycle Value**

At both universities, designing for environmental sustainability and lifecycle value has been integral to the design process aimed at attaining optimum investment benefit. The involvement of an environmental sustainability consultant has informed campus wide initiatives such as "green specifications" and extensive "metering and monitoring" of energy and water. Moreover, the design development of each building has been shaped by rigorous interaction between the consultant and the relevant architect and design team.

Sustainability approaches to building design are described in the summary reports for UMP<sup>[14-5]</sup> and SPU<sup>[14-6]</sup> and include a range of strategies appropriate in different circumstances. Inter alia, such design strategies include shading control, natural ventilation, mechanical ventilation systems, daylight and solar control, grey water harvesting, evaporative cooling and thermally activated building systems (TABS) for heating and cooling.

Environmentally sustainable design advice has yielded superior outcomes in relation to both quality and cost. However, Green Star accreditation was considered to be unnecessary and following discussions with the design team, the NUPMT advised against seeking accreditation in terms of the Green Star rating system managed by the Green Building Council of South Africa. After due deliberation the DHET concurred with the NUPMT's advice, which was based on the cost of the accreditation process, estimated by the design team at an additional 2.5% of construction cost, and the effort required of the project team that would almost certainly diminish its focus on the promotion of local participation and attainment of the challenging construction development targets that had been set.



**Fig 14.1: UMP Library, Building L003:- Daylight and Solar Control Input to the Design – Extract from UMP Environmental Design Performance Review by PJ Carew Consulting.**

#### **14.8.4 Commitment to essential quality**

At no time was the focus on quality diminished and two examples indicate how the client responded to different challenges during construction. Both examples occurred at SPU. The first challenge arose well into the construction process when the NUPMT realised that its general statement to the effect that all furniture would be purchased, had been interpreted by the architects to include student bedroom cupboards. Off-the-shelf bedroom cupboards would undoubtedly have provided inferior quality in terms of both functionality and durability. However, it was already late into the completion of the internal brickwork and there was concern for the cost and time impacts of a late decision to provide built-in cupboards.

The two affected contractors submitted quotations for appropriately designed cupboards and the client accepted the additional construction costs for 290 built-in cupboards in building C001 and 174 in building C002. The contractor for C002 was unable to guarantee completion on time if cupboard side walls were built in brickwork and the client accepted an alternative design using solid plywood, which enabled rapid erection after completion of the masonry work.

The second set of quality-related challenges at SPU resulted from the fast-track nature of the project. Although the buildings were constructed in accordance with the specifications of the design team, the time pressures described in the previous section led to the overlooking of some details. Many of these shortcomings were identified during construction but due to the potential time and cost impact of change, it was decided to complete the construction on time and to review the potential for subsequent enhancements after completion. The subsequent review led to the commissioning of a Building Enhancement Project that included improvements to projects C001, C002, C003 and CX01 that were undertaken by two of the three original contractors under the supervision of the architect for building C001.

The Enhancement Project included:

- Courtyard roof screens to provide shade protection and to keep out driving rain;
- Rooftop access way and waterproofing repairs; etc.
- Roof safety balustrades;
- Supply & installation of water filtration system to address quality of municipal water;
- Furnishings to the student laundry and direct access from Residence Building C001;
- Office sunscreen blinds;
- Installation of audible sirens linked to the security system and alarms to prevent abuse of the fire escape doors;
- Various landscaping improvements including planters, hand railings, stormwater gulley and tree rings.

The original scope and budget was submitted for approval to the TIC Contracts Meeting of 21 October 2016. The scope changed somewhat during implementation with savings made and additional priorities identified and added during implementation. However, the project finished within budget. Importantly, the budget of R10,36 million was funded from savings made on the original contracts. Enhancement works were completed by April 2017 within the control budget, which was derived from client savings on completion of the four contracts involved.



#### **14.8.6 Quality Recognition**

*Digest 21 of South African Architecture* (January 2017) carried a seventeen-page spread on the new universities development including the first buildings completed in 2016 (C001, C002 and C003 at SPU, and L001 and L006 at UMP). Other feature articles have appeared in *Detail Magazine*, Germany, *Earthworks Magazine* and *SA Architect*, South Africa.

The following awards have been attained:

##### **SPU C004 (Architects: Design Workshop SA)**

- Fulton Concrete Award for 'Architectural Concrete'

##### **SPU C002 Awards (Architects: Savage and Dodd)**

- SAIA Northern Cape Regional Award of Merit 2017
- World Architecture Festival, Berlin 2017 shortlisted in Higher Education & Research category and Best Use of Colour Category
- World Architecture Festival, Berlin 2017 - Highly Commended in Higher Education & Research Category

**In addition Building C002 was a Finalist** in the Southern African Institute of Steel Construction (Commercial Architectural Category) – wind driven louvres and bespoke multi-coloured vertical louvres

## 14.9. VALUE IN TERMS OF COST CONTROL AND COST OUTCOMES

### 14.9.1 Control Budgets

Total construction control budget allowances were established with the signing of the 4<sup>th</sup> Addendum to the MOA (see Chapter 3, section 3.5) and were adjusted with the signing of the 5<sup>th</sup> Addendum (see Table 4.4 - Final Control Budget summary) as follows:

- R804m - Sol Plaatje University
- R493,1m - University of Mpumalanga.

Building costs have been firmly benchmarked against the DHET's recognised cost norms for universities<sup>[14-7]</sup>. From the start of construction mobilisation at the beginning of 2014 and during subsequent construction, which commenced in October 2014, budget management became critical and was underpinned by overarching "*control budgets*" for SPU and UMP respectively. Simplified, rolled up examples of the overarching control budgets are illustrated in the next chapter (Chapter 15) as part of the five-year plans that were handed over to UMP and SPU in 2016 (see Fig 15.3 and Fig 15.4). These budgets incorporated the combined "*control budgets*" for every planned infrastructure-related project over several annual budget periods.

The New Engineering and Construction Contract (Option C: target contract with activity schedule) has supported early contractor involvement in the design process and a team ethos of completion within the control budget.

### 14.9.2 New Buildings – Cost Development

This section covers all costs associated with the new buildings and infrastructure required at the start of the 2016 academic year. The budgeted amounts (control budgets) included for

**DHET *Space and Cost Norms for buildings and other land improvements at Higher Education Institutions (2009)*** establishes the need norm, the area norm and the cost norm which are necessary for DHET to establish a budget allocation for higher education facilities. This publication describes and enables the following parameters to be evaluated:

- Full time equivalent student numbers (FTE) for a facility to be established. The FTE is a weighted number derived from student enrolments with the weightings based on the nature of curriculum programmes and qualifications. A FTE value is calculated by assigning to each course a fraction representing the weighting it has in the curriculum of a qualification, and by multiplying the headcount enrolment of that course by this fraction.
- The spaces for which assignable square metre (ASM) values are provided relate to:
  - classroom facilities, class / open laboratory facilities and office facilities associated with the Classification of Educational Subject Matter (CESM) categories;
  - research and academic support facilities;
  - student services;
  - institutional support;
  - operation and maintenance of plant; and
  - auxiliary enterprises.
- Building cost units (BCU) are representative of the all-inclusive estimate of building costs to provide one ASM building facilities space within a particular space use category. These costs include VAT, professional fees and all other costs directly attributable to the building project. Building costs units exclude roads, bridges, landscaping, open air parking areas, open-air recreational areas and utility distribution systems. However, a 13% allowance for the total cost units for new buildings is provided for the associated land improvement other than buildings
- The ASM multiplied by the FTE represents the area within the gross building area required for higher education purposes. It does not include all the spaces required to provide functional facilities. For example it does not include toilets, corridors, stairwells and the like.

new buildings, bulk and site infrastructure, ICT infrastructure, professional fees, and furniture, fittings and equipment.

All services, including professional services, were tendered to ensure best value.

All new buildings were completed within the control budget, which included a 5% contingency, an estimated escalation cost and the cost of professional fees. All buildings were completed within the DHET cost norms, except for one (at UMP), which derived unfortunate plan inefficiencies and founding costs from the nature of the site.<sup>[14-8]</sup> Rational tender processes yielded competitive pricing for professional fees, which on average were 14.41% at SPU and 15.81% at UMP (see Table 14.17).

The linking of the BCU to ASM rather than to the gross building area encourages efficient design, whereby the ASM multiplied by the FTE and divided by the gross building area represents the building's design efficiency. An efficiency of 70% is considered to be achievable and efficiencies of 70 to 75% were targeted in design.

The BCU was established in 1995 to be R3 065 on June 1995. This amount is adjusted from time to time using data provided by the Bureau for Economic Research and Medium Term Forecasting Associates to take into account inflation and to forecast future values.

Based on the estimated ASM costs and the estimated BCU, a control budget was established for each project and the design teams were required to design to that budget. Once the Target Cost was established for each construction project (in terms of the NEC ECC (Option C)), this amount together with associated professional fees, estimated escalation costs plus a 5% contingency, became the de facto control budget for each construction project.

At the outset, the cost of furniture, fittings and equipment was estimated at 8% of construction cost and formed part of the overall control budget.

The shifts in control budget at various stages in the delivery process are indicated in Table 14.15. All the buildings at Sol Plaatje University fell within the DHET cost norms while the construction of bulk on site infrastructure for the new buildings fell within the allowed 13% of the sum of the costs based on the DHET ASMs for the buildings. One of the buildings at the University of Mpumalanga which had an awkward footprint exceeded the cost norm.

**Table 14.15: Changes in control budgets as the work packages were developed**

Work package	Control budget (including VAT)		Final account (including VAT and professional fees) <sup>3</sup>	Cost based on DHET ASM of completed building including professional fees and VAT <sup>4</sup>
	Based on elemental cost analysis prior to contractor pricing the order <sup>1</sup>	Based on agreed target price at the time that the order was issued <sup>2</sup>		
<b>Sol Plaatje University (SPU)</b>				
C001	235 409 325	217 870 833	209 650 271	227 542 314
C002	248 472 064	243 958 078	232 145 660	245 227 872
C003	187 391 695	174 421 800	172 072 166	177 137 214
CX01	83 480 485	89 773 571	81 895 017	84 487 962 <sup>6</sup>
<b>Total</b>			<b>695 763 114</b>	<b>734 395 362</b>
<b>University of Mpumalanga (UMP)<sup>7</sup></b>				
L001	121 079 793	100 117 037	91 605 442	114 361 048
L004 <sup>5</sup>	47 224 073	47 621 235	47 070 781	31 797 058
L006	202 436 746	184 023 243	180 106 624	185 734 436
<b>Total</b>			<b>320 468 897</b>	<b>331 892 542</b>
<b>Notes</b>				
1 Includes estimate of construction based on limited information, a provision for price adjustment for inflation, a contingency of 5% and professional fees at 17% (UMP) and 19% (SPU).				
2 Includes construction cost, a provision for price adjustment for inflation, a contingency amount of 5%, and a professional fee estimate based on the tendered fees.				
3 Based on actual costs.				
4 Based on a BCU of R21 975.00 including VAT (2016) and ASM calculated from record drawings.				
5 Estimated costs exceeded the ASM value due to the awkward nature of the site, expensive foundations and the small footprint of the building with high wall to floor ratio.				
6 Value derived from 13% of the sum of the DHET ASM values for buildings C001, C002 and C003.				
7 The electrical, civil and bulk infrastructure control budget amounted to R87 482 995. The final account amounted to R76 692 025. This equates to 24% of the ASM costs for L001, L004 and L006. However, this infrastructure is able to service the next phase of buildings and will reduce as a percentage when all the buildings which are serviced are taken into account.				

Table 14:16 indicates the shifts in the costs from the initial agreed target price to the final cost to client. An allowance for price adjustment for inflation had to be made in the initial target price so that the increase in target price arising from compensation events (events for which the contractor is not at risk) can be compared to the final cost plus the Fee and the target price at Completion. Despite assumptions having been made regarding work not capable of being priced at the outset and despite significant changes in the Completion Dates, the small variance between the target price at the start and the final account reflects the tight control exercised in completing the outstanding design within the budget. It also reflects the collaborative culture achieved in the delivery process.

**Table 14:16: Shifts in the total of the prices in only the construction works contract**

Work package	Target price at the start	Target price at the start with allowance for inflation <sup>1</sup>	Final target price <sup>2</sup>	Price for Work Done to Date at Completion <sup>4</sup>	Client gain (+) / pain (-)	Cost to client
<b>Sol Plaatje University (SPU)</b>						
C001	178 336 429	184 703 040	184 543 260	181 652 357	+ 1 445 452	183 097 809
C002	191 776 818	198 623 250	208 263 636 <sup>3</sup>	198 036 334	+ 5 208 489	203 055 148
C003	140 366 859	145 377 956	149 129 474	154 303 411	-2 586 969	151 716 443
CX01	76 109 401	77 920 805	78 443 843	73 980 895	+ 2 297 733	75 405 110 <sup>5</sup>
<b>Totals</b>		<b>606 625 051</b>	<b>620 380 213</b>	<b>607 972 998</b>	<b>+ 6 364 705</b>	<b>613 274 510</b>
<b>University of Mpumalanga (UMP)</b>						
L001	79 392 515	82 171 599	79 802 745	78 685 387	+ 558 679	79 244 067
L004	38 749 003	40 234 912	38 945 512	42 768 205	-1 529 076	40 474 589
L006	152 222 456	158 570 132	156 082 984	155 720 087	+ 181 448	155 901 536
<b>Totals</b>		<b>280 976 643</b>	<b>274 831 241</b>	<b>277 173 679</b>	<b>-788 949</b>	<b>275 620 192</b>
<b>Notes</b>						
<sup>1</sup> The escalation allowances (estimates) were calculated using the MFA/BER indices.						
<sup>2</sup> Includes compensation events and price adjustment for inflation calculated in accordance with the provisions of the contract.						
<sup>3</sup> Includes R5,1m for compensation event associated with the failure by a structural engineer to connect a beam to a column in a stairwell and an acceleration cost of R2,1m.						
<sup>4</sup> Audited value for Defined Cost plus the Fee less Disallowed Costs						
<sup>5</sup> Includes a low performance damage deduction of R741 000 for failure to attain development targets						

Table 14.16 provides a breakdown of the direct costs associated with a construction works package. A breakdown of professional fees for the six buildings is shown in Table 14.17. These fees are significantly lower than the recommended tariffs published by the various built environment councils. This is due to the competitive tender process that was followed in procuring consulting services. A comparison of the professional fees for the three buildings for the Sol Plaatje University to that which would have been paid had the recommended tariff been used indicated a saving of just over 20%.



**Table 14:17: Direct costs professional fees and construction costs associated with each package**

Work package	Final account for the package (Rand)	Final construction cost to client	Final professional fees	Percentage of construction cost (%)
<b>Sol Plaatje University</b>				
C001	209 650 271	183 097 809	26 552 462	14.50
C002	232 145 660	203 055 148	29 090 512	14.31
C003	172 072 166	151 716 443	20 355 723	14.42
CX01	81 895 017	75 405 110	6 489 907	8.61
<b>University of Mpumalanga</b>				
L001	91 605 442	79 244 067	12 361 375	15.60
L004	47 070 781	40 474 589	6 596 192	16.30
L006	180 106 624	155 901 536	24 205 088	15.53

### 14.9.3 New Buildings Costs per Square Metre

Table 14.18 provides a breakdown of the rates per square metre based on gross building areas.

**Table 14.18: Rate per square metre based on gross building areas**

Work package	Final construction cost to client (including VAT)	Final construction cost to client (excluding VAT)	Gross building area	Rate per square metre (excluding VAT)
<b>Sol Plaatje University (SPU)</b>				
C001 (Student residence)	183 097 809	160 612 113	12 747	12 600
C002 (Multi-use - student residence: dining hall and kitchen, teaching venues, academic offices, and ground-floor retail space.)	203 055 148	178 118 546	13 532	13 163
C003 (Mixed-use: retail area, lecture halls, class rooms, academic meeting rooms, offices and gymnasium, sports centre, student SRC, Union and clubs)	151 716 443	133 084 599	9 624	13 828
<b>University of Mpumalanga (UMP)</b>				
L001 (Student residence)	79 244 067	69 512 339	6 153	11 297
L004 (Main auditorium and office block)	40 474 589	35 504 025	2 123	16 724
L006 (Science laboratory and faculty library)	155 901 536	136 759 909	7 536	18 147

AECOM's Africa Property & Construction Cost Guide 2016 contains a list of approximate inclusive building cost rates for various building types in South Africa, which represent the average expected building cost rates for 2016. These rates include the cost of appropriate building services, e.g. air-conditioning, electrical, etc., but exclude costs of site infrastructure development, parking, any future escalation, loss of interest, professional fees and Value Added Tax (VAT). Rates are provided for a number of building types including offices. There are, however, no rates for higher education facilities. The rate for an office block (high rise tower block with standard specification) is between R 10,000 - R 13,400.

In determining the assignable square metre costs, DHET Space and Cost Norms take due account of space categories. For example, a value of 1,0 is assigned to offices while a value of 1,5 is assigned to classrooms. Converting the buildings into "equivalent" office buildings enables costs to be benchmarked against AECOM values on an indicative basis.

Table 14.19 indicates that 5 of the 6 equivalent buildings costs fell within the AECOM benchmark range.

**Table 14.19: Equivalent office rates per metre squared**

Work package	Rate per square metre (excluding professional fees and VAT)	Conversion factor to reduce ASM to that for offices	"Equivalent" office rate per square metre
<b>Sol Plaatje University (SPU)</b>			
C001 (Student residence)	12 600	1.081	11 656
C002 (Multi-use - student residence: dining hall and kitchen, teaching venues, academic offices, and ground-floor retail space.)	13 163	1.069	12 313
C003 (Mixed-use: retail area, lecture halls, class rooms, academic meeting rooms, offices and gymnasium, sports centre, student SRC, Union and clubs)	13 828	1,081	12 791
<b>University of Mpumalanga (UMP)</b>			
L001 (Student residence)	11 297	1,0495	10 764
L004 (Main auditorium and office block)	16 724	1,335	12 528
L006 (Science laboratory and faculty library)	18 147	1,278	14 200

#### 14.9.4 Renovation of Existing Buildings

Based on the DHET Space and Cost Norms for new buildings at Higher Education Institutions (2009), the renovations undertaken at the Sol Plaatje University ranged from 35.5 to 54.5% of the replacement cost of the buildings as indicated in Table 4.20. If the purchase price of Whiteways Apartment Block (R15.0 million excluding VAT) and Diamond Lodge Hotel (R 15,0 million excluding VAT) are included as well as the allowance of 13% for site

services in the replacement costs, these percentages increase to 63.5% and 90.1%, respectively. Therefore, the strategy to purchase and refurbish existing buildings to meet the student enrolment imperatives for 2014 and 2015 at Sol Plaatje University yielded a cost effective solution. In the time available, the enrolment could not have been achieved had new build solution been attempted.

**Table 14.20: Cost of refurbishments at Sol Plaatje University expressed as a percentage of their replacement cost**

Building	Cost of renovations including VAT and excluding professional fees (R million)	ASM for building	Replacement cost based on a 2015 BCU of R 20 328 (including professional fees and VAT)(R m)	Refurbishment cost as a percentage of replacement cost including 7.8% percent professional fees
William Prescod Building	R 13,976	2201,1	R 44,743	33.7%
Old Provincial legislature	R 38,479	3726,41	R 81,887	50.7%
Whiteways Apartment Block	R 22,984	2 728,70	R 55,468	44.7%
Diamond Lodge Hotel	R 10,423	1 172,92	R 25,774	43.6%
<b>Total</b>			<b>R 207,87</b>	<b>45.0%</b>

**Table 14.21: Cost of refurbishments of MRTT buildings at the University of Mpumalanga expressed as a percentage of the replacement cost of the building**

Mpumalanga Regional Training Trust (MRTT) buildings	Cost of renovations including VAT and excluding professional fees (R)	ASM for building	Replacement cost based on a 2015 BCU of R 20 328 (including professional fees and VAT)(R)	Refurbishment cost as a percentage of replacement cost including 4.57% percent professional fees
Hostels	R 2 544 067	685.38	R 13 932 404.64	19.1%
Cottage	R 689 403	91.95	R 1 869 159.60	38.6%
Office	R 1 430 488	100.38	R 2 040 524.64	73.3%
Teaching Venues	R 2 945 712	271.45	R 5 518 035.60	55.8%
<b>Total</b>			<b>R 23 360 124.48</b>	<b>34.1%</b>

**Table 14.22: Cost of refurbishments of the LCA buildings at the University of Mpumalanga expressed as a percentage of the replacement cost of the building**

Lowveld College of Agriculture Buildings (LCA)	Cost of renovations including VAT and excluding professional fees (R)	ASM for building	Replacement cost based on a 2016 BCU of R 21 975 (including professional fees and VAT) (R)	Refurbishment cost as a percentage of replacement cost including 4.57% percent professional fees
Executive Offices	R 2 774 420	159.12	R 3 496 662.00	83.0%
Computer Laboratory, Library and Server Room	R 3 113 750	419.70	R 9 222 907.50	35.3%
Irrigation Laboratory	R 178 735	144.78	R 3 181 540.5	5.9%
Student Residences	R 2 860 897	1432.00	R 31 468 200.00	9.5%
Auditoriums	R 1 137 430	400.97	R8 811 315.75	13.5%
Portion of Administration	R 3 523 163	267.21	R 5 871 939.75	62.7%
Sports Change Rooms	R 81 493	131.84	R 2 897 184.00	2.9%
Welding Room	R 56 356	48.56	R 1 067 106.00	5.5%
House France	R 327 618	790.68	R 17 375 193.00	2.0%
Ariya Offices	R 292 940	132.46	R 2 910 808.50	10.5%
Total			R 86 302 857.00	17.0%

The renovations undertaken at the University of Mpumalanga ranged from 2 to 83% of the replacement cost of the buildings as indicated in Table 14.21 and 14.22 above.

The differences in costs between the various types of buildings that were refurbished at the two new universities can be attributed to factors such as the work required to:

- change the usage of the building from what was originally intended;
- upgrade the buildings to satisfy contemporary requirements;
- bring the building's fabric and finishes to an acceptable condition; and
- upgrade the building services (plumbing, electrical and mechanical) to satisfy current requirements.

#### 14.10. PROCUREMENT VALUE FOR MONEY

Whilst procurement cannot be considered a client delivery priority in the same sense as time, cost and quality, it is an important means to the attainment of delivery priorities and project value. Importantly in the public sector, procurement practice is an indicator of the client's commitment to the principles set out in Section 195 of the South African Constitution, including the efficient, economic and effective use of resources, accountability, transparency and delivery management processes that are fair, equitable and development oriented. For this reason, the procurement strategies used are covered in great detail in Chapter 9. However, it is relevant in this chapter to single out some high level indicators relating to procurement practice and outcomes.

Wits University's infrastructure procurement policy has been refined over time and has provided a departure point in the development and finalisation of the latest infrastructure procurement regulations issued by National Treasury in 2016. The Wits Infrastructure Procurement Policy has underpinned all procurement for development of the two new universities<sup>[14-9]</sup>. Value for money has been achieved through rational, competitive procurement processes, including public tenders (90.4%), Wits Procurement (3.2%), quotations (0.43%) and negotiated contracts (5.96%).

**Table 14.23: Expenditure against procurement type**

Expenditure against procurement type (Source: PMIS.)	Quotes	Negotiated Contracts	Tendered	Wits Procurement	Grand Total
Academic planning		4 130 244		933 751	5 063 996
DHET infrastructure book			869 795		869 795
Feasibility		938 293	5 741 029		6 679 322
General office and Management fee		158 685		51 056 721	51 215 406
Infrastructure provision		10 791 918	1 295 661 442		1 306 453 360
Institutional planning		9 818 999	6 479 077		16 298 076
Movable (FF&E)	6 995 224	1 718 430	117 659 536		126 373 190
Delivery management and project management services		69 328 659	42 218 691		111 547 349
<b>Total</b>	<b>6 995 224</b>	<b>96 885 228</b>	<b>1 468 629 570</b>	<b>51 990 472</b>	<b>1 624 500 495</b>
<b>Percentage of Total</b>	0.43%	5.96%	90.40%	3.20%	

Within the eight expenditure categories listed in Table 14.23 above, over 143 procurements were undertaken, resulting in 219 appointments<sup>[14-10]</sup>. Of the R1,62 billion total expenditure, R1,46 billion (90.4%) was procured through public tenders issued by the NUPMT, and all tenders were adjudicated by the Wits Tender Committee. Tenders were generally awarded to the highest points for price, preference and quality. Tenders for professional services were most often awarded at rates lower than those recommended by the relevant professional bodies.

R6,99m (0.43%) was procured through quotations called for by NUPMT. Some services relied on Wits' general procurement, (e.g. travel and catering) and the expenditure of R51,99 million (3.2%) includes Wits University's management fee of R39,62 million, which is 2.5% of total expenditure, as per the MOA between DHET and Wits and as confirmed by the final KPMG review. Procurements made through a negotiated procurement process as provided for by the Wits procurement policy, amounted to R96,8m, or 5.96%, of total expenditure. The negotiated contracts included the Wits project management team (NUPMT), specialist academics and specialists in the field of higher education.

At the stage of handover of infrastructure responsibility to the new universities, inestimable value was generated through the use of three-year framework contracts, which enabled the seamless transfer of contractors and professional service providers from the original contractual Employer (Wits) to the new contractual Employer (UMP and SPU respectively).

#### **14.11. VALUE AND THE GOAL OF BROAD-BASED BLACK ECONOMIC EMPOWERMENT**

As evidenced in Table 14.23 above, the largest expenditure category is the amount of R1,30b spent on new infrastructure delivered for the start of the 2016 academic year, including the design professions, project managers, contractors and suppliers of furniture, fittings and equipment.

Our records show that the bulk of the procurement for this new infrastructure was undertaken during the 2014/15 and 2015/16 financial years in the total amount of R1 176 739 446 representing 90.0% of the total (R1,3b) infrastructure spend. The empowerment outcomes for this amount of R1 176 739 446 consist of 32 procurements at SPU and 36 procurements at UMP, resulting in the expenditure amounts of R741 037 924 at SPU and R435 701 522 at UMP. These exclude the architects who were procured through the architectural design competitions in 2013.

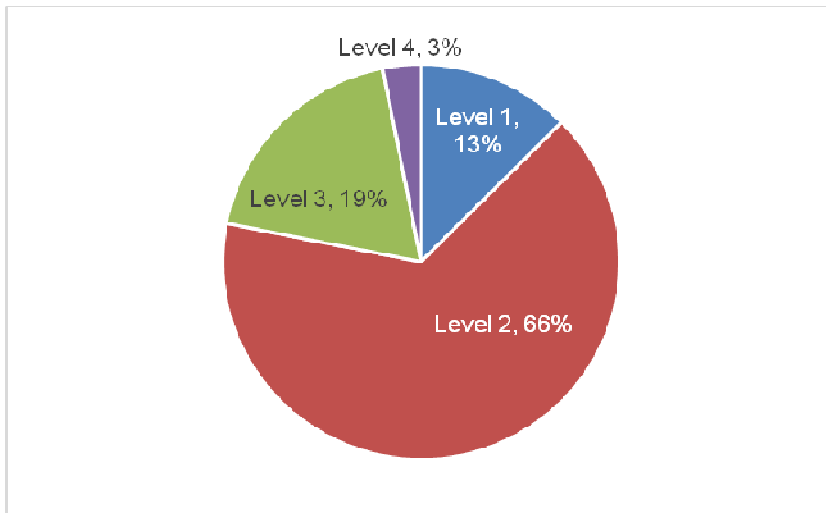
The empowerment outcomes as set out below (Table 14.24 and Table 14.25) show that 73% of expenditure went to B-BBEE levels 1 and 2 at SPU and 67% of expenditure went to B-BBEE levels 1 and 2 at UMP.

In addition to these empowerment outcomes (linked to direct awards of contract), further empowerment outcomes were achieved through the construction development targets described in Chapter 11 and highlighted in Table 14.28 below. These indicate a further calculated B-BBEE spend on empowerment in excess of R327m at SPU (78% of total) and R195m at UMP (89% of total).

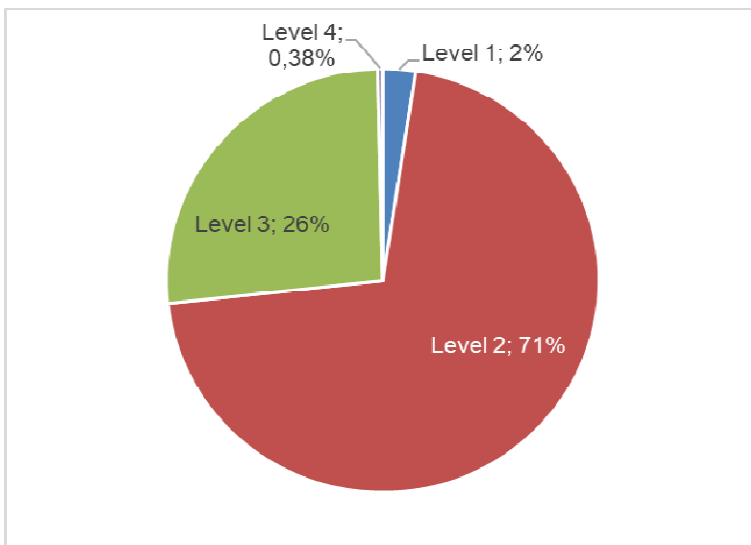
**Table 14.24: SPU Empowerment Outcomes for Procurements 2014 to 2016 (Source PMIS)**

BBBEE Level	No.	BBBEE %	Expenditure	Expenditure %
Level 1	4	13%	18 163 351	2%
Level 2	21	66%	524 755 662	71%
Level 3	6	19%	195 283 923	26%
Level 4	1	3%	2 834 988	0.38%
<b>TOTAL</b>	<b>32</b>	<b>100%</b>	<b>741 037 924</b>	<b>100%</b>

**Fig 14.2 Empowerment 2014 - 2016 by number of awards to B-BBEE level companies**



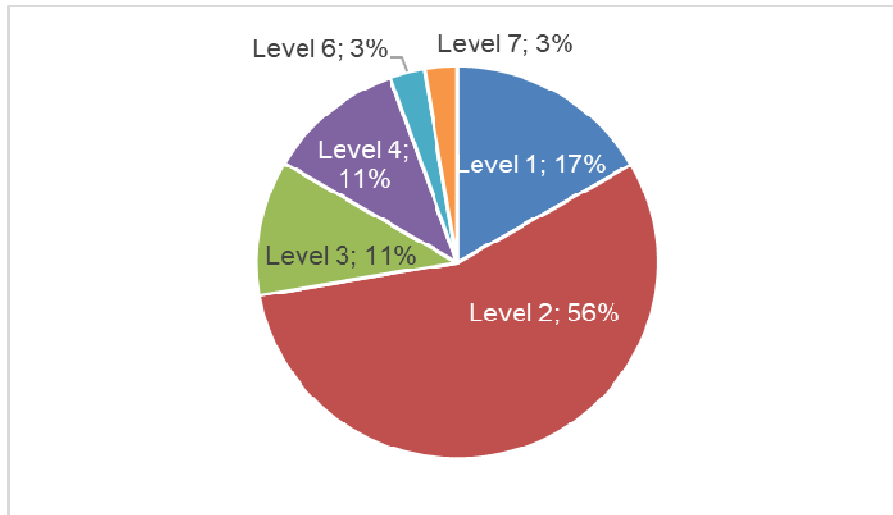
**Fig 14.3 SPU Expenditure Percentage per BBBEE level 2014 – 2016**



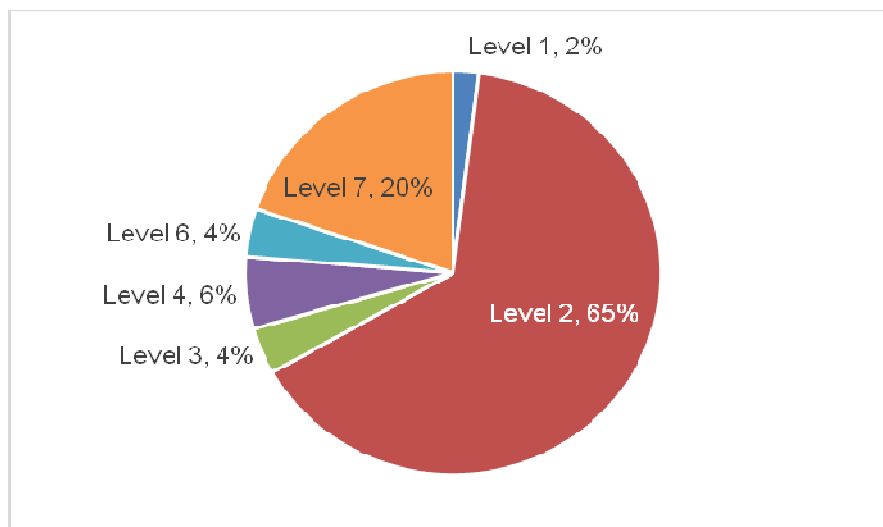
**Table 14.25 UMP Empowerment Outcomes for Procurements 2014 to 2016 (Source PMIS)**

BBBEE Level	No.	BBBEE %	Expenditure	Expenditure %
Level 1	6	17%	8 616 263	2%
Level 2	20	56%	282 344 344	65%
Level 3	4	11%	16 310 514	4%
Level 4	4	11%	25 172 318	6%
Level 6	1	3%	16 840 430	4%
Level 7	1	3%	86 417 654	20%
<b>TOTAL</b>	<b>36</b>	<b>100%</b>	<b>435 701 522</b>	<b>100%</b>

**Fig 14.4 UMP Empowerment 2014 – 2016 by number of awards to B-BBEE level companies**



**Fig 14.5 UMP Expenditure Percentage per B-BBEE Level 2014 – 2016**





## 14.12. VALUE AND THE CLIENT'S LOCAL DEVELOPMENT GOALS

Over and above the delivery imperatives of time, quality and cost and the secondary objectives of broad-based black economic empowerment, the client recognised the critical need to address local expectation for the people of each hosting town and province to participate in the construction delivery process. Moreover, the client understood that failure to address these expectations carried significant risk, as was highlighted in Project Steering Committee meetings where examples were cited of major projects in the Northern Cape that had been brought to a standstill for several years.

On the positive side, it was evident that a number of key delivery factors would support a genuinely developmental process. These included, in particular, the large-scale, three-year construction framework contracts that offered continuity of construction work and the potential to focus on local participation goals and skills development. In regard to the latter, the DHET had been searching for options to address the challenges facing young people needing on-the-job experience in order to complete their vocational and professional qualifications. Together, NUPMT and DHET decided on a bold strategy that would require innovative procurement and the client's constant attention in implementation.

As described in some detail in Chapter 11, the project contracting strategy established a set of local participation targets that the contractors tendered against on each contract for buildings and infrastructure. For ease of reference, these are repeated below and included:

- direct employment of local people ranging from 30 to 95% of total employment, with sub-targets for youth and women;
- local participation goals targeting local subcontractors and local suppliers, ranging from 30 to 50% of total procurement;
- broad-based black economic empowerment spend of 60% calculated in accordance with the scorecard for preferential procurement; and
- skills development goals (skills development opportunities which result in nationally accredited outcomes) of 250 hours per million rand expenditure.

Chapter 11 describes the outcomes achieved in some detail. A critically important outcome of the strategy was the eventual acceptance by local communities of each university as a project of the hosting town and province rather than a project imposed from afar. Importantly, not only were the above "*construction development targets*" achieved, but their establishment through the procurement process meant that they attracted no additional cost. To support implementation, the client invested a total of R1 233 222 in the development and management of a supplier database for each province. These databases continue to support implementation of the development targets, which have since been extended under the management of the two universities.<sup>[14-11]</sup>

Another important outcome worth highlighting in this appraisal of value, has been the emergence of genuine local construction capacity that can contribute to further development and to the maintenance and upkeep of the universities.

It is worth noting that while the project delivery team can generally be counted on to manage time, quality and cost, the attainment of genuine development outcomes of this nature requires a determined client delivery management focus. For ease of reference, some of the specific development outcomes summarised in Chapter 11 are reiterated in the tables below.

**Table 14.26: Skills Development**

	SPU		UMP		Examples of Qualifications
	Days	Learners	Days	Learners	
<b>Method 1</b>	8 774	176	10 194	99	Scaffolding Inspector & Erector; Working at Heights; Shot fixing; Safety, Health and Environment; Banksman; First Aider; Crane Operator; Dumper Operator; and Telehandler.
<b>Method 2</b>	5 585	57	7 473	160	Plumber; Carpenter; Plasterer; Welder; Bricklayer; Power Floating Supervisor; Tiler; and Scaffolding/Formwork.
<b>Method 3</b>	3 329	16	2 636	18	National Diploma: Civil Engineering; and National Diploma: Building Science.
<b>Method 4</b>	2 165	5	1 381	14	Quantity Surveyor; Engineer; Construction Manager.
<b>TOTAL</b>	<b>19 853</b>	<b>254</b>	<b>21 684</b>	<b>291</b>	

**Table 14.27: Local Expenditure**

	Total Actual Spend to Date	% Target of Local Expenditure	Actual Local Expenditure Spend	Actual %
<b>SPU</b>	R 502 312 001.95	36%	R 188 254 116.65	38%
<b>UMP</b>	R 237 820 000.00	44%	R 174 130 000.00	73%

**Table 14.28: Broad-based Black Economic Empowerment**

	Total Actual Procurement Spend	B-BBEE Target as a % of Procurement Spend	Calculated B-BBEE Procurement Spend	Actual %
<b>SPU</b>	R423 061 711.32	60%	R327 919 489.66	78%
<b>UMP</b>	R218 910 000.00	60%	R195 830 000.00	89%

#### **14.13. SAFETY ON SITE – A NON-NEGOTIABLE COMMITMENT**

Safety on site is a legal responsibility of the client in terms of the Occupational Health and Safety Act (Act 85 of 1993) as amended. The NUPMT, with DHET backing, has endeavoured to ensure that the appointed OHS agents at SPU and UMP were fully supported to take any necessary action when faced with contraventions endangering project staff, construction workers, students and staff. Despite the pressures of time, this unwavering client support for site safety was made clear to the project team and contractors from the outset.

Great value is therefore attached to the fact that reported lost time injuries were well below the industry benchmark at both SPU and UMP and that none of the reported lost time injuries were as a result of a fatality or a permanent disablement<sup>[14-12]</sup>. This is particularly significant at SPU where buildings C001, C002, C003 and site services CX01 were in jam-packed proximity to each other and none of the five cranes deployed at peak operation could rotate a full 360°.

#### **14.14. SOME CONCLUSIONS ON VALUE**

Completion time for the new buildings was fixed as academic facilities were required at the start of the 2016 academic year. This necessitated that the works commence before the designs were complete and assumptions had to be made on the value of the work (25 to 74%) not capable of being accurately priced when work was instructed. These kinds of limitations associated with time pressure invariably impact on cost and quality.

**The priority project outcomes** in terms of time, cost and quality can be summarised as follows:

- **time:** Construction Work Packages at UMP were completed substantially on time. At SPU, although the priority buildings and infrastructure were not completed within the projected time frames (which straddled in some instances two industry shutdown periods) and the actual time for completion exceeded the planned completion time by between 10 and 48%, all the essential academic facilities were opened at the start of the 2016 academic year
- **cost:** Despite extensions of time being granted and the designs being incomplete when the works commenced, buildings and infrastructure were delivered within the set control budgets and slightly below the DHET cost norms for university facilities while the construction Work Packages were delivered within 1% of the target price (with an agreed allowance for price adjustment for inflation)
- **quality:** The works were in accordance with the specifications and the buildings have achieved architectural recognition.

**Important secondary project outcomes** were substantial and exceeded the specified construction development targets in terms of empowerment (B-BBEE) and local participation and skills development.

Accordingly, it is believed that the adopted procurement and delivery management strategy, which promoted collaborative long-term relationships and included stringent eligibility criteria and the evaluation of quality at the tender evaluation stage, ensured that capable service

providers were appointed, and mitigated the risks associated with the required fast track construction.

The World Bank Procurement Regulations for IFP Borrowers (2016) suggest that value for money is the “*effective, efficient, and economic use of resources*”. The National Treasury Standard for Infrastructure Procurement and Delivery Management (2015) defines value for money as “*the optimum use of resources to achieve intended outcomes*”. Given that the gap between what was planned and what was achieved is very narrow, it may be concluded that value for money was achieved in delivering the 2016 facilities for the two new universities. Critical to this achievement was the persistent focus of the client body (DHET and the NUPMT) on its core value proposition – and on ensuring that the project team were similarly focused on the priority goals of this proposition.

### **Some observations for improvement**

Some unexpected and unsatisfactory aspects of the delivery process are worth noting for future improvement. These include the following:

1. There was a high turnover in senior staff in some of the large consulting firms and large contractors, which had a disruptive impact at both university projects making it difficult to build the optimal culture of collaboration over time. In this regard, the continuity of senior personnel is most critical within the project management and main contracting firms.
2. With regard to professional service providers it was a condition of contract that the key person specified in the tender (or a person with equivalent or better relevant qualifications and experience) provides the services or directs the services provided. A procedure was included in the professional service contracts for changing a key person. Failure to ensure this condition of contract resulted in the structural failure described in chapter 4 and led to substandard designs in some of the mechanical work.
3. NUPMT’s framework for professional fees is very different in several key aspects to the guideline fees published by the various statutory councils. In particular, it excluded travelling time and expenses because the service was deemed to be provided in either Nelspruit or Kimberley. To ensure this understanding, compulsory tender clarification meetings were conducted with professional service providers whose contracts made provision for fees to be paid on a percentage basis. The tender document stipulated that a full time employee, who would be involved in the preparation of tenders, must sign the attendance list in the name of the tendering entity.

Unfortunately, the communication between those that attended the clarification meeting and those that compiled the tenders did not always take place. This was very much the case with the larger consultancies who were awarded contracts in Kimberley. The unintended consequence was that there was a reluctance to attend meetings or to visit the site. Consultants with multiple engineering service appointments tended to send one person to represent all disciplines while others tended to take short cuts in the reviewing of work done on site or were slow in their response to attend to site issues as they arose.

4. It was generally easier for the project managers and cost consultants to work with the grade 7 and 8 contractors in addressing cost issues, as invariably one of the owners was intimately involved in agreeing the target price, any changes to the price, as well as the monthly assessment of cost as defined in the contract. This was not the case with the grade 9 contractor, where these matters were centralised at head office and the Contractor's site quantity surveyor had little authority to make decisions. While this is not a reflection on the quality of work delivered, at times it was a source of frustration in relation to quick and effective decision making.
5. The target cost contractors were incentivised to reduce costs through the pain / gain arrangements in the contract. The same opportunity was not afforded to the professional team, due to the fast track nature of the project which did not allow this option to be properly explored. However, end of stage deliverables were delayed by one or two non-performing consultants. Time allowing in future, consideration should be given to incentivising the professional team members to perform.

## REFERENCE DOCUMENTS

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- 14-2 Department of Higher Education and Training. (2012). Development Framework for New Universities in the Northern Cape and Mpumalanga. *Government Gazette*. (Notice 705. No. 35645).
- 14-3 Northern Cape Architectural Competition Brochure
- 14-4 Mpumalanga Architectural Competition Brochure
- 14-5 UMP Environmental Design Performance Summary
- 14-6 SPU Environmental Design Performance Summary
- 14-7 Department of Higher Education and Training's Space and Cost Norms for buildings and other land improvements at Higher Education Institutions (2009)
- 14-8 Watermeyer, R. CASE STUDY: Fast track approach to delivery 2016 facilities for the two new universities (October 2017)
- 14-9 University of the Witwatersrand. Construction procurement policy, processes, procedures, methods and delegations (December 2013)
- 14-10 List of service providers
- 14-11 SPU Powerpoint presentation on market analysis
- 14-12 Final Health and Safety Performance Report for Sol Plaatje University by NCC, April 2016