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**TECHNICAL AND VOCATIONAL
EDUCATION AND TRAINING**

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SECTOR: EDUCATION AND TRAINING

**PUBLIC EXPENDITURE AND POLICY
ANALYSIS (PEPA)**

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TABLE OF CONTENTS

LIST OF ACRONYMS	VI
GLOSSARY	VII
1 INTRODUCTION	1
1.1 Overview of the project	1
1.2 Objectives of the PER	2
1.3 Approach	3
2 BACKGROUND	3
2.1 Overview of the TVET sector	3
2.2 History of the TVET Sector	4
2.3 Types of programmes	6
2.4 Programme Design	7
3 PERFORMANCE ANALYSIS	11
3.1 Performance Indicators	11
3.2 Analysis of Certification Rates	13
4 REVENUE AND EXPENDITURE ANALYSIS	17
4.1 Revenue	17
4.2 Expenditure Analysis	19
4.3 Relationships between expenditure and performance	26
5 COSTING AND PROJECTIONS	27
5.1 Description of the costing model	27
5.2 Calibration and parameter values	30
5.3 Summary and main findings	34
6 OBSERVATIONS AND CONCLUDING REMARKS	35
6.1 Observations and key findings	35
APPENDIX 1 EXPENDITURE ANALYSIS METHODOLOGY AND ASSUMPTIONS	40
APPENDIX 2 COSTING MODEL METHODOLOGY	44
APPENDIX 3 COSTING MODEL SCENARIO ANALYSIS	52
APPENDIX 4 PED AND DHET LOGFRAMES	55
APPENDIX 5 P.R.A.G.M.A.T.I.C. INDICATOR EVALUATION METHODOLOGY	57

APPENDIX 6 COST ESTIMATION OF THE WHITE PAPER FOR POST-SCHOOL EDUCATION AND TRAINING	60
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LIST OF FIGURES

<i>Figure 1: Evaluation of TVET sector Performance Indicators.....</i>	<i>12</i>
<i>Figure 2: NC(V): Number of colleges, by province, with average certification rates in specified bands.....</i>	<i>16</i>
<i>Figure 3: NATED: Number of colleges, by province, with average certification rates in specified bands.....</i>	<i>16</i>
<i>Figure 4: Overall TVET funding by source in 2013</i>	<i>17</i>
<i>Figure 5: Expenditure Analysis Methodology</i>	<i>20</i>
<i>Figure 6: Average NC(V) College Expenditure per student FTE relative to funding</i>	<i>22</i>
<i>Figure 7: The costing model methodology</i>	<i>29</i>
<i>Figure 8: Effect of increasing class group sizes on cost per FTE.....</i>	<i>32</i>
<i>Figure 9: Effect of number of class groups per lecturer on cost per FTE</i>	<i>33</i>
<i>Figure 10: The effect of certification rates on the cost per graduate.....</i>	<i>34</i>
<i>Figure 11: Map of sampled colleges</i>	<i>40</i>
<i>Figure 12: Average relationship between total support staff costs and student FTEs</i>	<i>49</i>
<i>Figure 13: Average relationship between Indirect G&S costs and total student FTEs</i>	<i>51</i>
<i>Figure 14: Lecturer salaries</i>	<i>51</i>

LIST OF TABLES

<i>Table 1: Research questions</i>	<i>2</i>
<i>Table 2: TVET College Logical Framework (Part 1).....</i>	<i>9</i>
<i>Table 3: TVET College Logical Framework (Part 2).....</i>	<i>10</i>
<i>Table 4: NC(V) Certification Rates by programme.....</i>	<i>14</i>
<i>Table 5: NATED / Report 191 Certification Rates by programme.....</i>	<i>15</i>
<i>Table 6: Percentage of required funding received by province.....</i>	<i>18</i>
<i>Table 7: Minimum, average and maximum college programme expenditure per FTE.....</i>	<i>21</i>
<i>Table 8: Minimum, average and maximum college programme expenditure per FTE (in R).....</i>	<i>23</i>
<i>Table 9: Proportion of NC(V) spending on different expenditure categories</i>	<i>24</i>
<i>Table 10: Parameter values.....</i>	<i>30</i>
<i>Table 11: Data included in each expenditure category and data sources by priority.....</i>	<i>41</i>
<i>Table 12: Data sources used for 12 colleges in sample</i>	<i>42</i>
<i>Table 13: Average Direct Programme Costs per programme.....</i>	<i>45</i>
<i>Table 14: Per lecturer expenditure on memberships for each college in sample</i>	<i>47</i>
<i>Table 15: Percentage of lecturer and support staff costs spent on staff development at each college.....</i>	<i>47</i>
<i>Table 16: Average management staff salary.....</i>	<i>48</i>
<i>Table 17: Calculation of management staff costs allocated to each student FTE.....</i>	<i>49</i>
<i>Table 18: First level enrolments and average certification rates for Nkangala in 2014</i>	<i>52</i>
<i>Table 19: Determinants of lecturer requirement</i>	<i>52</i>
<i>Table 20: Class group size impact</i>	<i>53</i>
<i>Table 21: Number of class groups per lecturer impact</i>	<i>53</i>
<i>Table 22: Certification rates impact</i>	<i>54</i>
<i>Table 23: PED College Logical Framework</i>	<i>55</i>
<i>Table 24: DHET Logical Framework</i>	<i>56</i>
<i>Table 25: Example of Applying PRAGMATIC criteria to 2013/14 TVET performance indicators</i>	<i>58</i>
<i>Table 26: Average costs per programme</i>	<i>60</i>
<i>Table 27: Estimated total TVET costs under different long term scenarios (in R millions).....</i>	<i>60</i>

LIST OF ACRONYMS

DG	Director-General
DHET	Department of Higher Education and Training
DoE	Department of Education
EEA	Employment Equity Act
FET	Further Education and Training
FTE	Full-Time Equivalent
G&S	Goods and Services
MTSF	Medium-Term Strategic Framework
NATED	National Certificate Technikon
NC(V)	National Certificate Vocational
NEETs	Persons between 18 and 24 not in employment, education or training
NQF	National Qualifications Framework
NSF	National Skills Fund
NSFAS	National Student Financial Aid Scheme
PED	Provincial Education Department
PFMA	Public Finance Management Act
SAQA	South African Qualifications Authority
SETA	Sector Education and Training Authority
TVET	Technical and Vocational Education and Training

GLOSSARY

Apprenticeships	Apprenticeships are workplace based training programmes in the occupational trades.
Certification rate	Certification rates are calculated as the number of students who successfully completed a certain qualification / programme, as a percentage of the number of candidates who were eligible to complete this qualification / programme and wrote all the necessary examinations to do so. e.g. [Number completing NC(V) Tourism at level 2] / [Number eligible to complete NC(V) Tourism L2 and writing all necessary exams to do so]
Dropout rate	Dropout rates can be calculated by using examinations data as: The number of students who write examinations divided by the number of students who are enrolled to write examinations.
Internships	Internships are short periods of practical work experience aimed at increasing the employability of learners.
Learnerships	Learnerships are structured programmes that combine theoretical knowledge with practical workplace experience. Learnerships lead to a qualification registered on the National Qualifications Framework.
NATED	NATED, or “N”, programmes were historically the flagship programmes of the TVET / FET sector, and acted as the theoretical component of the artisanal training system for apprentices employed by private sector firms. In recent times, students increasingly enrol in NATED without first being employed or obtaining employer sponsorships. NATED courses are primarily theoretical in nature and are presented six trimesters for Engineering Studies (N1 to N6) or three semesters for business and services programmes.
NC(V)	The National Certificate (Vocational) is a three-year programme that integrates theory and simulated practical training and is an alternative to the National School Certificate for school leavers.
Programme	For the purposes of this Performance Expenditure Review, the term ‘programme’ refers to the NC (V), NATED and other occupational qualifications delivered at TVET colleges.
Short skills programmes	These are short training programmes across a wide range of disciplines, generally delivered over a three to six month period.
Throughput rate	Throughput rates are, ideally, calculated by measuring what proportion of a cohort of students that start a qualification eventually complete that qualification (at some point in time). However, given the lack of cohort level data, annual throughput rates are estimated as: [Certification rate] * [1 – Dropout rate].

1 INTRODUCTION

1.1 Overview of the project

The National Treasury has commissioned a set of Performance and Expenditure Reviews (PERs) across 30 to 40 government policy initiatives. The aim of these reviews is to provide insights into the trends, composition and drivers of government expenditure across key programmes. These reviews provide useful insights into the cost of government services and can be an important tool for decision makers in pursuing efficiency gains and value for money. This PER focuses on the public Technical and Vocational Education and Training (TVET) college sector.

TVET colleges (previously referred to as Further Education and Training colleges) aim to provide educational opportunities to those who either do not qualify for tertiary education or require vocational training with direct application to the workplace. The National Development Plan (NDP) states that the sector has a critical role to play in the development of practical, employable skills and, hence, the reduction of youth unemployment and skills shortages in the country. This is reflected in the plan to increase enrolments in public TVET colleges from approximately 639,618 in 2013¹ to 2.5 million in 2030 and thereby have it be larger, by enrolments, than the university sector; as is also reflected in the *White Paper for Post-School Education and Training*.

The public TVET sector has undergone a number of fundamental changes in recent times:

- In 2001/02, 152 technical colleges were merged into the current 50 TVET colleges, in an attempt to consolidate college administration and budgets, and to reduce past disparities between Historically Advantaged and Historically Disadvantaged colleges.
- National Certificate (Vocational) programme, abbreviated as “NC(V)”, was introduced in 2007 as a parallel alternative to the National Senior Certificate, but with a greater emphasis on practical and vocation-specific learning. Subsequently, NC(V) programmes now attract a greater proportion of funding and expenditure than the traditional Report 191 (NATED) and occupational programmes.
- A large scale recapitalisation of TVET colleges was undertaken from 2007 onwards, and in 2014, another R2.5 billion was committed towards the refurbishment of existing campuses and the building of 12 new campuses
- The administrative function of TVET colleges has been shifted from provincial to national (higher) education departments, including TVET college staff being transferred to the DHET

Public sector TVET colleges receive the vast majority (typically in excess of 90%) of their funding from government, either directly from the DHET or indirectly through student bursaries supplied by the NSFAS and specific programme funding provided by the NSF and SETAs. Private revenue through (non-bursary) course fees, donations and private company funding comprises only a small share of income. NSFAS bursary funding has increased dramatically from R0.3bn in 2009 to R1.8bn in 2013, after it was found that the inability of many students to afford college fees was a key factor undermining greater participation in the sector. As a result, the proportion of privately funded student fees has decreased substantially. This means that any increase in enrolments to meet long-term policy targets would have

¹ DHET (2015): Statistics on Post-School Education and Training in South Africa: 2013

to be funded almost exclusively by government, unless the funding structure or programme mix of public TVET colleges changes dramatically.

1.2 Objectives of the PER

The purpose of this PER is to examine the pattern, composition and trends in expenditure within the public TVET sector. In particular, this PER looks to answer the research questions listed in Table 1.

Table 1: Research questions

Main question	Relevant Section	Guiding questions
1. How does the TVET sector work?	2 Background	- What are the different types of programmes delivered by TVET colleges? - How is training delivered within TVET colleges? - What is the role of the DHET within the TVET sector?
2. What are the intended outcomes of the TVET colleges system and how are these outcomes achieved?	2.3 Programme Design	- Are the causal relationships between inputs, activities, outputs and outcomes realistic? - Are the 'right' performance indicators being used to measure the 'right' things?
3. How is the system performing?	3 Performance Analysis	- What are the main performance measures at college, provincial and national level? - What are the key trends?
4. How is the TVET sector funded and financed?	4.1 Revenue	- Who funds TVET colleges? - What do they fund TVET colleges for?
5. How, and on what, do TVET colleges spend their resources?	4 Revenue and Expenditure Analysis	What are the different types of direct and indirect costs incurred by TVET colleges?
6. What factors drive the cost of TVET programmes?	4 Revenue and Expenditure Analysis 5 Costing and Projections	- What are the main cost drivers for the TVET sector? - What are the unit costs of different programmes within TVET colleges?
7. What are the projected costs of meeting the DHET's target enrolments?	6 Observations and Concluding Remarks	- What are the projected costs of meeting the DHET's targets based on the current disbursement mix? - What are the projected costs of meeting the DHET's targets under different scenarios?
8. What can be done to improve the cost effectiveness of the TVET sector?	6 Observations and Concluding Remarks	- How cost effective are different TVET programmes? - How can the disbursement mix be configured to deliver better value for money?

1.3 Approach

In keeping with the methodology approved by the National Treasury, this PER was carried out in six stages. Further detail on the methodology can be found in Appendix 1.

The analysis was initially conducted using reports and data publicly available or supplied by the DHET. During the expenditure analysis stage of the project, it was found that sufficiently granular data was not centrally available to enable the estimation of expenditure at programme level; i.e. it was not possible to determine how much colleges spend on each of the different programmes that they present. For example, how much a given college spent on delivering NC(V) Hospitality relative to NC(V) Office Administration.

To enable this calculation, a sample of 15 colleges were selected based on a number of criteria. Firstly, only colleges that were expected to have sufficiently accurate financial information - based on an analysis of trial balances and recent audit opinions - were included. Secondly, to ensure sufficient geographic coverage, colleges from 8 of the 9 provinces were included. Thirdly, to investigate the causes of substantial inter-provincial differences in funding and performance, four colleges were selected from each of the Western Cape and Kwazulu-Natal, given the large differences observed between these provinces.

Appendix 1 describes the range and nature of data collected from colleges, as well as the methodology used to conduct a detailed expenditure analysis. In addition to data collection, the project team interviewed senior management officials in each of the sampled colleges to verify data collected and shed light on the key college specific factors and challenges that affect programme delivery.

The review focusses on spending during the 2014 academic year, but is supplemented by data from other periods - usually 2013 - where data for 2014 is not available.

2 BACKGROUND

2.1 Overview of the TVET sector

A dichotomy prevails in the South African labour market where there is large youth unemployment juxtaposed with a dire shortage of scarce skills. Youth unemployment continues to remain stubbornly high at 36.1% in 2014². The National Development Plan affirms that one of the nine challenges confronting South Africa is that *"too few people work"*³.

The government has long recognised that the majority of the unemployed are poorly educated and do not have the requisite skills to gainfully partake in a technologically advanced economy⁴. Consequently, the government has over the years instituted strategies to reconcile the employers' demands for specific skills with young people's aspiration to attain decent work. One such policy has been the Human Resource Development Strategy for South Africa (HRDSSA), which was launched in 2001 to provide people with a solid educational foundation for social participation and be empowered to

² City Press. Stats SA. 2014. Youth Unemployment soars-Stats SA. <http://www.citypress.co.za/business/youth-unemployment-soars-stats-sa/>

³ National Planning Commission. 2011. National Development Plan 2030. Our Future – make it work.

⁴ Du Toit, R., 2012. Impact Assessment of National Skills Development Strategy - The NSF as a Mechanism to Address Skills Development of the Unemployed in South Africa, Pretoria: Department of Labour.

develop relevant and marketable skills at further and higher educational levels. Post school education is deemed critical to improve the skill set of the youth to meaningfully participate in the economy.

Traditionally, a large proportion of government post school education expenditure was spent on universities, but in recent times, funding towards technical and vocational training has increased. The considerable growth in funding for Technical and Vocational Education and Training (TVET⁵) colleges (previously Further Education and Training [FET] colleges) has been underpinned by the recognition that occupational and vocational trades are important contributors to employment and a country's long-term development trajectory.

The TVET sector has not been functionally optimally to absorb and train the number of school leavers. The NDP notes that the sector is too small, ineffective and the output quality is poor. It further states that the quality and relevance of courses needs urgent attention⁶. The unemployment rates among TVET college graduates (11%) is more than double (5%) that of university graduates⁷ Furthermore, an audit conducted by the Human Science Research Council (HSRC) on the efficiency of 50 FET Colleges in 2010 measured by the throughput rates⁸ (defined as the portion of students successfully completing their studies for that year, including dropouts) found:

- NC(V) achieved a national average throughput rate of 30% per annum over a three-year period (2007-2009).
- The N programmes achieved 47% and
- Other programmes 66 %

The study noted that the lacklustre performance was of serious concern in the context of the DHET's intention to increase enrolments in the sector to one million students by 2014, and to four million students in the post-school (non-university) sector as a whole by 2030⁹.

The White Paper for Post-School Education and Training declares that government wants TVET colleges to become the cornerstone of the country's skills development system. Accordingly, the DHET has prioritised expanding access by providing more funding for the TVETs. But this has not always been allocated efficiently. Government needs to understand the costs of delivering the various programmes across the various TVET colleges to obtain value for money and be able to fund more programmes and students.

2.2 History of the TVET Sector

The TVET sector can trace its roots to the 1920s where Technical Colleges were founded to give impetus to the government's industrial strategy. The colleges were established to provide a consistent

⁵ "The name better reflects their nature and better defines their main role in the diversified post-school education and training system" - White Paper for Post School Education and Training

⁶ National Development Plan 2030

⁷ Dailyvox. 2014. SA youth unemployment: What's the problem? <http://www.thedailyvox.co.za/sa-youth-unemployment-whats-the-problem/>

⁸ Note that these are annual throughput rates; i.e. the proportion of students who complete a specific level from those who start that level; and is not an estimate of what proportion of students complete all levels from those who start the first level; as throughput is defined elsewhere in this document

⁹ HSRC, 2010. Further Education and Training (FET) Colleges at a glance in 2010. FET Colleges Audit.

supply of skilled labour. There were fewer than eight colleges, an advanced technical college, and SoE training centres that were exclusively available to white males only¹⁰.

The Manpower Act of 1981 was enacted to provide artisanship training for all racial groups. Consequently, it enabled more technical colleges to be established in rural and peri-urban areas of the country. However, these:

- Were small, weak and poorly resourced,
- Fostered inequalities and racial seclusion,
- Had poor access and industry and community linkages and partnerships¹¹.

In 1995, the vocational environment comprised of 152 technical colleges located within numerous education departments that were managed and funded in various ways¹². Moreover, the quality of programmes varied largely between the colleges and was not responsive to the needs of the economy¹³.

The advent of democracy saw the establishment of a single National Qualifications Framework (NQF) in 1996 to integrate all education and training in South Africa within the jurisdiction of the South African Qualification Authority (SAQA). The National Committee on Further Education (NCFE) was appointed in 1996 to, among others, investigate the challenges confronting FETs. In 1997 the *Framework for the Transformation of FET in South Africa* was published; which was followed by, in quick succession, a Green Paper for FET, a White Paper for FET and the Further Education and Training Act, 1998 (Act No 98 of 1998)¹⁴.

The FET Act of 1998 was the guiding legislation for the governance and administration of the FET sector between 1998 and 2006. It specified a broad and long-term national framework for the transformation of the sector; including transformations to curricula, learning and teaching approaches, qualifications offered, funding, quality assurance, and institutional arrangements¹⁵

A task team, appointed in 2000 to investigate the sector, recommended that the 152 FET Colleges be consolidated to 50 public colleges, each with its own council and with the responsibility resting with provincial MECs. The motivation for the mergers were to:

- combine smaller and weaker colleges into stronger institutions, which would result in economies of scale and create capacity within colleges to teach more students and offer a wider range of programmes
- to geographically position colleges to meet social and economic demands

¹⁰ Maharaswa. 2015. Rebranding the Further Education and Training (FET) sector through leadership and organisational development. http://academic.sun.ac.za/chae/docs/LS2013_Maharaswa.pdf

¹¹ Maharaswa. 2015. Rebranding the Further Education and Training (FET) sector through leadership and organisational development. http://academic.sun.ac.za/chae/docs/LS2013_Maharaswa.pdf

¹² DHET Strategic Plan 2010/2015

¹³ *ibid*

¹⁴ Government Notice 1361. 2008 National Education Policy Act, 1996 (Act No. 27 of 1996) and The Further Education and Training Colleges Act, 2006 (Act No. 16 of 2008)

¹⁵ Government Notice 1361. 2008 National Education Policy Act, 1996 (Act No. 27 of 1996) and The Further Education and Training Colleges Act, 2006 (Act No. 16 of 2008)

- make colleges a central feature of the government's strategy to tackle skills shortages, job creation and economic growth¹⁶

The FET Act of 1998 was supplanted by the FET Colleges Act 16 of 2006, to strengthen the sector and support government's vision to develop a modern, vibrant FET College system that was responsive to the needs of the 21st century¹⁷.

The FET Colleges Act 16 of 2006, was amended in 2009 to transfer the FET Colleges function from the provinces to the newly founded National Department of Higher Education in line with government's strategy to create an integrated post-school education and training sector. The Green Paper (2012) provides a vision for a single, coherent, differentiated and highly articulated post-school education and training system. Accordingly, TVET colleges are envisaged to contribute to overcoming the structural challenges confronting the South African society by expanding access to education and training opportunities and increasing equity, as well as achieving high levels of excellence and innovation¹⁸. The *White Paper on Post School Education and Training* which was which was informed by input and consultations to the Green Paper specifies the various strategies to improve the sector. Accordingly, these inter alia include focussing attention on improving the quality of programmes delivered, up skilling lecturers, strengthening governance and management, improving IT systems and increasing learner support.

2.3 Types of programmes

Although the technical and vocational training sector is complex and diverse, TVET colleges offer seven main types of programmes:

- **National Certificate Technikon (NATED)** were historically the flagship programmes of the TVET / FET sector, and acted as the theoretical component of the artisanal training system for apprentices employed by private sector firms. In recent times, students increasingly enrol in NATED without first being employed or obtaining employer sponsorships. NATED courses are primarily theoretical in nature and are presented six trimesters for Engineering Studies (N1 to N6) or three semesters for business and services programmes.
- **National Certificate Vocational (NC(V))** programmes integrate theory and simulated practical training. They are designed to provide students with a broad range of knowledge and practical skills within specific disciplines such as business, management and occupational trades.
- **Learnerships** are structured programmes that combine theoretical knowledge with simulated practical workplace experience leading to a qualification registered on the National Qualifications Framework

¹⁶ HRDC. 2014. Synthesis report of the TVET colleges technical task team strengthening and supporting TVET colleges for expanded access and increased programme quality.

http://www.lmip.org.za/sites/default/files/documentfiles/3A%20TVET%20SYNTHESIS%20REPORT_Draft%20Final%20Report_0.pdf

¹⁷ Government Notice 1361. 2008 National Education Policy Act, 1996 (Act No. 27 of 1996) and The Further Education and Training Colleges Act, 2006 (Act No. 16 of 2008)

¹⁸ HRDC. 2014. Synthesis report of the TVET colleges technical task team strengthening and supporting TVET colleges for expanded access and increased programme quality.

http://www.lmip.org.za/sites/default/files/documentfiles/3A%20TVET%20SYNTHESIS%20REPORT_Draft%20Final%20Report_0.pdf

- **Apprenticeships** are largely workplace-based training programmes for the occupational trades, although some theoretical training is often delivered at TVET colleges.
- **National Higher Certificate** are programmes that prepares learners for entry into university.
- **Skills programmes** are short courses based on a cluster of unit standards, and offered to build specific skills and competencies.
- **Adult Basic Education and Training** are basic literacy and numeracy programmes for adult who have either not been to school or not completed basic education¹⁹.

2.4 Programme Design

This section maps the casual relationship between the inputs, activities, outputs and outcomes of the main role-players in the TVET sector. The analysis of the programme design is crucial to this PER as it establishes a link between the performance of TVET colleges and the activities and associated expenditure of the various role-players in the sector. This section therefore focuses on the roles that the DHET, PEDs and TVET Colleges play in the sector.

Table 2 and Table 3 present the logical framework for an individual TVET college, while the logical framework of the PEDs and DHET can be found in Appendix 2. Please note that these diagrams represent the sector as at the start of the PER project; i.e. the end of 2014. As part of the centralisation of the administrative function of TVET colleges to the DHET, finalised throughout 2015, many of the activities and outputs listed as PED activities and outputs will have migrated to the DHET, as indicated in the components analysis presented in the previous section.

As indicated by the logical frameworks presented here, all key stakeholders contribute to the same long term intended impact: “A country where all South Africans are skilled and engaged in economic activity that contributes to the long term development of the economy”. This impact statement captures the potential effects of the NSF’s training, capacity building and research programmes in: (1) developing the skills and competencies of South Africans and (2) increasing their capabilities to enter the formal economy and/or engage in entrepreneurial activities. The impact statement is derived from the preamble to the National Development Plan (NDP).

Similarly all stakeholders are jointly responsible for the achievement of the following outcomes:

1. Fair and equitable access to technical and vocational training
2. A post school education system that delivers high quality technical and vocational training
3. Technical and vocational training that meets the needs of a growing economy

The outcomes reflect the key requirements for a functional and effective TVET sector: It should reach and educate a sufficient number of people, provide these students with quality education and ensure that the education provided meets the ever evolving needs of the economy. As the sector is expected to expand substantially in line with policy targets articulated in the NDP, it is important that these three aims are tackled simultaneously. The NDP targets each of these outcomes by specifying the following targets: (1) increase the proportion of those aged 20 to 24 in the TVET sector from 3% currently to 25%

¹⁹ DHET. 2014. FET Courses [Online] Available at: <http://www.fetcolleges.co.za/Site/Courses.aspx>

in 2030, (2) increase certification rates from approximately 40% currently to 75% in 2030 and (3) produce 30,000 artisans per year (who are highly in demand by industry).

To enable the achievement of these outcomes, stakeholders need to efficiently and effectively deliver a host of what are referred to as “final” outputs. Each “final” output is comprised of a number of intermediate outputs with associated activities. In the case of TVET colleges these final outputs are:

1. Appropriate curricula are developed
2. Applications are received and processed
3. Learners are enrolled and registered
4. Learners receive training (both theoretical and technical) that enables them to pass programmes in sufficient numbers
5. Qualified staff are employed and further capacitated
6. Infrastructure and equipment in place that meets requirements
7. Journal Articles and other publications
8. Product and process developments completed
9. External projects delivered
10. A well-managed TVET college
11. A financially sustainable TVET college

The “final” outputs highlight the many factors required for a college to deliver tuition of the desired degree and thereby produce graduates that are sufficiently knowledgeable to gain employment. However, during our interviews with college staff, certain additional activities and intermediate outputs were mentioned that might be required to achieve these “final” outputs. For example, it was regularly mentioned that bridging programmes might be necessary to assist the many students who enter the TVET sector with insufficient training and knowledge. Currently funding is typically not directly provided for such programmes. Similarly, colleges currently offer limited student support in terms of study centres, libraries and psychological support; although the DHET have requested colleges to increasingly focus on these aspects.

Table 2: TVET College Logical Framework (Part 1)

TVET COLLEGES - LOGICAL FRAMEWORK											
Impact	A country where all South Africans are skilled and engaged in economic activity that contributes to the long term development of the economy										
Outcomes	Fair and equitable access to technical and vocational training		A post school education system that delivers high quality technical and vocational training		Technical and vocational training that meets the needs of a growing economy						
Final outputs	Applications received		Learners enrolled			Curricula developed and customised to industry needs	Learners passing their training programme				
Intermediate outputs	TVET programmes advertised widely	Applications processed	Applications are adjudicated	Learners enrolled per programme	Awarded bursaries	Engagements with industry during curricula development	LTSM delivered	Classroom based teaching delivered	Experiential training delivered (WBE)	Examinations and trade testing completed	Learners certified and graduated
1. Activities	Identify potential advertising channels	Receive and acknowledge applications	Convene adjudication panel(s)	Inform applicants	Advertise bursaries	Identify industries within the catchment area for engagement	Identify LTSM needs based on learner numbers and curriculum	Identify training programme coordinators	Engage with stakeholders to identify potential work based placements	For customised training programmes, develop examinations	Communicate results
2. Activities	Develop advertising material	Process applications	Adjudicate applications	Register learners onto TVET system	Registered learners submit applications for bursaries	Establish fora for industry engagement	Procure LTSM	Develop and distribute training programme schedules	Formalise identified WBEs	For non-customised courses, receive examination papers	Address any appeals
3. Activities	Advertise TVET programmes widely in catchment areas		Capture selected applications	Enrol registered learners onto programmes	Review and adjudicate bursary applications	Hold regular engagements with industry	Disseminate LTSM to learners and lecturers	Administer training programme	Allocate students to WBE per programme	Administer examinations and trade tests	Issue certificates
4. Activities			Analyse and review selected applications in line with training programme targets and HDI mix		Recommend to financial aid committee	Customise curriculum to reflect industry needs	Collect loaned LTSM at end of academic year	Deliver training	Undertake and organise WBEs	Marking of exams and trade tests	
5. Activities					Award the bursaries to learners					Completed exam papers are sent for moderation	
6. Activities					Submit learner documentation to NSFAS						
Inputs	Budget, Communication and Marketing specialists	Database system, administrative personnel	Database system, administrative personnel, educators	Learner registration system	Funding	Funding, educators	Textbooks, IT equipment, libraries, media centres	Physical infrastructure, equipment, educators	Stipends	Invigilators, moderators	Administrators, database system
Main programme element	Register and Enrol learners					Curriculum development and assessment	Programme delivery			Quality Assurance	Programme delivery

Table 3: TVET College Logical Framework (Part 2)

Final outputs	Staff employed and capacitated				Infrastructure and equipment in place that meets requirements		Journal Articles and other publications	Product / process developments completed	External projects delivered	A well-managed TVET college				A financially sustainable TVET college			
Intermediate outputs	Human resource plan produced	Staff complement filled and allocated per programme	Lecturers trained and capacitated	Performance evaluations conducted regularly	Infrastructure and equipment duly repaired and maintained	Infrastructure and equipment expanded as per growth requirements	Articles submitted to journals and other publications	Patent registered		Strategic and operational plans	Annual report	A functioning TVET council	Registration with professional bodies and engagement with key stakeholders	Approved budget	Timely salary and service provider payments	Quarterly financial reports submitted to PED	Annual Financial Statements
1. Activities	Analyse enrolment data, staffing levels and infrastructure	Advertise vacant positions	Identify training needs relative to requirements	A performance contract is signed with each staff member	Maintenance schedules created and resourced	Assess infrastructure and equipment needs	Collate a research agenda	Support staff in R&D	Identify potential construction and development projects	Draft strategy and operational plans	Draft annual report	Council delegates responsibilities to academic board and other committees	Register with professional bodies	Cost operational plans by campus / programme	Effect payments	Draft quarterly reports	Draft annual financial statements
2. Activities	Determine staff mix by programme and level	Receive and process applications	Identify potential training providers	Complete Performance evaluations	Conduct maintenance	Develop infrastructure and equipment plan	Incentivise research output through performance management system	Facilitate the registration of patents	Marketing of product offering	College council approves strategic and operational plans	College council approves annual report	The council monitors the implementation of the strategic plan and budget	Participate in events	Apply for bursary funding from NSFAS and NSF for training programmes	Monitor and record payment information	College council approves quarterly reports	College council approves annual financial statements
3. Activities	Develop and approve human resource plan	Adjudicate applications	Ensure training is conducted	Analyse results of performance evaluations and make recommendations	Monitor maintenance schedules	Cost infrastructure and equipment plan	Monitor research output		Execute projects			The council approves policies and procedures (admission, language, financial, HR)		Obtain allocation letters from PED		Submit quarterly reports to PEDs	Submit annual financial statements to PED
4. Activities		Select and recruit staff members				Approve and submit infrastructure and equipment plan	Establish and maintain relationships with research institutions					The council establishes posts for educators and non-educators		Develop and collate total college budget			
5. Activities		Induct new staff members												College council approves budget			
6. Activities																	
Inputs	HR System / PERSAL, HR specialists	HR System / PERSAL, HR specialists	HR System / PERSAL, HR specialists, Service providers, funding	HR System / PERSAL, HR specialists	Physical infrastructure, equipment, maintenance staff, funding	Funding	Funding		Trained staff and equipment	Council, Management, Financial Management Systems and skills		Funding				Council, Management, Financial management systems and skills	
Main programme element	Budgeting, Funding and Resourcing						Curriculum development and assessment		External projects	Budgeting, Funding and Resourcing	Policy and direction setting	Curriculum development and assessment	Budgeting, Funding and Resourcing				

3 PERFORMANCE ANALYSIS

To develop a comprehensive understanding of the performance indicators in the sector, a review was done of all the indicators used by the DHET, by individual colleges and by Provincial Departments of Education (PEDs). Since indicators differed substantially between different colleges, and given the reduced role of PEDs in the TVET, the analysis in Section 3.1 focuses on the indicators used by the DHET. In particular, it discusses the method used to determine appropriateness and comprehensiveness of the range of indicators monitored by the DHET; as well as the lessons learnt from this analysis. Section 3.2 then analyses the actual performance of the TVET sector based on arguably the most important performance indicators in the sector, certification rates and through-put rates.

3.1 Performance Indicators

As many performance-related factors are not practically and/or reliably measurable, performance indicators (PIs) are inherently imperfect measures of the true performance of an institution or programme. Ensuring that the most appropriate and relevant PIs are used can therefore be a difficult task.

To determine the appropriateness of PIs, the set of characteristics that an indicator (or set of indicators) should comply with are first defined. This is often done through the use of a standard set of characteristics that form an abbreviated “apronym”²⁰, such as the S.M.A.R.T. criteria²¹. In this evaluation, an adapted version of the P.R.A.G.M.A.T.I.C.²² apronym criteria, suggested by Williams (2003)²³, was employed.

As discussed in Appendix 5, the P.R.A.G.M.A.T.I.C. criteria is deemed to be a particularly effective approach, as it (a) is a composite of several commonly used apronyms (b) incorporates a number of factors that can be easily overlooked (such as whether an indicator is Game-proof; i.e. not easily malleable or manipulated) and (c) considers how well the indicators are “Integrated”; i.e. how well they are jointly able to measure all the pertinent aspects of the objective or achievement that they are intended to represent.

Applying the P.R.A.G.M.A.T.I.C. criteria (using the innovative methodology described in Appendix 5) to the performance indicators used by the DHET in the 2013/14 Annual Report, it appears that the PIs do not adequately or comprehensively measure the achievement of the DHET’s strategic objectives.

The following figure provides the result of the PI evaluation for DHET, the PEDs and the TVET sector. Each indicator was evaluated separately and categorised as “full” (meets 7-9 out of the 9 criteria), “partial” (meets 4-6 out of the 9 criteria) or “weak” (meets 1-3 out of the 9 criteria) adherence to the P.R.A.G.M.A.T.I.C. criteria.

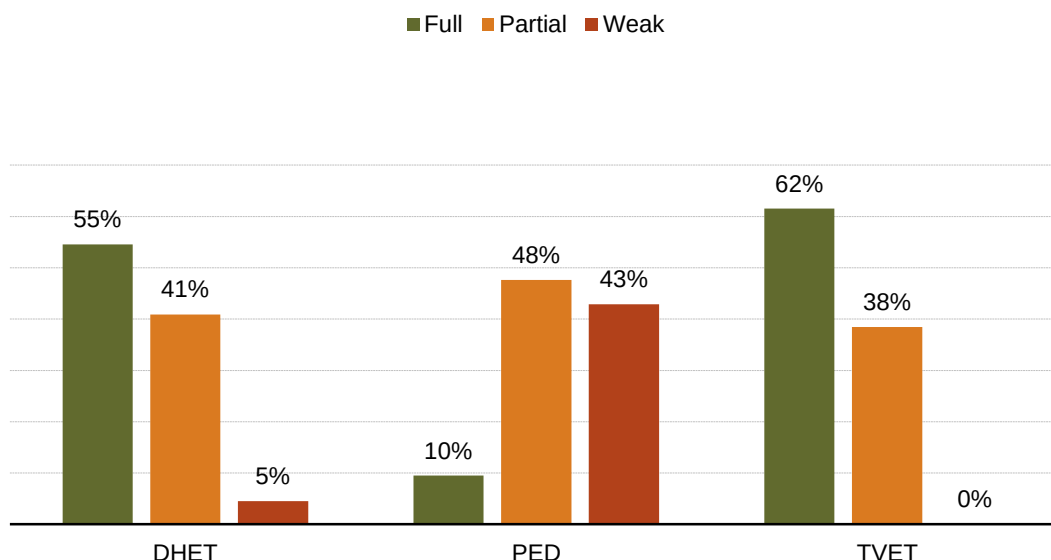
²⁰ An apronym is a type of acronym that spells out a word or phrase relevant to the expanded version

²¹ The S.M.A.R.T. criteria requires that indicators are Specific (and / or Sensible), Measurable, Achievable, Relevant (and / or Reliable / Reportable) and Time-Based

²² The P.R.A.G.M.A.T.I.C. criteria requires that a set of indicators, evaluated jointly, are Proximate, Relevant (and/or reliable), Achievable, Game-proof, Measurable, Appropriate, Timely (or time-based), Integrated, Cost-effective

²³ Williams (2003) *S.M.A.R.T., Q.U.E.S.T. AND F.A.B.R.I.C: ARE THEY MORE THAN JUST ACRONYMS?*

Figure 1: Evaluation of TVET sector Performance Indicators



Source: DNA Economics

The evaluation revealed the following key shortcomings:

- Many indicators only very indirectly relate to its associated objective. For example, it is not clear if indicators such as “the number of colleges councils trained in institutional and corporate governance” are reliable measures of the success in terms of the strategic objective “Improve success in programmes”
- Indicators are insufficiently integrated and internally inconsistent which leads to cases in which not all relevant aspects of performance are measured. For example, as dropout rates were not published in the 2013/14 report, it is not clear how throughput rates differ between programmes, even when certification rates are known.
- Indicators are often not specified at sufficiently achievable and / or granular levels to allow useful analysis of performance relative to target. Given that certification rates for NC(V) are highly variable between different programmes, different colleges and different provinces, just reporting the national certification rate sheds no light on the drivers of this underperformance, nor are potential measurement issues or changes discussed.
- Uncertainty also remains about the degree to which TVET qualifications are valued in the workplace. The NDP identified the lack of business engagement in ensuring that qualifications meet the needs of industry as a key challenge. A 2010 HSRC audit²⁴ found that only 18 out of 50 colleges track the progress of students after they leave college, which makes it difficult to reliably measure the value of obtaining TVET qualifications.
- Total enrolments acts as both the main indicator of access in the system and as the indicator of long term targets. However, if colleges are incentivised to enrol additional students without being simultaneously incentivised to increase performance, there is a risk that throughput rates will

²⁴ Cosser, Kraak and Winnaar (2010), FURTHER EDUCATION AND TRAINING (FET) COLLEGES AT A GLANCE IN 2010

suffer, which means that the number of students who eventually obtain TVET qualifications does not actually increase

3.2 Analysis of Certification Rates

This section focuses on the analysis of what is seen as the main indicator of student performance; certification rates. The analysis of certification rates was all done on 2013 examination results, as detailed 2014 results were not yet available at the time of the study.

It should be noted that certification rates do not perfectly measure all relevant aspects of student performance. A first important limitation is that certification rates are calculated based only on students who pass all the required exams to complete a qualification at a certain level²⁵. They do not take into account cases where students write only a subset of the exams required to proceed to the next level or only pass a subset. For example, a student passing six out of seven NC(V) subjects is treated the same in the calculation as a student who passes zero out of seven. Similarly, a student who completes a level by passing his one outstanding subjects is given the same weight as one who passes the full seven subjects in one attempt.

A second key limitation is that while throughput rates are affected by both dropout rates and certification rates; dropout rate data are available based on examinations data²⁶, which means that those students that enrol in a course and then dropout before the exam is written are not included in the calculation. Therefore the analysed certification and dropout rates do not necessarily accurately measure the throughput rate of the total enrolments at the beginning of the academic year.

3.2.1 Overall sectoral performance

Table 4 below show the average certification, dropout and (estimated) throughput rates for different programmes, based on 2013 examinations data (see Glossary for definitions). Low throughput and certification rates are severely hampering the potential impact of TVET colleges. In 2013, the national certification rate was only 32.5% for NC(V) Level 2 courses. When incorporating drop-out rates the situation becomes even worse; particularly for NC(V) Level 2 with a 2013 national drop-out rate of 28.2%. While accurate throughput rates tracking cohorts of students over the full three years of an NC(V) courses are not available nationally, based on 2013 certification and drop-out rates it can be estimated that only approximately 2.0% of students who start NC(V) courses at Level 2 are likely to complete the entire qualification up to Level 4 within the minimum time period of 3 years.

As students are able to repeat subjects failed, more students from a cohort will graduate in subsequent years (i.e. in more than 3 years). Therefore, the cumulative throughput rate (the number of students who complete the programme in any number of years) is likely to be meaningfully higher than the 3-year estimate. It is not possible to calculate the accurate cumulative throughput rate from the available data. However, if we assume that all students enrolled in a programme repeat each level once in cases

²⁵ Certification rates are defined as the number of students who successfully completed a certain qualification / programme, as a percentage of the number of candidates who were eligible to complete this qualification / programme and wrote all the necessary examinations to do so. e.g. [Number completing NC(V) Tourism at level 2] / [Number eligible to complete NC(V) Tourism L2 and writing all necessary exams to do so]

²⁶ As with the calculation of certification rates, the calculation of dropout rates only include the population of students who are enrolled in a sufficient number of subjects that would (if all passed) enable them to proceed to the next level of the qualification; i.e. if a student is enrolled in only a subset of the exams required to pass the relevant qualification, the student will not be included in the calculation of either dropout or certification rates

where they do not complete that level on the first attempt, then on average 10.6% of students complete an NC(V) programme within six years, based on 2013 data.²⁷

Table 4: NC(V) Certification Rates by programme

NC(V) Programmes	Certification rates			Dropout rates			Throughput rates (within minimum time)			
	L2	L3	L4	L2	L3	L4	L2	L3	L4	L2-L4
Civil Engineering & Building Contr.	23%	20%	26%	31%	14%	13%	16%	17%	23%	0.6%
Education and Development	44%	60%	61%	28%	12%	10%	32%	53%	55%	9.3%
Electrical Infrastructure Constr.	23%	26%	29%	29%	10%	9%	16%	23%	26%	1.0%
Engineering and Related Designs	25%	19%	23%	29%	16%	11%	17%	16%	21%	0.6%
Finance, Economics & Accounting	30%	30%	28%	30%	12%	7%	21%	26%	26%	1.4%
Hospitality	40%	41%	37%	24%	15%	10%	30%	35%	33%	3.4%
IT and Computer Science	18%	15%	21%	32%	13%	11%	12%	13%	18%	0.3%
Management	33%	30%	44%	31%	13%	10%	23%	26%	40%	2.4%
Marketing	35%	41%	39%	30%	15%	11%	24%	35%	34%	2.9%
Mechatronics	29%	22%	29%	19%	6%	2%	23%	21%	29%	1.4%
Office Administration	43%	33%	47%	24%	13%	10%	33%	29%	42%	3.9%
Primary Agriculture	26%	35%	28%	22%	10%	9%	20%	32%	26%	1.7%
Primary Health	61%	N/A	N/A	29%	N/A	N/A	43%	N/A	N/A	N/A
Process Plant Operations	40%	40%	45%	26%	18%	8%	30%	32%	42%	4.0%
Safety in Society	47%	43%	49%	29%	20%	14%	34%	35%	42%	4.9%
Tourism	41%	42%	63%	31%	14%	9%	29%	36%	57%	5.9%
Transport and Logistics	42%	61%	N/A	29%	16%	N/A	30%	51%	N/A	N/A
Total	33%	30%	37%	28%	13%	10%	23%	26%	33%	2.0%

Source: DHET 2013 Examinations Data

The strikingly low performance in certain programmes are of particular concern. Certification rates are particularly low in the engineering and information technology programmes within NC(V). By looking at individual subject pass rates collected by DNA Economics during field visits, it becomes clear that low pass rates in a small number of subjects – particularly mathematics – are the major cause of these low certification rates. Mathematics, rather than Mathematical Literacy, is a compulsory part of part of NC(V) Engineering courses, but typically not for NC(V) programmes. Interviewed college officials indicate that they attempt to overcome this problem by:

- Increasing the entry requirements for subjects with low certification rates; often by only accepting Grade 11 or 12 graduates rather than Grade 9 or 10 graduates. This contrasts to the original intention of NC(V) programmes as a parallel stream to the last three years of high school. The total cost per student to the whole education sector also increases if students first need to complete higher levels in the Basic Education system before entering the TVET system

²⁷ This calculation assumes that the dropout and certification rates for those who repeat a level is the same as those for those who enrol in a level for the first time. As the figures in Table 4 include both first time and repeat students it is not clear whether this calculation is likely to over- or underestimate the true 6 year throughput rate. In addition, not all students will repeat their qualification; which would mean that the true rate is likely to be lower) than estimated here. In a minority of cases students might be able to repeat a level more than once, although NSFAS funding would not be available to such students.

- Increasing the number of hours allocated to mathematics training, either through additional mathematics lectures (and hence reductions to other subjects) or through employing additional staff members to provide direct assistance to individual students
- Through bridging programmes that attempt to consolidate previous learning

Table 5 shows us that, when compared to NC(V), NATED performance, measured in terms of the proportion of students who complete their qualification in the minimum time, is generally better than NC(V) for Engineering Studies N1 to N3 (9.7%) and Engineering studies N4 to N6 (12.3%) while approximately equivalent performance is achieved for Business Studies (2.3%). These rates have to be interpreted taking into account that many students enrol in a course with the intention of only completing one level. Consequently, throughput rates across all the levels of NATED might not be the most relevant measure of performance; and the throughput rate for each level should receive greater focus. Furthermore, as mentioned in the discussion of NC(V) through-put rates, a proportion of students in a defined cohort might repeat levels (often only a subset of subjects when some but not all are passed) and consequently graduate in subsequent periods. This is not captured in the average throughput rates over the three levels of the NATED courses.

Another point worth noting is that certification and throughput rates in Engineering Studies are significantly higher than those in other programmes. Since roughly half of Full-Time Equivalent student in NATED are enrolled in Engineering Studies, a large proportion of most colleges' graduates are in these programmes.

Table 5: NATED / Report 191 Certification Rates by programme

	Certification rate			Dropout rate			Throughput rate (within minimum time)			
N1-N3 Programmes	N1	N2	N3	N1	N2	N3	N1	N2	N3	N1-N3
Engineering Studies	50%	47%	45%	4%	2%	2%	48%	46%	44%	9.7%
N4-N6 Programmes	N4	N5	N6	N4	N5	N6	N4	N5	N6	N4-N6
Engineering Studies	54%	52%	46%	2%	2%	2%	53%	51%	45%	12.3%
Art and Design	44%	50%	59%	8%	3%	4%	41%	49%	57%	11.4%
Business Management	34%	40%	17%	6%	5%	5%	32%	38%	17%	2.0%
Clothing Production	42%	58%	46%	10%	2%	10%	37%	57%	42%	9.0%
Educare	40%	51%	48%	5%	6%	2%	38%	48%	47%	8.6%
Financial Management	30%	51%	27%	4%	4%	3%	29%	49%	26%	3.7%
Hospitality and Catering	25%	39%	30%	4%	3%	1%	24%	38%	29%	2.7%
Human Resource Management	30%	22%	25%	5%	3%	4%	29%	21%	24%	1.5%
Introductory Art and Design	52%	N/A	N/A	3%	N/A	N/A	50%	N/A	N/A	N/A
Introductory Business Studies	35%	N/A	N/A	4%	N/A	N/A	34%	N/A	N/A	N/A
Introductory Clothing Prod.	31%	N/A	N/A	0%	N/A	N/A	31%	N/A	N/A	N/A
Management Assistant	44%	31%	40%	5%	5%	5%	42%	30%	38%	4.7%
Marketing Management	33%	37%	21%	5%	5%	2%	31%	36%	20%	2.3%
Public Management	25%	27%	34%	6%	4%	3%	24%	26%	33%	2.0%
Public Relations	45%	32%	22%	4%	4%	3%	43%	31%	21%	2.8%
Tourism N	40%	29%	37%	4%	5%	2%	38%	28%	36%	3.9%
Total N4-N6 Business	34%	33%	27%	5%	4%	4%	32%	32%	26%	2.7%

Source: DHET 2013 Examinations Data

3.2.2 Provincial differences

Since the administration of TVET colleges has historically been a provincial function and funding has also varied by province, it might be expected that there are provincial differences in performance as well. As indicated by Figure 2, there are significant difference in annual certification rates by province. For example, all six colleges in the Western Cape achieve average NC(V) certification rates in excess of 35%, whereas all four colleges in the Free State have average certification rates below 30%. Similar provincial trends are observed in Figure 3 for NATED, with certification rates typically being higher than for NC(V). As will be discussed in Section 4.3, there appears to be a relationship between provincial funding levels and certification rates, but given the significant intra-provincial variances in certification; it is clear that this is only one of several factors influencing college academic performance. Section 4.3 explores the relationship between performance and expenditure in greater depth.

Figure 2: NC(V): Number of colleges, by province, with average certification rates in specified bands

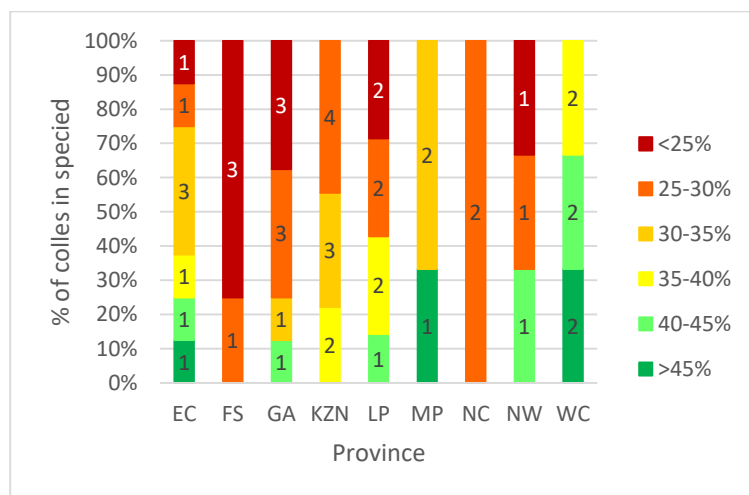
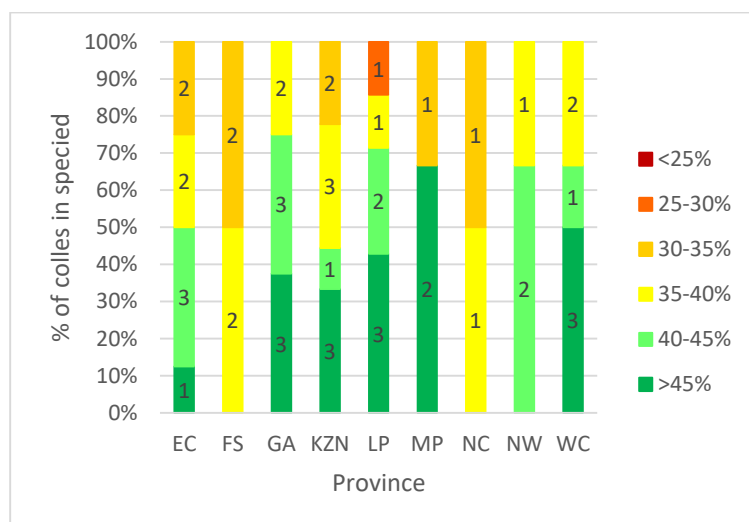


Figure 3: NATED: Number of colleges, by province, with average certification rates in specified bands



4 REVENUE AND EXPENDITURE ANALYSIS

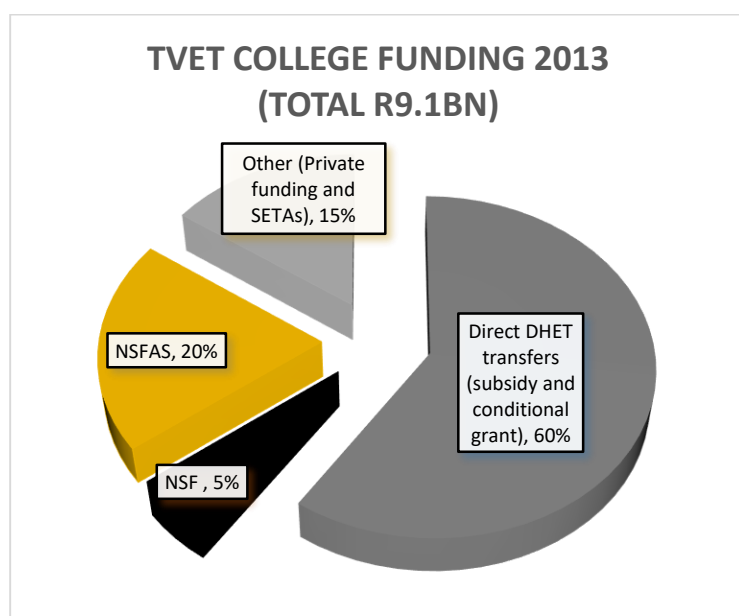
This section will provide an overview of the sources and size of the funding of the TVET sector, before discussing the methodology and findings of the expenditure analysis that was conducted. It concludes by looking at the relationships between expenditure and performance.

4.1 Revenue

4.1.1 Sources of funding

As indicated in Figure 4 below, TVET colleges in 2013 received a total of R9.1bn in funding, with the vast majority of their funding from government sources²⁸. A key change in college funding in recent times, is the substantial increase in the amount of student bursaries and loans provided by NSFAS; increasing from R0.3bn in 2009 to R1.83bn in 2013 in an attempt to increase access to the TVET sector. This has made TVET colleges even more reliant on public funding by reducing the proportion of funds received from privately funded students for tuition, transport and accommodation.

Figure 4: Overall TVET funding by source in 2013



4.1.2 DHET funding model

As indicated in Figure 4, the primary funding source is direct transfers from the DHET, either to colleges themselves or directly to college staff that are registered on PERSAL. This funding is allocated on the basis of Full-Time Equivalent (FTE) enrolments in NC(V) and NATED programmes using a funding norm that allocates different amounts by NATED and NC(V) programme. For example, in 2014/15 the funding model assumes that it costs R59,986 per FTE to deliver NC(V) Hospitality, whereas it assumes R31,443 per FTE for NC(V) Office Administration.

Total revenue that flows to a college is then calculated by multiplying the funding norms per programme by the number of FTE enrolments in that programme. The funding norm is capped; this

²⁸ Note that the "Other" funding category in Figure includes SETA funding – i.e. not exclusively non-government funds – as it was not possible to isolate funding from SETAs from other project funding received by colleges from private entities.

simply means that the maximum subsidy that can be made available to colleges is limited to 80% of the total amount estimated in terms of the funding norms. Colleges were encouraged to find the remaining 20% from other sources.

However, in practice all colleges receive only a proportion of this 80% from the DHET based on two factors: (i) the total funds made available for the TVET sector and (ii) the province they are located in. Therefore, Limpopo colleges received 52% of the 80% they were entitled in terms of the funding norms, compared to 79% in the Eastern Cape.

Despite college funding and administration being migrated to being a national function, there is still considerable variation in the funding received by provinces. Even though funding norms is used to determine the funding requirement based on FTE students, the difference between the funding received and the capped funding norm differs substantially by province. This reflects the use of the provincial allocations that were in place before the function shift, when different provinces prioritised TVET training to different degrees. Table 6 illustrates the wide variation between provinces in the percentage of required funding.

Table 6: Percentage of required funding received by province

College	Province	Percentage of capped funding norm*
Buffalo City	Eastern Cape	79%
East Cape Midlands	Eastern Cape	79%
Cape Town	Western Cape	77%
Boland	Western Cape	77%
South Cape	Western Cape	77%
Nkangala	Mpumalanga	73%
Flavius Mareka	Free State	64%
Orbit	North West	62%
Esayidi	Kwazulu-Natal	58%
Umgungundlovu	Kwazulu-Natal	58%
Thekwini	Kwazulu-Natal	58%
Lephalale	Limpopo	52%

Source: DNA Economic calculations and DHET data

*Note: When the maximum funding that a college can receive is capped at 80%

Based on our analysis of the differences between actual and the funding norms, the following observation are noteworthy:

- The formula does not appear to incorporate any college specific factors, other than the province the college is based in and its enrolments.
- The funding norms assumes that the programme funding model is equally appropriate for all colleges, regardless of whether they are urban or rural, large or small, or produce high certification rates or not.

- The funding model's indifference to student performance also does not incentivise colleges to improve performance. It can even create a perverse incentive to enrol more students even if dropout rates are high, as funding is allocated regardless of dropout rates.²⁹

As discussed in Section 4.2.5 in practice colleges differ substantially not only how much they spend per student in total, but also how much they spend on the different categories of expenditure; which suggests that college context should perhaps also play a role in funding allocation.

4.2 Expenditure Analysis

4.2.1 Approach

The original mandate of the project was to analyse expenditure and performance using data available centrally within the DHET. However, after analysing the available data, it became apparent that it was not possible to determine expenditure at the level of the individual programme and compare individual programmes to one another. Without the ability to calculate how much colleges were spending on specific programmes it was not possible to draw meaningful conclusions on the drivers of expenditure.

Historically, accurate detailed data for the TVET sector has been difficult to find, as was highlighted by a 2010 audit of the sector conducted by the HSRC³⁰. While the quality and quantity of data available centrally has improved - due to standardisation and centralisation initiatives driven by the DHET, as well as a multi-year DHET contact with SAICA to ensure that colleges have sufficient financial management and reporting skills – data is often still lacking in accuracy and/or consistency. In particular, analysis of central data revealed that college expenditure data was not available in consistent formats and frequently contained inaccuracies or anomalies that could not be resolved without detailed analysis. It was therefore clear that colleges would have to be contacted individually if a meaningful expenditure analysis was to be conducted.

To achieve this, data on each of the types of NCV and NATED programmes was directly collected from a sample of colleges selected on the following criteria:

- Availability of detailed college trial balance information to ensure accuracy by validation
- History of accurate financial data; based on having an unqualified audit opinion in a recent year
- Ensure a mix of urban (7) and rural / semi-rural (8) colleges
- Include colleges from 8 provinces
- Include 4 colleges from KwaZulu-Natal and 4 colleges from Western Cape to investigate the substantial observed performance and spending differences between these provinces

A map showing the location of the selected colleges is included in Appendix A 1.2.

²⁹ The DHET have indicated that the funding norms do in theory include an incentive for performing colleges through a performance bonus. However, due to financial constraints such performance bonuses have not been allocated. The DHET further have stated that *"The norms initially provided that those colleges that are not performing should have budget cuts but there was an outcry that this punishes other prospective students who would not have recourse if the enrolment figures have to be dropped due to decrease in the budgets of non performing colleges."*

³⁰ Cosser, Kraak and Winnaar (2010), FURTHER EDUCATION AND TRAINING (FET) COLLEGES AT A GLANCE IN 2010

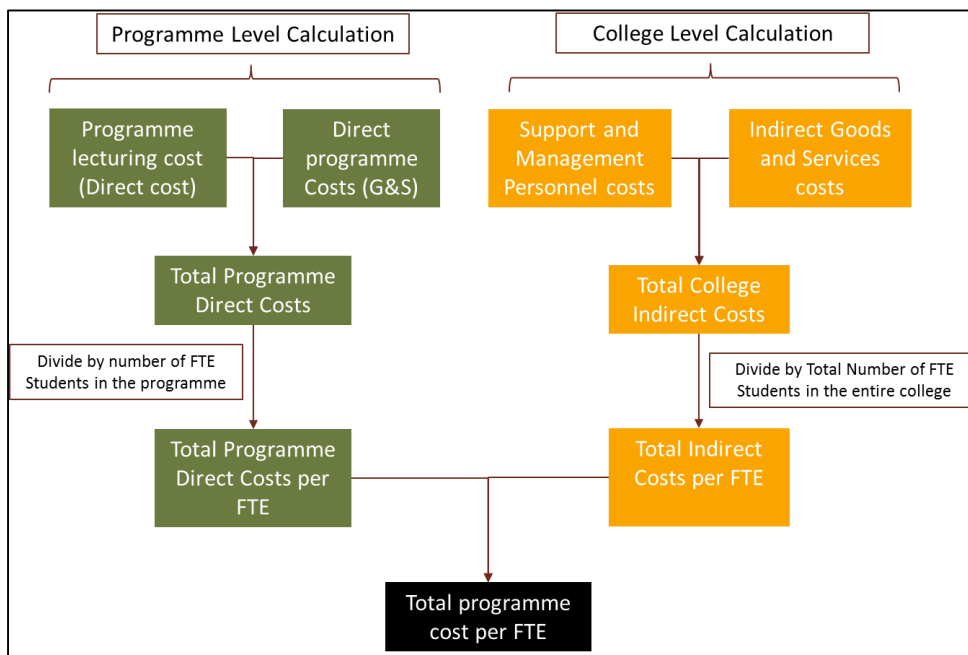
4.2.2 Data Analysis Methodology

Detailed data on the following expenditure categories / topics were collected directly from sampled colleges:

- Direct programme costs (textbooks, LTSM etc.)
- Lecturer salaries
- Number of Full-Time Equivalent (FTE) lecturers employed per programme
- Expenditure split by lecturer, management and support staff
- A small number of qualitative questions on key college financial challenges

This information was then supplemented by data taken from financial statements, trial balances and PERSAL, to ensure that all 2014 college expenditure would be accurately included and could be allocated first to expenditure categories and then to programmes. The final output of the calculation is the amount spent by each college per FTE student (which will be referred to occasionally as the “unit cost”) for each of the programmes it presents. Figure 5 provides a high level representation of this calculation; while a detailed description of the methodology and its limitations is provided in Appendix 1.

Figure 5: Expenditure Analysis Methodology



While the initial sample included 15 colleges, sufficiently accurate data was only received from 12 of these colleges, despite the best efforts of the project team. The three colleges were excluded due to student unrest, an inaccurate data submission and unresponsiveness of key officials respectively.

The project team visited each of the sample colleges for one day to validate the information provided to understand the college’s programme offering, delivery approach, the main challenges it faces and how these challenges are addressed in practice.

4.2.3 College level expenditure

Table 7 lists how much each college spent per student on its lowest cost, average cost and highest cost programme within NC(V) and NATED separately. For example, Buffalo City college spent R35,792 per FTE student on its lowest cost NC(V) programme (Office Administration), R45,022 on its most expensive NC(V) programme (Mechatronics) and R37,708 on average across all NC(V) programmes. The table is listed in descending of the average costs.

The table displays the substantial differences in unit costs (expenditure per FTE) amongst colleges; with average spending on NC(V) ranging from R20,063 to R39,925 and average spending on NATED ranging from R15,462 to R36,763 per FTE.

Table 7: Minimum, average and maximum college programme expenditure per FTE

College	Minimum Expenditure per FTE (2014)	Average Expenditure per FTE (2014)	Maximum Expenditure per FTE (2014)
NC(V)	R 17,561	R 29,220	R 48,362
South Cape	R 37,462	R 39,925	R 44,023
Buffalo City	R 35,792	R 37,708	R 45,022
Boland	R 33,693	R 36,812	R 48,362
Cape Town	R 29,895	R 33,589	R 45,024
East Cape Midlands	R 31,074	R 32,744	R 36,473
Nkangala	R 24,561	R 31,663	R 34,873
Flavius Mareka	R 22,988	R 26,368	R 31,407
Thekwini	R 23,049	R 24,746	R 28,637
Umgungundlovu	R 18,601	R 23,681	R 28,564
Lephalale	R 19,221	R 20,898	R 24,985
Esayidi	R 19,058	R 20,519	R 22,744
Orbit	R 17,561	R 20,063	R 26,434
NATED	R 13,703	R 21,401	R 105,782
South Cape	R 31,627	R 36,763	R 39,480
Boland	R 27,793	R 31,627	R 43,101
East Cape Midlands	R 21,837	R 25,228	R 32,505
Cape Town	R 21,222	R 25,061	R 51,592
Umgungundlovu	R 20,920	R 22,823	R 24,832
Thekwini	R 16,552	R 22,678	R 27,905
Buffalo City	R 18,951	R 21,842	R 26,918
Nkangala	R 17,468	R 19,496	R 24,349
Orbit	R 13,703	R 18,974	R 105,782
Esayidi	R 16,846	R 18,256	R 20,934
Flavius Mareka	R 14,475	R 15,919	R 20,191
Lephalale	R 14,409	R 15,462	R 59,496
Overall	R 13,703	R 24,799	R 105,782

Source: DNA Economics calculations

These differences in average spending appear to be largely related to funding, as might be expected. Figure 6 displays average college expenditure on NC(V) against the level of funding received in 2014 as

a proportion of the capped funding norm. As discussed in Section 4.1.2, although funding requirements are calculated using the same enrolment based formula for all colleges, provinces receive different proportions of this requirement. Figure 6 shows that in the sample, colleges in better-funded provinces like the Western Cape and Eastern Cape spend substantially more than those in low-funding provinces such as Limpopo or KwaZulu-Natal.

What is also interesting about this result is that, in the sample, a 1% increase in funding is, on average, associated with 2.2% (R 657) higher NC(V) per FTE expenditure³¹. This disproportionate increase in spending suggests that better funded colleges are also more able to attract other sources of funding.

Figure 6: Average NC(V) College Expenditure per student FTE relative to funding



4.2.4 Programme level expenditure

Contrary to what might be expected based on the programme level funding norms, unit costs don't typically differ substantially between different NCV and NATED programmes within the same college; as is evident, firstly, by looking horizontally within a college in Table 7. With the exception of a few isolated cases, the range between minimum and maximum programme expenditure per FTE within a college is small relative to the average. Indeed the cost of the most expensive NC(V) programme in the five lowest expenditure colleges is still lower than the minimum expenditure in the five most expensive colleges. For NATED, the same observation is broadly true, except for a few cases where maximum expenditures are very high.

In fact, these high maximum values – for example the R105 782 maximum observed for NATED Tourism studies at Orbit college - are usually the result of very low student numbers in a programme that result in fixed lecturing costs being divided between these few students. These do not appear to be indicative of variances in the underlying costs of presenting different programmes.

Table 8 focuses on the minimum, average and maximum amounts per FTE that different colleges spent on the NC(V) and NATED programmes. It is again immediately evident that there is very little difference in the average amounts spent on different programmes, with NC(V) between R26,426 and R31,445

³¹ Similarly, spending on NATED programmes increase on average by 1.8% (or R393) per student for a 1% increase in funding

and NATED between R19,686 and R24,527. The wide variances between minimum and maximum expenditure levels are determined largely by differences in total funding available to different colleges, rather than underlying complexity associated with delivering the different types of NATED and NC(V) programmes.

It appears likely that (within the sample) NC(V) programmes subsidise NATED programmes to some extent; since NC(V) programmes on average receive 80% higher funding than NATED programmes per FTE, while average spending per FTE is only 37% higher in the sample. This can be seen from last two columns of Table 8, which provide the programme costs from the funding norms and a comparison of the average expenditure to this norm. Average expenditure on NC(V) programmes is typically only about 60% of funding norm costs, whereas NATED average costs in some cases even exceed the norm cost.

Table 8: Minimum, average and maximum college programme expenditure per FTE (in R)³²

	Minimum Expenditure per FTE	Average Expenditure per FTE	Maximum Expenditure per FTE	Funding Model (Normed) Cost 2014/15	[Average Exp.] as a % of [Normed Cost]
NATED	13,703	21,401	105,782	25,666	83%
Management Assistant	14,495	24,527	39,383	19,818	124%
Educare	13,703	22,875	59,496	24,074	95%
Financial Management	16,886	22,667	34,069	19,818	114%
Business Management	17,342	20,863	36,370	19,818	105%
Engineering Studies N4-N6	16,260	20,783	27,610	23,406	89%
Human Resource Management	14,409	20,302	31,627	19,818	102%
Engineering Studies N1-N3	14,475	19,686	39,480	20,063	98%
NC(V)	17,561	29,220	48,362	46,349	63%
IT and Computer Science	20,658	31,939	44,023	48,200	66%
Hospitality	21,344	31,445	48,362	59,986	52%
Tourism	17,561	31,094	38,733	45,690	68%
Electrical Infrastructure Construct.	18,601	29,406	41,387	48,938	60%
Engineering and Related Designs	20,390	29,349	41,372	64,359	46%
Civil Engineering & Construction	19,058	28,937	41,860	49,615	58%
Finance, Economics and Accounting	19,343	27,627	36,406	35,176	79%
Office Administration	19,131	26,426	40,626	31,443	84%
Total	13,703	24,799	105,782	36,007	69%

Source: DNA Economics calculations

4.2.5 Breakdown by category of expenditure

To understand why there is so little variance between programme level spending within a college and why NC(V) costs diverge substantially from the costs specified in the funding norms, it is useful to compare the breakdown by category of expenditure between actual NC(V) expenditure in the sample and what is assumed in the funding model, as given in Table 9. Comparing the last two rows in the table, it becomes clear that while the proportion spent on staff compensation is fairly well aligned to

³² Note that the table only includes those programmes that are presented by 8 or more colleges to save space and allow focus on the programmes where sufficient data exists to draw conclusions.

what is assumed in the funding norms, substantially less is spent on direct programme costs than was anticipated.

The total full cost per FTE was calculated as the sum of four expenditure categories:

1. Lecturing staff costs
2. Director Programme Costs
3. Indirect Goods and Services Programme Costs
4. Support and Management Costs

Appendix 1 contains a description of what is included in the calculation in each of these categories.

The DHET has prescribed a 63% funding norm on compensation of employees from 2015 onwards; and hence we would expect variances between colleges in terms of categories of spending to reduce over time as colleges adjust to the new regime. However, it should also be noted that capital expenditure was not included in Table 9, and hence the percentages given here for compensation of employees would be higher than the percentages if capital expenditure was included in the analysis.

Table 9: Proportion of NC(V) spending on different expenditure categories

College	Lecturing Staff	Support & Management Staff	Direct Programme Costs	Indirect Goods & Services Costs
South Cape	34%	20%	1%	44%
Nkangala	52%	12%	6%	28%
Cape Town	55%	15%	3%	25%
Boland	41%	18%	7%	34%
East Cape Midlands	46%	15%	6%	29%
Buffalo City	58%	14%	2%	26%
Flavius Mareka	53%	17%	6%	19%
Esayidi	44%	18%	14%	25%
Lephalale	45%	22%	8%	25%
Orbit	43%	20%	12%	25%
Thekwini	51%	16%	3%	30%
Umgungundlovu	45%	18%	2%	35%
Average of sampled colleges	47%	17%	6%	29%
Funding Norm Model Breakdown	42%	18%	25%	14%

Source: DNA Economics calculations & Figaji (2009), Report on investigation into FET College Funding Norms

Case Study: The impact of college context on categories of spending

From interviews conducted with college representatives it was apparent that there are several contextual factors that determine college level differences in the breakdown of spending. While the data sample is not sufficiently large to meaningfully analyse such aspects quantitatively, an example can be instructive of potential wider issues: Among the three Western Cape colleges in the above table, Cape Town college spends substantially less on goods and services than South Cape college and Boland college, and (hence)

proportionally much more on lecturing costs. During interviews it became apparent that Boland and South Cape, being rural or semi-rural colleges have campuses that are geographically widely spread, and hence can incur meaningfully high costs on student transport and accommodation due to the far distances that students frequently have to travel (which can exceed NSFAS allocations) or the expenses incurred when programmes are centralised to being presented on only one campus. Conversely, Cape Town college is an urban college and encounters comparatively low student transport costs, but faces much greater challenges in retaining skilled lecturers due to the high cost of living and greater range of employment alternatives available in the area; which can raise lecturing costs. Such issues should be investigated in more depth to determine the appropriate funding mechanisms for different college.

The relatively low variance in spending between different programmes and the substantially lower spending on direct programme costs than funding norms both suggest that programme delivery is much less practical (and hence less costly) than was envisioned in the design of NC(V) programmes³³. This point was also corroborated through our interviews with the colleges.

A large number of college officials interviewed confirmed that NC(V) programmes are often delivered in a substantially less practical way than was likely intended at the time that the programmes were designed. This seemingly reflects not only decisions to reduce costs by limiting direct programme costs or workshop equipment costs, but in some cases also decisions to prioritise theoretical teaching in an attempt to increase low pass rates in theoretical examinations. College officials often drew the distinction between truly practical sessions (learning through doing it yourself) and learning through being shown or told how a practical task is done.

Textbook retention policies

A key cost driver in terms of direct programme costs, is the extent to which colleges are able to retain (i.e. re-use) the textbooks from one year to the next. Interviewed colleges reported vastly different retention rates of textbooks; with estimates ranging widely both between colleges and over time within individual colleges. This appears to be the result of several factors. Firstly, there appears to exist (or have existed) a lack of consistency in policy and confusion about the appropriate policy (which differed by province in the past) where even within a specific college, policies have often changed from year to year, weakening the collection process. Secondly, colleges report that some students refuse to return textbooks, claiming that it belongs to them given that the NSFAS funding was allocated directly to students. Thirdly, frequent changes to syllabi have also reduced colleges' ability to re-use textbooks in certain programmes.

³³ Note that other factors could also affect relatively low direct programme costs, rather than just reducing the practical component of programmes. For example, if colleges are able to re-use textbooks and / or toolkits over multiple years (the degree to which this happens appears to vary widely across both time and colleges) that would substantially reduce programme costs without compromising the nature of programme delivery

4.3 Relationships between expenditure and performance

Given the relatively small sample available and the large number of potentially relevant factors for which data is not available, it is not possible to perform a reliable analysis on the underlying determinants of performance as it relates to spending. However, looking at the relationships between expenditure and performance data does still deliver a number of interesting results that can form the basis for future research and discussion.

In particular, as both programme level expenditure and programme level pass rates were available for each of the colleges in the sample³⁴, it is possible to perform linear regressions over a fairly large number of observations and obtain statistically significant results despite including a number of programme and college specific control variables³⁵.

Three particularly noteworthy results on the relationship between performance and expenditure:

- **NC(V) Certification rates increase by 0.8% for a R1000 increase in expenditure per FTE.** As might be expected, colleges that spend more achieve significantly better results. While we should be careful not to interpret this result as saying that increasing spending will necessarily increase certification rates, it does suggest that within the sample the colleges that receive more funding and / or are more able to attract other funding sources perform better. It is thus important to not conflate the concept of lower costs per enrolment with the concept of lower cost per graduate; as is discussed in greater depth in later sections
- **NC(V) Certification Rates increase by 2.1% for every 100 additional student enrolled in a programme.** At first glance, this results appears counter-intuitive; as education theory suggests that smaller class sizes typically result in better student performance. However this result does not relate to smaller class sizes, but rather states that colleges perform comparatively better in programmes in which they have a larger number of enrolments than others. This is likely reflective of colleges being able to provide better student support and teaching in subjects where they have a sufficiently large base of students. If this result is observed more widely it would justify encouraging colleges to increase enrolments on the programmes that they present well, although this might reduce student access to smaller programmes. This provides some support for the creation of Centres of Specialisation, as is being implemented by the DHET³⁶.

³⁴ It should be noted however that certification rates are not yet available for 2014 at the time of writing, and therefore 2014 expenditure data is compared to 2013 certification data; which potentially reduces the accuracy of the analysis

³⁵ See Appendix 1 for a discussion on the analysis conducted

³⁶ DHET (2015) *How to become a Centre of Specialisation*

- **Colleges that spend more on staff development (as a proportion of their total compensation bill) have significantly higher certification rates.** Since staff development comprises only a fairly minor portion of total expenditures (and less than 1% of compensation spending typically) it is potentially an important mechanism to improve performance. However, it is likely that the exact nature and practical usefulness of staff development will be at least as important as the amount of money spent on it. The approach taken by East Cape Midlands College (described below) provides an interesting perspective in this regard.

East Cape Midlands staff development approach

During 2013, East Cape Midlands registered the highest average certification rates for NC(V) programmes amongst all colleges in the country. College officials suggested that this might be related to their approach to staff development. The lecturing ethos espoused by ECM management is to ensure that lecturers are properly trained and prepared for all types of lessons that they deliver; in particular that they are sufficiently exposed to industry practices. Initiatives are implemented so that lecturers are kept abreast of the latest developments in their field and versed in the latest relevant pedagogical techniques. Improving subject knowledge is enhanced by proactive steps to identify gaps in lecturer's knowledge. Gaps are addressed by implementing plans and processes (e.g. Lecturer Work Based Education and Training, Worker Integrated Learning [WIL], Sharing best practices [focus groups] and Refresher workshops) to improve subject knowledge and capacity to deliver programmes. These actions are complemented by improving access to adequate and relevant teaching and learning resources and equipment (e.g. Information Technology).

5 COSTING AND PROJECTIONS

5.1 Description of the costing model

The costing model utilises the data from the expenditure review to estimate three types of unit costs for a user-determined cohort of students progressing through the three levels of NC(V) and NATED programmes. For a single college, the costing model can estimate:

- the cost per enrolment
- cost per FTE student
- certification and graduate

Included in the model are parameters that the user can calibrate to allow them to realistically estimate unit costs. For instance, based on the low throughput rates at TVET colleges, the model assumes that each student is likely to repeat each level at least once. The model then allows the user to determine the:

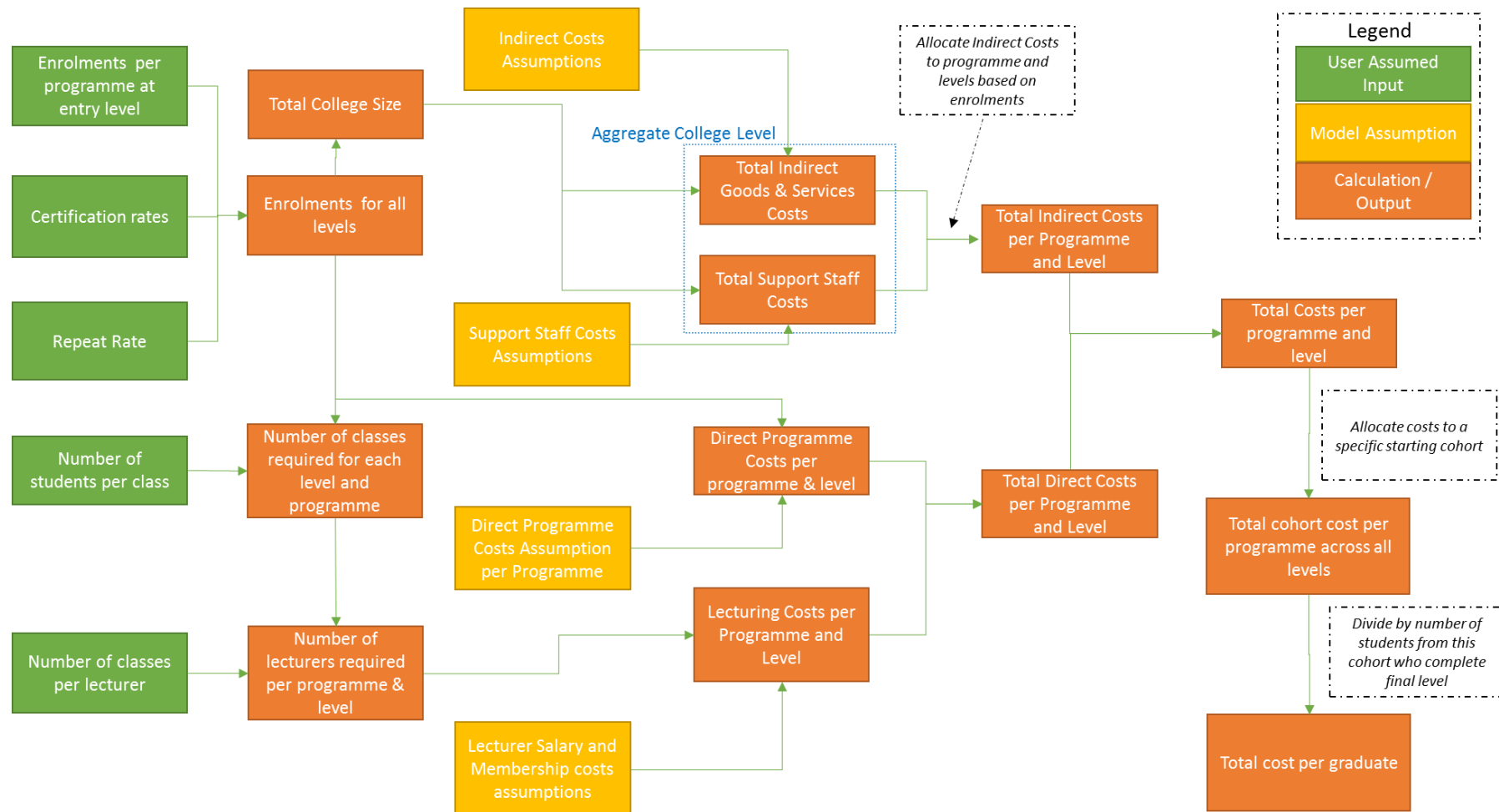
- percentage of students that will repeat the year,
- number of subjects that each student will be repeated.

The model is built on the statistical relationships between costs and parameters derived during the expenditure analysis.³⁷ Some of these parameters include class group size, students per lecturer, number of FTEs etc. These statistical relationships were then used to allocate costs to student FTEs. This in turn allows the model to estimate the costs per enrolment, per student FTE, per certification and per graduate.

The model utilises user-defined parameter values to calculate and present the results of alternative scenarios. A graphical illustration of the model is shown below. The associated explanation of how changes in parameter values impact the model to change the final result is presented in Appendix 2.

³⁷ Information on the estimation of these relationship is available in **Error! Reference source not found..**

Figure 7: The costing model methodology



5.2 Calibration and parameter values

This section describes the output of a model for a specific college. To illustrate how the model works, it was calibrated according to the values presented in Table 10. The “First level enrolment” and “Certification rate” values are based on the real 2014 values of a randomly selected college from the PER sample. The “Target class size” and “Classes per lecturer” values are based on averages across the colleges in the sample. Lastly, estimates were used for the “repeat rate” and “Number of subjects in repeat year” values as there is not sufficient data to accurately estimate the values of these variables in practice.

Table 10: Parameter values

Programme	NATED/NCV	First level enrolment	Certification rate	Target class groups size	Repeat rate	Number of subjects in repeat year	Classes per lecturer
Civil engineering construction	NCV	60	30%	25	50%	3	4.5
Electrical infrastructure construction	NCV	420	30%	25	50%	3	4.5
Engineering & related design	NCV	566	30%	25	50%	3	4.5
Finance, economics & accounting	NCV	197	25%	35	50%	3	4.5
Hospitality	NCV	115	40%	35	50%	3	4.5
IT & computer science	NCV	74	20%	30	50%	3	4.5
Education and Development	NCV	52	60%	35	50%	3	4.5
Office administration	NCV	304	35%	35	50%	3	4.5
Tourism	NCV	64	40%	35	50%	3	4.5
Engineering Studies N1-N3	NATED	4020	60%	25	50%	2	4.5
Engineering Studies N4-N6	NATED	630	55%	25	50%	2	4.5
Business Management	NATED	560	35%	35	50%	2	4.5
Financial Management	NATED	246	25%	35	50%	2	4.5
Human Resource Management	NATED	854	20%	35	50%	2	4.5
Management Assistant	NATED	298	35%	35	50%	2	4.5
Tourism N	NATED	320	40%	35	50%	2	4.5

5.2.1 Student enrolment at first level of each programme

Each college has its programme qualification mix, that is the number of NCV and NATED programmes it can deliver and the number of students it can enrol in each of these programmes. Along with certification rates, the number of students enrolled in the first level of NCV and/or NATED has a direct impact on the number of FTEs in the entire college. The more first year entrants, certification rates being equal, the more FTEs in the entire college.

The size of the college matters because it influences indirect costs. There are two components to indirect costs in FTE colleges: a fixed component (e.g. the student administration IT system) that does not vary with the number of student FTEs and a variable component that is related to the number of students enrolled. The model works on the assumption that increasing total student FTEs will increase aggregate expenditure, but will decrease the indirect costs per student FTE, as fixed costs are spread over more students.

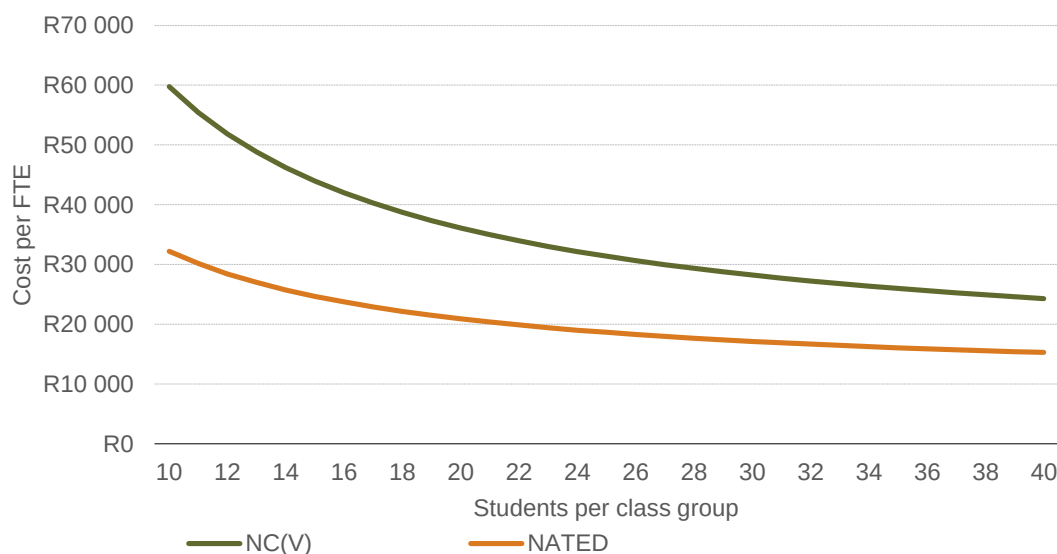
5.2.2 Class group size

The class group size is defined as the maximum number of students in a single class or lecture. As lecturing costs constitute such a large proportion of total costs and class group size determines the number of required lecturers, class group size is a significant driver of costs. Smaller class groups will increase the number of required lecturers for a set of enrolments, increasing total costs and cost per FTE student.

Based on the parameter settings in Table 10, the graph below illustrates the effect of increasing class group sizes on cost per student FTE for NATED and NC(V) respectively. The graph shows that as class group sizes increase, the cost per FTE initially declines sharply, after which the rate of decline slows considerably. On average, per FTE costs decrease by R2 363 (4.1%) and R1 128 (3.5%) for NC(V) and NATED respectively for every extra student added in a class group of between 5 and 40.

In reality, class size in TVET colleges range from 15 per class group in the practical engineering subjects to around 35 for others. On average, across all subjects, it is estimated that there are around 30 students per class; although the number tends to be slightly lower for programmes that have a greater practical component. If this average was increased to, for instance, 35, this would lead to a R2 793 (9.9%) cost per student FTE saving for NC(V) programmes and a R1 347 (7.9%) cost per student FTE saving for NATED programmes.

Figure 8: Effect of increasing class group sizes on cost per FTE



Source: DNA Economics calculations

5.2.3 Number of class groups per lecturer

The models determines the number of lecturers requires by calculating the number of class groups assigned to each lecturer. This is a proxy measure of workload in the model. Class groups per lecturer is defined as the number of classes that a full-time lecturer can teach. As lecturer take on more class groups, the average cost per student FTE declines.

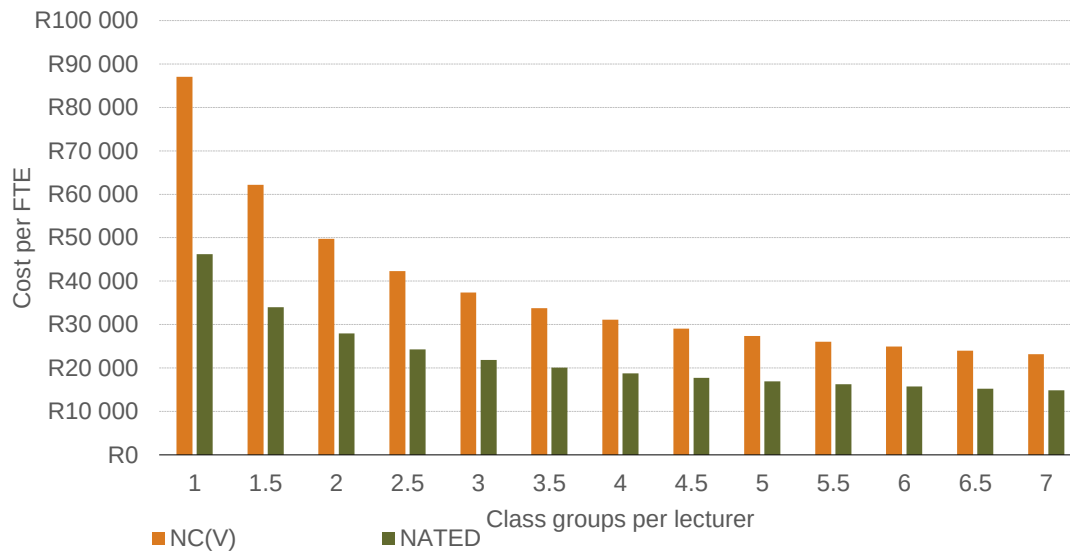
Figure 9 shows the effect of the class groups per lecturer on the cost per student FTE. The number of class groups per lecturer increases from 1 to 7 by increments of 0.5. Increasing the number of class groups per lecturer from 1 to 4 leads to a 64.3% and 59.4% cost saving per unit (student FTE and graduate) for NC(V) and NATED respectively. Under the same circumstances, increasing the number of class groups from 4 to 7 would only decrease unit costs by 25.7% and 21.0% respectively. The extent of the cost saving per FTE from increasing the number of class groups per lecturer therefore greatly depends on the status quo. Colleges that currently assign comparatively fewer class groups to each lecturer could benefit more from an incremental increase in the number class groups than colleges that currently assign comparatively more.

The sample colleges' data indicates that, on average, each lecturer is assigned approximately 4.5 class groups per year³⁸. There were however colleges that assigned up to 6 class groups to each lecturer on average. Increasing the number of class groups from 4.5 to 6 in the model³⁹ results in a in a R4 143 (14.3%) cost per student FTE saving for NCV programmes and a R2022 (11.4%) cost per student FTE saving for NATED programmes.

³⁸ Note that the college sample is not representative. When we therefore say "average", we do not mean the average for the population, but for the sample specifically.

³⁹ Ceteris Paribus

Figure 9: Effect of number of class groups per lecturer on cost per FTE



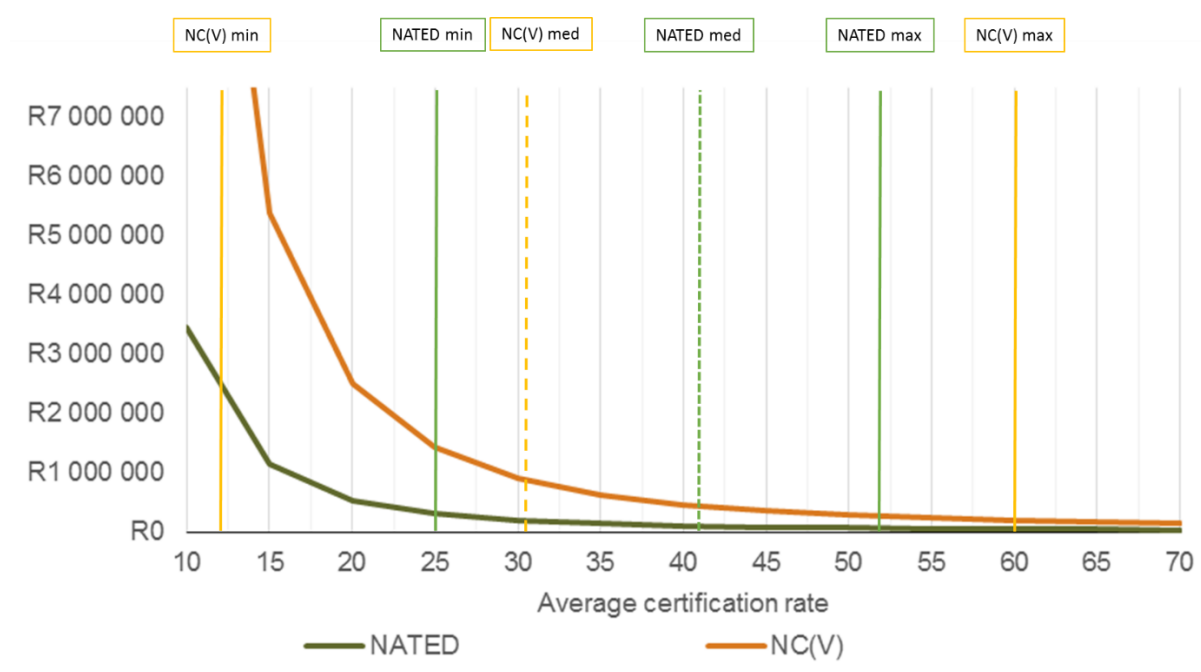
Source: DNA Economics calculations

5.2.4 Certification rates

Along with illustrating the effect of improved certification rates on cost per graduate, Figure 10 shows the minimum, median, and maximum average certification rate for NC(V) and NATED respectively across all colleges. For NC(V), 50% of colleges have average certification rates below 30.5%. The cost-effectiveness gains from only a slight improvement in certification rates are therefore immense. The gains from improvement in NATED certification rates are less pronounced, but nevertheless significant, as a result of its better baseline performance.

In addition to providing cost information for all programmes at an aggregate level, the costing model also estimates the cost per graduate for each programme. To provide a sense of the immensely poor cost-effectiveness of a programme with low certification rates, refer to the IT & computer science course in Table 10. Based on these parameters and the assumption that each student can repeat each level only once, with a certification rate approximately 20%, of the 197 students that enrol at the first level, approximately 6 students will graduate. In this scenario, each graduate would cost R1 201 755 according to the model. If the certification rate is improved by a mere five percentage points, five extra students graduate and the cost per graduate decreases by 35.8% to R771 371. Another 5 percentage point improvement in certification rate and a further five students graduate at R537 584 per graduate.

Figure 10: The effect of certification rates on the cost per graduate



This section was focussed on explaining the influence of changes in parameter values. These values were chosen according to the averages across the colleges in the expenditure analysis. The section was therefore aimed at presenting relative changes in costs due to changes in parameters. For absolute values based on an actual college and a scenario analysis, see Appendix 3.

5.3 Summary and main findings

From our analysis of TVET colleges' expenditure, we found the primary cost driver to be the number of lecturers required for a given number of student FTEs. As the requirement for the number of lecturers will be determined by the number of class groups per lecturer and number of students per class group, these parameters are assumed to be the main cost drivers. As expected, increasing the number of students per lecturer will decrease total and per FTE lecturing costs. However, the size of the cost saving will primarily depend on the current number of students per lecturer as the cost decrease is much greater when the change is from lower numbers of student per lecturer levels. Therefore, for colleges with very few students per lecturer, it might be possible to decrease per FTE costs significantly by increasing the number of students per lecturer if this can be done without harming the quality education.

The effect that this can have on the quality of education is however very important for the effectiveness of the system (as measured by the number of students that graduate). Figure 10 showed us the immense impact that low certification rates can have on the cost-effectiveness of a college and the large improvement in cost effectiveness that can be achieved by just a small improvement in certification rates.

Even though targets in this sector are mostly focussed on enrolment numbers, if those enrolled do not graduate and become contributory elements of the economy, the sector provides no benefit to the country. The question therefore is not exclusively how to minimise costs per FTE, but more importantly

how to minimise cost per graduate as the graduates contribute to the productive capacity of the economy, and TVET graduates in particular should be workplace-ready.

Decreasing cost per graduate can be done in two ways. Total costs can be decreased or the total number of graduates can be increased. Unfortunately, this costing model is unable to take into account the influence of increasing the number of lecturers per student might have on the quality of education and subsequently certification rates, given the lack of available data. Nevertheless, this relationship has to be taken into account when using this model, as there is sure to be some combination of resource inputs that minimises cost per graduate.

6 OBSERVATIONS AND CONCLUDING REMARKS

Technical Vocational Education and Training (TVET) colleges aim to provide educational opportunities to those who either do not qualify for tertiary education or who feel they require vocational training with direct application to the workplace. The importance of the TVET sector to the South African government has been clearly communicated by the National Development Plan and more recently through the White Paper for Post-School Education and Training. This PER therefore analysed the patterns and trends of expenditure and performance within the public TVET sector with the primary objective of providing relevant and useful information that will guide the sector to the achievement of its policy targets. This section will provide a summary of the key findings.

6.1 Observations and key findings

6.1.1 Performance indicators evaluation

The performance indicators used within the TVET sector generally, and within the Annual Report of the DHET in particular, do not appear to measure the performance relative to sectoral strategic objectives in a comprehensive and consistent way. In particular, relatively few indicators focus directly on the key student performance indicators. Therefore, indicators should be expanded to include dropout and throughput rates, statistics on the employment status of graduates after they leave colleges as well increasing the level of granularity at which performance targets are set in relationship to important indicators such as certification and pass rates.

Increasing low certification and throughput rates is arguably the greatest challenge facing TVET colleges to ensure that they have a meaningful positive impact to the South African economy. The low certification and high dropout rates in NC(V) programmes is of particular concern, especially given the higher cost of NC(V) programmes relative to NATED programmes.

6.1.2 Funding

Colleges receive the vast majority (in excess of 85%) of their funding from government. If the targets set out in the White Paper and NDP are to be reached, the increase in enrolments will have to be funded almost exclusively from government funds. Alternatively, colleges will have to substantially increase partnerships with industry or increase the proportion of students that are self-funded.

In a funding model where funding is determined by enrolments, rather than performance, there is a risk that colleges will prioritise increases in enrolments over increases in graduations. If the ambitious targets to increase in enrolments in the TVET sector reduce the focus on performance, and increased enrolments are not accompanied by increases in graduations, the policy aim of increasing the contribution of the TVET sector to the economy will not be achieved. Ensuring that funding and

performance measurement correctly aligns the incentives of colleges to the country's long-term policy goals should therefore be a key focus area.

6.1.3 Expenditure

Although there are substantial differences in average spending per student FTE between colleges, spending per FTE doesn't typically differ substantially between different programmes within the same college. In particular, even though programmes that are expected to be more practical (e.g. NC(V) Hospitality) receive substantially more funding than those that are not (e.g. NC(V) Office Administration), reflecting the idea that practical elements add to the cost of delivery, colleges in the sample generally do not in practice spend substantially more on programmes, such as engineering, that contain a large experiential and practical component than those programmes that are largely theoretical.

A large number of college officials interviewed confirmed that NC(V) programmes are frequently delivered in a substantially less practical (i.e. "learning through doing") way than was intended by the programme design. This seemingly reflects not only decisions to reduce costs by limiting direct programme costs or workshop equipment costs, but in some cases also the decisions to prioritise theoretical teaching in an attempt to increase low pass rates in theoretical examinations.

6.1.4 Performance

Low throughput rates often result in small class sizes at later levels of NC(V) and NATED programmes. This increases the costs per student, as generally the same amount of lecturing time is required even when classes become very small.

Given the low throughput rates, the costs per graduate are exceedingly large in many colleges and particularly in programmes with lower certification rates, such as the NC(V) engineering programmes where certification rates are generally less than 25%. Improving the average 6-year NC(V) throughput rate from the current 10.6% to 30% reduces the cost per graduate from R454,000 to R233,000; assuming that this can be achieved without increasing the costs per enrolment.

In the sample, a positive relationship is observed between certification rates and each of (a) funding (b) expenditure per FTE student and (c) staff development spending. These results should be interpreted with caution, as they do not prove that additional funding will necessarily lead to higher certification rates. In addition, many other factors influence certification rates that could not be included in this part of the analysis.

Certain additional activities and outputs might be needed that are currently not the focus of TVET programmes. For example, during interviews with college staff it was regularly mentioned that bridging programmes might be necessary to assist the many students who enter the TVET sector with insufficient training and knowledge. Currently funding is typically not directly provided for such programmes. Similarly, colleges currently offer limited student support in terms of study centres, libraries and psychological support; although the DHET have requested colleges to increasingly focus on these aspects.

6.1.5 Considerations for achieving the long-term policy goals

Based on the results of the expenditure analysis and analysis conducted through the costing model, it is possible to comment on the potential costs of increasing enrolments to 2.5 million by 2030 in line

with the requirements of the *White Paper on Post School Education and Training*. Using the cost per student FTE and cost per enrolment estimates from the expenditure analysis and assuming that the sector remains effectively as-is, it can be estimated that enrolling 2.5 million students according to the current programme breakdown will result in an annual cost of approximately R36bn; although economies of scale are likely to exist which would reduce this estimate. The calculations along with a scenario analysis is available in Appendix 6.

Given the limitations to the study mentioned in Appendix 1, as well as the many uncertainties that remain about the likely programme mix and programme delivery methods in 2030, it should however be made clear that this discussion should be interpreted only as an attempt to highlight key planning decisions that need to be made and the likely impact of such decisions; and not as a robust estimate of the likely costs of meeting long-term targets.

Several other factors need to be considered in the creation of a more accurate long-term estimate of the associated costs:

- An almost four-fold increase in the size of the sector will of course also have to be accompanied by substantially capital infrastructure expenditures. Capital expenditure was, however, not within the scope of this study and therefore were not included in the indicative estimates above
- By building more effective relationships with industry, colleges could generate a greater proportion of their funding from private sources, which could reduce the financial strain on the fiscus to meet these targets. This approach might require substantial up-front costs in increasing quality and / or capacity of colleges, but could unlock new funding streams through, for example, increasing the proportion of employer-funded occupational programmes.

The composition of college spending might need to be altered to ensure that certification rates are increased. This could, for example, involve an increased focus on bridging programmes, staff development or student support; all of which could reduce or increase cost per graduate depending on their effectiveness.

An in-depth study has been commissioned by National Treasury to estimate the total costs of implementing the *White Paper on Post-School Education and Training*. This study is currently underway and will provide a more detailed evaluation of the likely costs and policy options available for meeting these targets.⁴⁰

6.1.6 Concluding remark and key next steps

It is crucial that the low throughput rates in the sector be addressed to increase the cost effectiveness of the sector. Two urgent reforms are proposed in this regard. The first reform is to review the funding formula to ensure that funding is allocated not just on the basis of enrolments, but that it also takes into account throughput and / or certification rates. This would encourage colleges to also implement interventions that raise the throughput rates. In restructuring the funding formula, the DHET should take into account the different contexts in which colleges operate, and reward relative improvements. By rewarding relative improvements, rather than absolute performance, all colleges are evaluated relative to their own historical context and student population, rather than the national average.

⁴⁰ This study is also being performed by DNA Economics and is expected to be completed by May 2016.

However, robust assessment standards and controls should be put in place and enforced to ensure that the quality of qualifications are not compromised.

The second proposed reform is to introduce some form of bridging or foundational programme to prepare students (particularly those that have dropped out of the basic education system) for the NC(V) and NATED programmes. Although, a foundational programme may increase the initial cost of NC(V) programmes per enrolment initially, they may reduce the overall cost per graduate if they increase throughput rates, and reduce the number of repeaters in the system.

Improving throughput rates is particularly essential given the strategic policy importance and high long-term enrolment targets envisioned for the sector in the National Development Plan and the White Paper on Post-School Education and Training. Clarifying the path and qualification mix towards meeting these long term targets, and defining in more depth what the sector should look like in 2030 are important first steps to optimise the performance of the sector given likely budget constraints.

An important part of long term planning and management should be the improvement of data available at national level. As discussed in the limitations section above, the expenditure analysis conducted in this study focussed on a sample of the overall colleges in the sector due to the unavailability of certain types of data centrally; with even enrolment data not being seen as completely reliable. To enable fact-based monitoring and policymaking in future, the DHET should improve and increase the consistency and scope of the data that is provided to them by colleges. In particular, the template and methodologies employed in this study – where the focus is on cost and performance at the level of the individual training programme - could form the basis for a wider initiative to ensure that data of this type is available for all colleges in the sector.

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APPENDIX 1 EXPENDITURE ANALYSIS METHODOLOGY AND ASSUMPTIONS

A 1.1 The six stages of the PER

Stage 1: Inception meeting followed by the drafting and finalisation of an inception report with a detailed work plan

Stage 2: Provision of a description of the various programme elements relevant to the TVET sector

Stage 3: Development of an expanded logframe comprising of all programme elements

Stage 4: Expenditure analysis: As sufficient reliable data was not available with the DHET, a sample of 15 colleges were chosen based on criteria described below to collect primary data from.

Stage 5: Development of a costing model based on the information from the expenditure analysis

Stage 6: Draft a final report based on the plethora of information gathered during the project.

A 1.2 College Sampling Approach

A sample of colleges for primary data collection was selected based on the following criteria:

- Availability of detailed college trial balance information to ensure accuracy by validation
- History of accurate financial data; based on having an unqualified audit opinion in a recent year
- Ensure a mix of urban (7) and rural / semi-rural (8) colleges
- Include colleges from 8 provinces
- Include 4 colleges from KwaZulu-Natal and 4 colleges from Western Cape to investigate the substantial observed performance and spending differences between these provinces

The map below illustrates the geographic distribution of the selected colleges across South Africa.

Figure 11: Map of sampled colleges



In practice, sufficiently accurate data was only received from 12 of the 15 colleges in the sample. For the three colleges that were excluded the main reason for exclusion was respectively (1) disruptions

due to student unrest during data collection period (2) illness to key college officials (3) inaccuracies in data supplied.

A 1.3 Methodology for calculating expenditure per FTE

The total cost per Full-Time Equivalent Student (FTE) was calculated as the sum of four expenditure categories:

1. Lecturing staff costs
2. Direct Programme Costs
3. Indirect Goods and Services Costs
4. Support and Management Costs

Table 11 provides a list of what data was collected to enable the calculation of the expenditure in each of these categories.

Table 11: Data included in each expenditure category and data sources by priority

	Lecturing Costs	Direct Programme Costs	Indirect Goods & Services Costs		Support and Management Costs
Data collected	FTE Lecturers per programme	Learning materials (LTSM)	College Council	Municipal Services	Total support staff compensation
	Lecturer salaries by post level	Tools per learner	Communication Contract	Rent	Total management compensation
		Programme Consumables	Services	Residence Staff	
		Apparatus	Depreciation	Development Student admin	
		Chemicals	Extra-curricular		
		Teaching Aids	Financial Costs	Systems	
			General Consumables	Transport	
			Maintenance	Travel	
			Marketing	Vehicles	
			Membership		

It should be noted that the calculations done include only the operational costs of running a college, and exclude any costs associated with expanding the capital infrastructure of the college. On-going capital maintenance and replacement costs are indirectly incorporated through the inclusion of expenditure items such as depreciation and maintenance.

The first two cost categories in the list above represent the costs that can (at least in theory) be directly attributed to a specific programme. These are the direct costs of providing tuition and training; i.e. the costs of lecturer's time assigned to the teaching and supporting their classes and the costs of learning materials, consumables and teaching aids that are employed directly in the presentation of a specific programme.⁴¹ These direct costs are calculated at the level of the programme; i.e. using the data provided by colleges, we can determine how much colleges actually spent in 2014 on lecturing costs

⁴¹ Note that the distinction between "direct" and "indirect" here is not whether an item relates directly to teaching (or not), but rather whether the item can be attributed reliably to a specific programme; e.g. NC(V) Office Administration.

and direct programme costs for, for example, NC(V) Hospitality. This is then be divided by the number of students in each programme to determine the direct costs per FTE student in that programme.

The second two categories can be broadly categorised as “indirect” expenditures and comprise the overheads required to maintain the college. As mentioned in the Limitations section below, not all of these costs are completely indirect; but it is not practically achievable to allocate these costs to a specific programme. These indirect costs are calculated at the aggregate (total) college level and then divided by the total number of full time equivalent students in the entire college; giving the total indirect cost per FTE student, which is then assigned to every student.

The primary data source in the analysis is the survey template that was created by DNA Economics and completed by the colleges in the sample. The template collected primarily the following data:

- Direct programme costs (textbooks, LTSM etc.)
- Lecturer salaries
- Number of Full-Time Equivalent (FTE) lecturers employed per programme
- Compensation expenditure split by lecturer, management and support staff

Where applicable, this college template data was used as the primary data source, but in several cases was supplemented with data from other sources; as described in Table 12 below.⁴²

Table 12: Data sources used for 12 colleges in sample

	Preferred data source		Secondary source or data check source	
	Description	Number of colleges	Description	Number of colleges
Number of students enrolments	DHET central enrolments data	12	College Template	
Number of FTE lecturers	College Template	8	College lecturing administration system (Coltech)	4
Lecturer salaries by level	College Template	9	PERSAL	3
Direct Programme Costs	College Template	8	Trial balance (allocated to programmes based on college guidance)	4
Indirect Programme Costs	Trial Balance	12		
Support and Management Costs	Completed Template	12		

Perhaps the most critical data item that was not available centrally was the number of lecturers that provide tuition on different programmes; a key item in understanding programme level expenditure. Colleges were asked in the template to provide the number of full time equivalent lecturers that provide tuition on each programme at each post level; which required colleges to divide the time of lecturers who spend their time across different programmes. While all attempts were made to ensure that this allocation between programmes was done in the most accurate way and it was validated as far as possible, we are still ultimately reliant on the colleges to ensure the accuracy of this information.

⁴² Wherever possible, data sources were compared to ensure accuracy of data. Where differences existed, the preferred data source listed in the table above was used. In a small set of cases for each of the data sources data errors were identified, these errors were confirmed with colleges and corrected values used.

For a sample of colleges it was possible (and necessary) to calculate the amount of lecturing time assigned to different programmes using the Coltech administration. For these colleges, DNA Economics used Coltech data that listed all the subjects taught by each lecturer and the number of classes that he / she has in each of these subjects. From this information, it could be determined what proportion of his / her time was spent on each subject (and hence programme); which when aggregated provides the number of full time equivalent lecturers in each programme. The DHET could consider using data of this form to systematically create a system to calculate the FTE lecturers costs per programme for all colleges; which would be invaluable in future costing exercises and for management information purposes.

A 1.4 Limitations: Data and Analysis

A few key limitations of the analysis conducted should be highlighted:

- As the bulk of the expenditure analysis presented here was based on data collected from a sample of 12 colleges, it should be emphasised that not all findings for the sample under consideration will necessarily apply to the entire TVET sector. More broadly, a vast array of complex contextual factors are likely to impact on the expenditure and performance of TVET colleges and the paucity of data in the sector makes it difficult to evaluate these factors. A more extensive study would be required to make exact determinations on all the drivers and determinants of expenditure and performance for all TVET colleges in the country. The analysis should, therefore, be interpreted with caution if applied to decision or policy making for the sector as a whole.
- As might be expected of a primary data collection exercise in a sector known for inaccuracies and inconsistencies in data systems, expenditure data sourced from colleges were not always accurately available at the appropriate (usually programme) level due to weaknesses in college financial and management information systems. In such cases assumptions had to be made based on communications with college officials and the best judgement of the project team. While every attempt was made to ensure the accuracy and reliability of expenditure analysis calculations, some inaccuracies or simplifications are likely to remain. However we are confident that the impact of any such issues on the overall findings and trends observed are likely to be minor.
- Some of the expenditure categories that have been marked as “indirect” in the above analysis, such as depreciation and maintenance, are not truly indirect; since capital and maintenance will to some extent be more directly related to the provision of certain programmes. Therefore we would ideally want to allocate expenditure on such items more directly to the programmes that are most directly affected by these items. However, such allocation is not practically and reliably achievable. Firstly, allocation of these expenditure to programmes would need to be done by colleges themselves during the process of creating their financial statements; and this cannot be done retrospectively. Secondly, even if colleges were to attempt such an exercise, it would not be clear how to allocate, for example, the depreciation of central offices (where teaching often doesn’t take place) to a specific programme; which could create a distortion if not done well. It was therefore decided that all such costs will be treated as indirect; and hence assigned equally to each full time equivalent student on each programme. The impact of this assumption is again expected to be only minor, as these are not typically major expenditure categories and hence are unlikely to affect overall results.

- As comprehensive performance (i.e. examinations) data for 2014 is only finalised in 2016, the most recent performance data available was 2013. In contrast, reliable expenditure data from colleges could only be generated for the most recent year, 2014. Again, we do not believe that this mismatch substantially affects the accuracy or appropriateness of the findings of the study but the reader is cautioned to interpret the results with this limitation in mind.

APPENDIX 2 COSTING MODEL METHODOLOGY

The costing model estimates four key outputs (a) the cost per student FTE (b) cost per student enrolment (c) cost per certification (i.e. cost per student passing one level of a programme) and (d) the cost per graduate (i.e. cost per FTE student passing all three levels of a programme). This estimation is based on a number of user-defined inputs about the theoretical college being modelled, and a number of model assumptions that were derived using the results of the expenditure analysis presented in Section 4.2 the report.

Figure 7 in section 5.1 provides a diagrammatical representation of how the total cost per graduate is estimated. The model simulates a theoretical college by estimating all the costs of operating the college and allocating these costs to students. The cost per graduate is then calculated as the total costs incurred for a cohort of students (i.e. a group of students who start the first level of a programme at a certain point in time) during their time at the college, divided by the total number of students from this cohort who complete all levels of the programme.

The calculation is based on the following user-defined input parameters:

- the number of students enrolled at the first level of each programme (i.e. the initial cohort size)
- the annual certification rates (which can be defined at programme or college level)
- the proportion of students who repeat the following year if they have failed (“repeat rate”)⁴³
- The number of subjects on average each student repeats
- the number of students per class; and

the number of class groups per lecturer. Using a number of cost assumptions (derived from the expenditure analysis) along with the abovementioned user inputs, the model calculates important parameters relating to college size; specifically the enrolments at each level (and hence total college size by FTE), the number of classes required and the number of lecturers required. These size variables (over time) are then used to calculate the college’s operating costs within different cost categories – broadly (i) lecturing costs, (ii) direct programme costs, (iii) support and management staff costs and (iv) indirect goods and services costs. Slightly different methodologies are used for each of these categories, with the key distinction being that “direct” costs (i and ii) being calculated at programme level (i.e. directly assigned to the student) and “indirect” costs (iii and iv) being calculated at total (aggregate) college level before being allocated across all student FTEs.

⁴³ It is assumed that students can repeat a programme only once after they have failed; in line with NSFAS guidelines. This means, e.g., for NC(V) that a student has up to 6 years to complete the programme - he / she can fail each level once

Note that while the model calculates the total college size, the focus is on the costs associated with a specific cohort of students; which allows the model to isolate the cost to the college per enrolment, per FTE, per certification or per graduate.

The sub-sections of this appendix provides more details on the methodology used to allocate costs to FTEs for different types of costs. In particular, it explains how model assumptions were derived and how inputs are used to calculated the required outputs of the model.

A 2.1 Direct Programme Costs

Direct programme costs are costs of specific elements directly related to each of the programmes presented that can be allocated to each student FTE enrolled in the programme. Information was collected during the primary data collection exercise for the expenditure review. Direct programme cost include the following elements:

- Learning materials including approved textbooks
- Individual tools
- Instrumentation
- Consumables
- Suitable clothing
- Subscriptions
- Apparatus
- Chemicals

For the costing model, averages for each programme across the colleges in the expenditure review were used to allocate a value for direct programme cost to each student FTE. For those programmes for which there was no information, an average across all programmes for which there was information was used. This average was equalled to R1 213 per student FTE and is presented in Table 13 along with the average values used for each of the other programmes.

Table 13: Average Direct Programme Costs per programme

Programme	NATED/NC(V)	Total per student FTE DPCs
Civil engineering construction	NC(V)	R 1 774
Drawing office practice	NC(V)	R 1 213
Electrical infrastructure construction	NC(V)	R 2 166
Engineering & related design	NC(V)	R 2 285
Mechatronics	NC(V)	R 853
Process instrumentation	NC(V)	R 1 213
Process plant operations	NC(V)	R 1 213
Finance, economics & accounting	NC(V)	R 1 369
Generic management	NC(V)	R 2 552
Hospitality	NC(V)	R 3 122
IT & computer science	NC(V)	R 1 615
Education and Development	NC(V)	R 1 046

Marketing	NC(V)	R 950
Office administration	NC(V)	R 1 231
Primary agriculture	NC(V)	R 2 737
Tourism	NC(V)	R 1 404
Safety and Security	NC(V)	R 1 650
Transport and Logistics	NC(V)	R 1 674
Primary Health	NC(V)	R 2 219
Engineering Studies N1-N3	NATED	R 1 173
Engineering Studies N4-N6	NATED	R 1 110
Multi Disciplinary Office Practice	NATED	R 1 213
Fertiliser Manufacturing	NATED	R 1 213
Textile	NATED	R 1 213
Business Management	NATED	R 1 010
Financial Management	NATED	R 1 229
Human Resource Management	NATED	R 850
Introductory Business Studies	NATED	R 1 753
Introductory Clothing Construction	NATED	R 1 213
Introductory Educare	NATED	R 1 213
Management Assistant	NATED	R 759
Marketing Management	NATED	R 794
Public Management	NATED	R 630
Public Relations	NATED	R 558
Legal Secretary	NATED	R 1 213
Art and Design	NATED	R 888
Clothing Production	NATED	R 1 213
Educare	NATED	R 849
Farming Management	NATED	R 2 442
Hair Care	NATED	R 1 213
Hospitality and Catering Services	NATED	R 2 976
Interior Decorating	NATED	R 1 213
Introductory Art and Design	NATED	R 612
Introductory Food Services	NATED	R 1 213
Medical Secretary	NATED	R 1 213
Popular Music: Composition	NATED	R 1 213
Popular Music Performance	NATED	R 1 213
Popular Music: Studio	NATED	R 1 213
Tourism N	NATED	R 1 862

Source: DNA Economics calculations

A 2.2 Memberships

Information from college trial balances were used to calculate the average membership costs spent per lecturer in the college. These costs include those costs associated with membership for benefits such as pension, medical aid and housing allowances. The model calculates the number of lecturers based on the number of students, the number of students per class group and the number of class groups per lecturer. According to the trial balances, on average, colleges spend R774.31 per lecturer. There were however some anomalies, and Nkangala, Lephalale and Umgungundlovu were excluded from the calculation of the average for this reason. The table below shows this calculation.

Table 14: Per lecturer expenditure on memberships for each college in sample

College	Per lecturer expenditure on memberships
South Cape	R856.28
Nkangala	R93.38*
Cape Town	R945.15
Boland	R1 556.46
East Cape Midlands	R1 672.51
Buffalo City	R805.08
Flavius Mareka	R432.05
Esayidi	R461.42
Lephalale	R6 618.49*
Orbit	R448.93
Thekwini	R565.22
Umgungundlovu	R2 794.87*
Average	R774.31

Source: DNA Economics calculations

*excluded from calculation of average

A 2.3 Staff development

Staff development costs as a percentage of total lecturer and support staff costs was found to be relatively consistent across colleges at 1.2%. The model therefore calculates total expenditure on lecturer and support staff salaries according to its calculation of staff requirement and then estimates staff development expenditure as 1.2% of this amount. The data used for this estimation is shown in Table 15

Table 15: Percentage of lecturer and support staff costs spent on staff development at each college

College	% of lecturer and support staff costs
South Cape	0.8%
Nkangala	0.8%
Cape Town	1.7%
Boland	2.0%

East Cape Midlands	2.4%
Buffalo City	0.9%
Flavius Mareka	0.9%
Esayidi	0.4%
Lephalale	0.7%
Orbit	1.2%
Thekwini	1.2%
Umgungundlovu	0.9%
Average	1.2%

Source: DNA Economics calculations

A 2.4 Management staff costs

Management staff costs are defined as the total salaries paid to management staff. Management staff mostly includes a Principal, two deputy principles and a Chief Financial Officer. This composition of management staff is however not standardised as it was found, from the primary data collection, that some colleges have five, three and sometimes only two management staff members. The total number of management staff members cross—referenced with total spend on management staff, as indicated by the trial balances, was used to estimate average management staff salaries. The total management staff cost was then calculated by multiplying the average salary (R730 105) by the average number of management staff members (4). The portion of management staff costs allocated to each student FTE was calculated by dividing total management staff costs divided by the number of student FTEs in the entire college. The calculation of average management staff cost is shown in Table 16 and the subsequent allocation to each student FTE in Table 17.

Table 16: Average management staff salary

College	Number of Management staff	Average management salary
South Cape	2	R 710 500.80
Nkangala	4	R 791 560.00
Cape Town	5	R 536 764.40
Boland	5	R 647 432.16
East Cape Midlands	3	R 937 352.33
Buffalo City	4	R 713 494.00
West Coast	5	R 834 470.76
Flavius Mareka	4	R 729 798.01
Esayidi	3	R 727 125.00
Lephalale	n/a	n/a
Orbit	3	R 841 780.33
Thekwini	3	R 560 881.33
Umgungundlovu	n/a	n/a

Average	3.7	R 730 105.38
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Source: DNA Economics calculations

Table 17: Calculation of management staff costs allocated to each student FTE

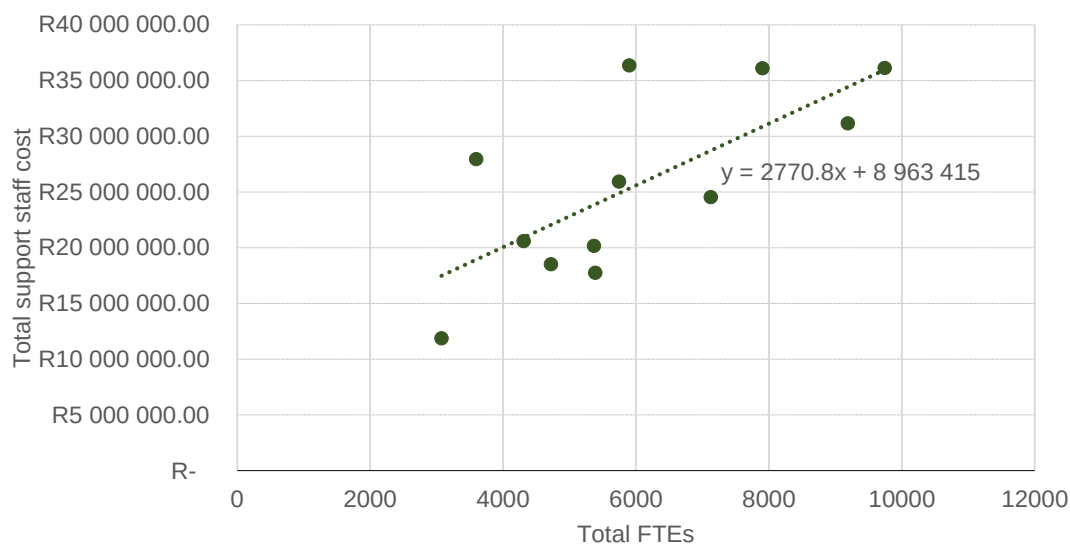
	Year 1	Year 2	Year 3
Total management staff costs	R730 105 x 4 = R2 920 422	R730 105 x 4 = R2 920 422	R730 105 x 4 = R2 920 422
Total management staff costs per FTE	= R 2 920 422 / # of student FTEs enrolled in college in year 1	= R 2 920 422 / # of student FTEs enrolled in college in year 2	= R 2 920 422/Number of student FTEs enrolled in college in year 3

Source: DNA Economics calculations

A 2.5 Support staff costs

Support staff costs are salaries paid to support staff such as security guards, cleaning and maintenance staff and assistants. Estimating these costs for a college is slightly more complicated than estimating an average as it is assumed that there is a fixed cost component which is a cost that would be incurred regardless of the size of the college. To estimate this fixed component, it is necessary to regress total support staff costs of each college against its total size of the college using total student FTEs as a proxy for college size. Doing this for the 12 colleges for which we had reliable information, this provides us with the following scatter graph and trend line.

Figure 12: Average relationship between total support staff costs and student FTEs



Source: DNA Economics calculations

The formula for the trend line implies that the fixed cost component for support staff costs equals R8 963 415 with a R2 770.80 increase in total support staff costs for every student FTE in the college⁴⁴. This formula was used to estimate total support staff costs for the college according to the parameters

⁴⁴ In the formula, y represents total support staff costs and x represents total number of FTEs in the college

entered into the model. Allocation to student FTEs was then done by dividing the total support staff costs by the total number of student FTEs as shown in the formula below.

$$\text{Support staff costs per student FTE} = \frac{2\,770.80 \times (\text{number of student FTEs in college}) + 8\,963\,415}{\text{number of student FTEs in college}}$$

A 2.6 Total Indirect goods and services (g&s) costs

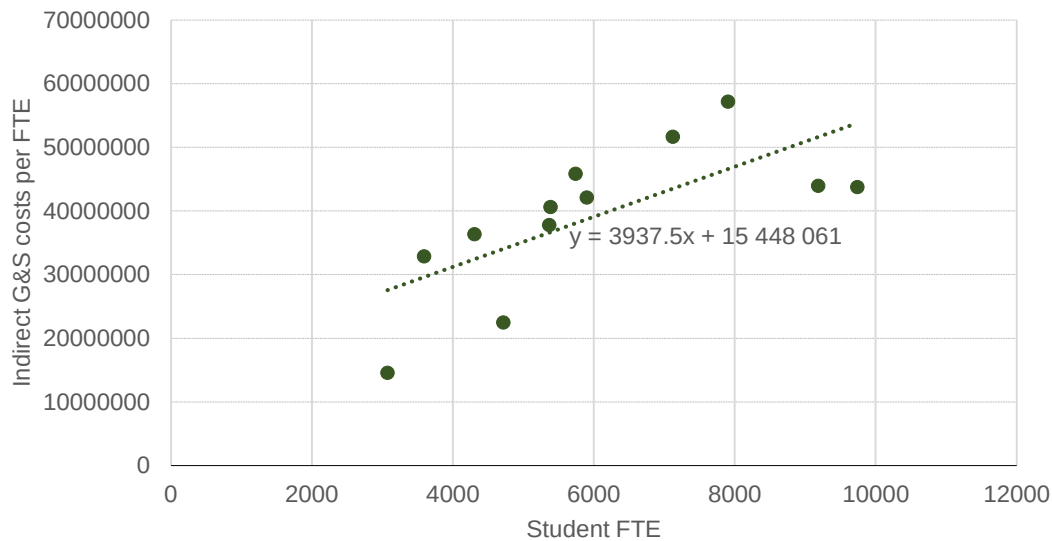
Total indirect goods and services (g&s) costs are costs that cannot directly be allocated to a student, but are necessary for the functioning of the college. The information for these costs were collected from the trail balances of each of the colleges in the expenditure review sample. Individual components used include the following categories:

- Communication
- Contract Services
- Depreciation
- Examinations
- Extra-curricular
- Finance and financial costs
- General consumables
- Maintenance
- Marketing
- Municipal services
- Other
- Student admin
- Systems
- Vehicles

As is the case with support staff costs, these cost elements will also include a significant fixed component. Because it is likely that these costs will also be dependent on the size of the college, the relationship between these costs, aggregated for each college, and the total student FTEs for each college was used to estimate the total indirect cost to be allocated to each student FTE in the model.

Regressing total indirect costs against total student FTEs for the colleges in the expenditure review sample provides us with the following scatter graph and trend line.

Figure 13: Average relationship between Indirect G&S costs and total student FTEs



Source: DNA Economics calculations

Figure 13 shows that, on average, indirect goods and services costs equal R15 448 061 plus R3 937.50 added to total costs for every extra student FTE enrolled in the college. Similar to support staff costs, the formula for allocating indirect goods and services costs to each student FTE is as follows:

$$\text{Total indirect g\&s per student FTE} = \frac{3\,937.50 \times (\text{number of student FTEs in college}) + 15\,448\,061}{\text{number of student FTEs in college}}$$

A 2.7 Lecturing costs

Lecturing costs are dependent on two variables. Firstly, the number of lecturers required for the student cohort and the salaries paid to each lecturer based on his or her employment level. The model assumes three levels of employment; i.e. head of department, senior lecturer and lecturer. It is also assumed that each programme will have a head of department⁴⁵, and that the remaining required lecturers will be constituted of a quarter senior lecturers and three-quarters lecturers. Lecturer salaries for each level is based on averages across the college sample as follows:

Figure 14: Lecturer salaries

Expenditure related to lecturers	Lecturer	Senior lecturer	Head department of
Average salary levels	R250 000.00	R360 000.00	R420 000.00

Source: DNA Economics calculations

Based on the number and distribution of lecturers, the total cost of lecturers is then calculated for each programme as follows:

$$\# \text{ of lecturer FTEs required for cohort} = \frac{\text{Cohort Student FTEs} / \text{Target class size}}{\text{Classes per lecturer}}$$

⁴⁵ For NATED, Engineering studies have one HoD

Total cost of lecturers is then calculated as follows:

$$\begin{aligned}
 & \text{Total lecturing cost required for cohort} \\
 &= [R420\,000 \times 1 \text{ HOD}] \\
 &+ [R360\,000 \times \left(\frac{1}{4}\right) \times (\# \text{ of lecturer FTEs required} - 1)] \\
 &+ [R250\,000 \times \left(\frac{3}{4}\right) \times (\# \text{ of lecturer FTEs required} - 1)]
 \end{aligned}$$

APPENDIX 3 COSTING MODEL SCENARIO ANALYSIS

The parameter values are based on an actual college, namely Nkangala. The college was chosen based on the reliability of the data gathered from the college as well on the fact that its costs are close to the average costs for all the colleges in the sample.

Nkangala's enrolments for 2014 and average certification rates for 2013 across each programme's three levels is presented in Table 18. Table 19 presents their target class group size and the number of class groups each lecturer teaches assuming this target is achieved.

Table 18: First level enrolments and average certification rates for Nkangala in 2014

Programme	NATED/NC(V)	Number of enrolled at first level?	Certification rate
Civil engineering construction	NC(V)	60	30%
Electrical infrastructure construction	NC(V)	420	30%
Engineering & related design	NC(V)	566	30%
Finance, economics & accounting	NC(V)	197	25%
Hospitality	NC(V)	115	40%
IT & computer science	NC(V)	74	20%
Education and Development	NC(V)	52	60%
Office administration	NC(V)	304	35%
Tourism	NC(V)	64	40%
Engineering Studies N1-N3	NATED	4020	60%
Engineering Studies N4-N6	NATED	630	55%
Business Management	NATED	560	35%
Financial Management	NATED	246	25%
Human Resource Management	NATED	854	20%
Management Assistant	NATED	298	35%
Tourism N	NATED	320	40%

Table 19: Determinants of lecturer requirement

Parameter	Value
What is the target class group size?	30
How many class groups per lecturer (NC(V))?	3.4
How many classes groups per lecturer (NATED)?	6

A 3.1 Changing the class group size

The table below shows the impact on cost per FTE and cost per graduate of changing class group size. According to the model, cost per FTE amounts to R33 591 for NC(V) and R18 400 for NATED. For NC(V), increasing the class group size to 35, decreases per FTE and per graduate cost by R2 628 and R93 778 respectively, or 7.8% for both. This same increase in class size for NATED causes a decrease of R788 per FTE and R8 670 per graduate or 4% for both. On the other hand, decreasing class size, thereby increasing the requirement for number of lecturers, would increase NC(V) unit cost by 11.7% and NATED by 6.3%. The variance in the percentage change difference between increasing and decreasing class group size is explained in footnote **Error! Bookmark not defined..**

Table 20: Class group size impact

NC(V)/NATED	Cost measurement	Baseline (30)	Increase class group size to 35	Decreasing class group size to 25
NC(V)	Total cost per FTE	R33 591	R30 963	R37 526
NC(V)	Unit cost per graduating student	R1 198 829	R1 105 051	R1 339 277
NATED	Total cost per FTE	R18 400	R17 662	R19 558
NATED	Unit cost per graduating student	R216 197	R207 527	R229 807

Source: DNA Economics Calculations

A 3.2 Number of class groups assigned to each lecturer

As discussed, another very important driver of costs in a TVET college is the number of class groups assigned to each lecturer. Table 21 shows the impact of increasing and decreasing the value of this parameter by one for NC(V) and NATED respectively. Unit costs for NC(V) decreases by 11.3% when assigning an extra class to each lecturer while it increases by 23% if extra lecturers are hired so that on less class group is assigned to each lecturer. For NATED, an extra class groups per lecturer decreases unit cost by 4% while one less class group increases unit costs by 6.3%.

The effects of decreasing marginal cost saving is very clearly illustrated in this example. Decreasing the number of class groups assigned to each NC(V) lecturer increases unit cost by more than twice the amount saved when decreasing the number of class groups by the same number. For NATED, it is only 1.6 times the amount. The difference in these values is exclusively due to the difference in the baseline parameter values for NC(V) and NATED showing us that the lower the current lecturer to student ratios are, the more significant the impact of changes to these ratios will be on unit costs.

Table 21: Number of class groups per lecturer impact

NC(V)/NATED	Cost measurement	Baseline (NC(V): 3.4; NATED: 6)	One more class group per lecturer	One less class group per lecturer
NC(V)	Total cost per FTE	R33 591	R29 781	R41 333
NC(V)	Unit cost per graduating student	R1 198 829	R1 062 864	R1 475 154
NATED	Total cost per FTE	R18 400	R17 662	R19 558
NATED	Unit cost per graduating student	R216 197	R207 531	R229 801

Source: DNA Economics Calculations

A 3.3 Changes in certification rates

In the previous two scenarios, we have assumed that quality remains constant while resource inputs change. For this scenario it is assumed that it is possible to improve quality (using certification rate as a proxy) without changing the student to lecturer ratio. The results are presented in Table 22.

The first interesting point to note is that certification rate improvement or deterioration has very little impact on cost per FTE. The only reason that there is any change whatsoever is because of changes in the lecturer requirement in the second and third level of each programme due to a greater (improvement in certification rates) or lesser (deterioration in certification rates) proportion of the student cohort reaching these levels.

The second point is directly related to the cost-effectiveness of a TVET college defined as the cost per graduate. This is influenced immensely by even slight changes in certification rates, especially, as discussed in section 0, when the baseline certification rates are low. For Nkangala, the baseline average certification rates are 34% and 39% for NC(V) and NATED respectively. Even though it might look like the curve in Figure 10 is starting to flatten out at these points, there is still a 28.3% and 20% cost-effectiveness improvement for NC(V) and NATED respectively when certification rates improve by only 5 percentage points across all programmes.

Table 22: Certification rates impact

NC(V)/NATED	Cost measurement	Baseline	Increasing certification rates by 5 percentage points	Decreasing certification rates by 5 percentage points
NC(V)	Total cost per FTE	R33 591	R33 186	R33 973
NC(V)	Unit cost per graduating student	R1 198 829	R859 771	R1 766 617
NATED	Total cost per FTE	R18 400	R18 100	R18 807
NATED	Unit cost per graduating student	R216 197	R173 002	R279 572

Source: DNA Economics calculations

APPENDIX 4 PED AND DHET LOGFRAMES

A 4.1 Appendix PED Logical Framework

Table 23: PED College Logical Framework

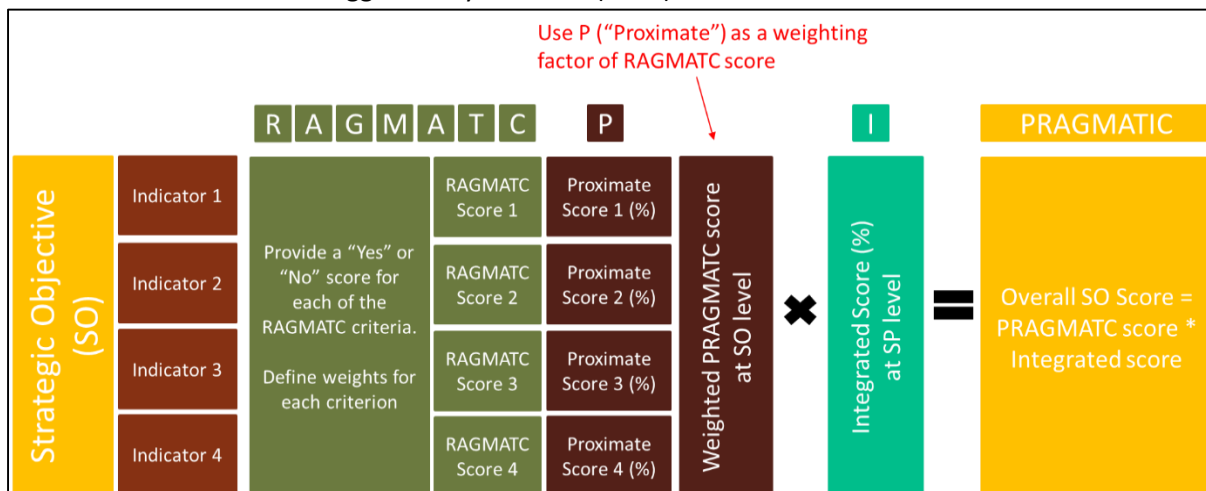
PROVINCIAL EDUCATION DEPARTMENTS LOGICAL FRAMEWORK						
Impact	A country where all South Africans are skilled and engaged in economic activity that contributes to the long term development of the economy					
Outcomes	Fair and equitable access to technical and vocational training	A post school education system that delivers high quality technical and vocational training		Technical and vocational training that meets the needs of a growing economy		
Final outputs	Functional governance structures at TVET colleges	Timely disbursement of fiscal resources	Resource utilisation is efficient and sustainable	Functional and resourced TVET colleges		
Intermediate outputs	College council is appointed by MEC	Resources are disbursed in a timely manner to TVET colleges	Expenditure is monitored	Positions are filled in line with needs	Competent and skilled educators	Institutional support is provided to TVET colleges
1. Activities	Nominate and appoint council members	Inform TVET colleges of their allocation	Analyse quarterly reports	Estimate post provisioning requirements in TVET colleges in line with norms	Develop a training plan	Support TVET colleges in preparing for examinations
2. Activities	Induct council members	Transfer disbursements to TVET colleges	Report and communication variances in expenditure to TVET and DHET	Advertise vacant positions	Develop training materials and methods	Manage sporting and other extra-curricula activities
3. Activities	Monitor functionality of college councils		Recommend corrective action	Adjudicate applications	Schedule training interventions	
4. Activities				Receive and process applications		
5. Activities				Select and recruit staff members		
Inputs	HOD, MEC, Council Members	Public Finance Specialists	Public Finance Specialists	Human Resources Specialists	Human Resources Specialists	Educators, Moderators, Subject Advisors
Main programme element	Policy and direction setting	Budgeting and funding		Capacity building		

Table 24: DHET Logical Framework

DHET LOGICAL FRAMEWORK												
Impact	A country where all South Africans are skilled and engaged in economic activity that contributes to the long term development of the economy											
Outcomes	Fair and equitable access to technical and vocational training		A post school education system that delivers high quality technical and vocational training				Technical and vocational training that meets the needs of a growing economy					
Responsibility												
Final outputs	Policy framework for the TVET system		Curricula that is responsive to the development agenda of the country		Reliable and credible examination results		Competent and skilled educators	Well resourced and managed public TVET colleges			Additional capacity is developed to meet demand for TVET	Private TVET colleges meet minimum standards
Intermediate outputs	TVET Policy Framework	National Skills Development Strategy	Approved curriculum for TVET programmes	New TVET qualifications registered onto the NQF	Registered learners	Completed assessments and exams	Detailed training plan for TVET colleges	Funding allocations for all TVET colleges are published	Conditional grant transfers done timeously	Institutional capacity building	Develop country wide TVET infrastructure plan	Registered private TVET colleges
1. Activities	Conduct needs assessment	Update and align the National Skills Development Strategy (NSDS) with TVET policy framework	Define competency and skills matrix	Identify disciplines where new qualifications are needed	Acknowledge receipt of learner information from TVET colleges	Draft examination and assessment papers	Develop a training plan	Monitors that subsidy funding is disbursed on time by PEDs	Develop schedule for transfer conditional grant	Develop an approach to providing institutional support to TVET colleges	Identify capacity constraint and infrastructure needs	Publicize regulatory process
2. Activities	Develop a skills planning mechanism	Published national and provincial TVET targets	Review, design and/or update curriculum	Develop qualifications and unit standards	Register learners onto examination database	Issue guidance to PEDs on examination procedure	Develop training materials and methods	Provide assistance to TVET colleges whose funding is withheld for valid reasons by PEDs	Transfer funding	Develop interventions per college to build institutional capacity	Cost infrastructure needs	Register private TVET colleges
3. Activities	Draft policy framework based on needs analysis and results of skills planning		Consult and pilot curriculum	Consult with industry bodies and other stakeholders	Issue examination number to TVET colleges for dissemination	Disseminate examination papers and monitor	Schedule training interventions	Compile reports on funding disbursements by PEDs to TVETs	Reconcile conditional grant at year end	Evaluate effectiveness of institutional support	Prioritise infrastructure development and allocate available funding	Monitor compliance of private TVET colleges against regulation
4. Activities			Revise draft curriculum and approve curriculum	Finalise qualifications and register onto NQF		Mark examination papers and publish results					Contract service providers and monitor construction	Enforce compliance with regulations
5. Activities						Issue certificates to learners					Handover completed TVET colleges	
Inputs	Education researchers, labour market analysts, policy experts	Education researchers, policy experts	Curriculum and assessment specialists, markers and moderators					Public finance specialists, architects, planners, engineers				Inspectors
Main programme element	Policy and direction setting		Curriculum development and assessment				Capacity building	Budgeting and funding				Quality assurance

APPENDIX 5 P.R.A.G.M.A.T.I.C. INDICATOR EVALUATION METHODOLOGY

The diagram below illustrates the methodology used by the project team to apply the P.R.A.G.M.A.T.I.C. criteria suggested by Williams (2003)⁴⁶ to the indicators in use in the TVET sector.



P.R.A.G.M.A.T.I.C. criteria requires that a set of indicators, evaluated jointly, are:

- Proximate
- Relevant and/or reliable
- Achievable
- Game-proof
- Measurable
- Appropriate
- Timely or time-based
- Integrated
- Cost-effective

The first step in the methodology used involves assigning a weight to each of the criteria – indicative of the fact that some criteria are more important than others; with this varying likely varying in different contexts. The Proximate criterion is then used as an overall weighting factor for joint the RAGMATC score; to reflect the importance that even if an indicator meets all the other requirements it must still be closely related to the objective that it measures. Therefore indicators that most closely relate to the strategic objective is given more weight. The final step ("Integrated") is then to evaluate whether the indicators jointly measure all relevant (measurable) aspects of the strategic objective.

Table 25 below provides an example application of the PRAGMATIC method as applied to the 2013/14 TVET performance indicators as given in the 2013/14 DHET Annual Report.

⁴⁶ Williams (2003) S.M.A.R.T., Q.U.E.S.T. AND F.A.B.R.I.C: ARE THEY MORE THAN JUST ACRONYMS?

Table 25: Example of Applying PRAGMATIC criteria to 2013/14 TVET performance indicators

Strategic Objective	Performance Indicator (From DHET 2013/14 Annual Report)	WEIGHTS							"RAGMATC" Score	Proximate score	PRAGMATIC Score	Integrated Score	Overall PRAGMATIC Score	Comment (Integrated and Proximate)
		Relevant	Achievable	Game-proof	Measurable	Appropriate	Timely, Timebound	Cost-effective						
(4.5.1.1) Increase access to and improve success in programmes leading to intermediate and high-level learning by 2014	Number of headcount enrolments in FET colleges	1	1	0	1	1	1	1	82%	100%	81%	75%	61%	Integrated: Do not measure drop-out rates and many of the indicators are only partially relevant (as indicated by "Proximate" field.
	Number of FET college students awarded bursaries	1	1	0	1	1	1	1	82%	100%				
	Revised NC(V) qualification policy approved by the DG	1	1	0	1	0	0	1	64%	25%				
	Amended National Senior Certificate (Orientation) developed and approved by the DG	1	1	1	1	1	1	1	100%	25%				
	Higher Certificate (Foundation) developed and approved by the DG	1	1	1	1	1	1	1	100%	25%				
	Number of colleges offering NQF Level 5 to 6 programmes	1	1	0	1	1	1	1	82%	25%				
	Certification rates in the VET qualification	1	0	1	1	1	1	1	82%	100%				
	Pass rate in Maths and Maths Literacy Certification rates of bursary recipients	1	0	1	1	1	1	1	82%	50%				
	Number of lecturers, SSS managers and PDE/regional offices officials trained to implement the comprehensive student support services framework	1	1	0	1	1	1	1	82%	25%				
	Number of lecturers trained to support curriculum delivery	0	1	0	1	1	1	1	64%	50%				
(4.5.1.2) Strengthen the institutional capacity of VET institutions to improve their performance and efficiency	Number of fully constituted college councils	0	1	0	1	1	1	1	64%	50%	71%	50%	35%	It's not clear to what extent these indicators really measure the institutional capacity of colleges - nor how or if this impacts performance
	Number of College Councils trained in institutional and corporate governance	1	1	0	0	1	1	1	64%	25%				
	Number of personnel at public FET colleges trained in financial management	1	1	0	0	1	1	1	64%	50%				
	Number of new public FET college campuses built and completed	1	0	1	1	0	1	1	73%	50%				

	Number of personnel at public FET colleges trained in Strategic and Operational planning	1	1	0	0	1	1	1	64%	25%				
	Human Resource Management and Planning (HRM&P) framework for FET colleges developed and approved by the DG for implementation	1	1	0	1	1	1	1	82%	25%				
	Percentage of public FET college functions transferred to the DHET	1	1	1	1	1	1	1	100%	25%				
(4.5.1.3) Manage and administer a credible and efficient examinations and assessment system for VET institutions	An efficient registration, resulting and certification system per examination cycle	0	1	1	1	1	1	1	82%	50%	71%	50%	36%	Again a lack of an indicator that measures quality reliably
	Percentage of FET colleges conducting improved assessments	0	1	0	1	1	1	1	64%	100%				
	A national examination report compiled and approved by the Minister	1	1	0	1	1	1	1	82%	25%				
(4.5.1.4) Provide support for the implementation of monitoring, evaluation, and research for the improvement of the vocational education and training sub-system	Business Management System standard set for public FET colleges and approved by the DG	0	1	0	1	1	1	1	64%	25%	77%	25%	19%	Indicators don't really measure the activities of the DHET or the quality of the M&E and research that is done. None of the gathered info from the survey is used for example
	Number of public FET colleges responding to an annual survey conducted by DHET	1	1	1	1	1	1	1	100%	50%				
	Percentage of private FET Colleges responding to an annual survey conducted by DHET	1	0	0	1	1	1	1	64%	50%				
	A report on the implementation of a public FET college Model developed and approved by the DG	0	1	0	1	1	1	1	64%	25%				
	Percentage of private colleges complying with applicable regulations	1	1	0	1	1	1	1	82%	50%				

APPENDIX 6 COST ESTIMATION OF THE WHITE PAPER FOR POST-SCHOOL EDUCATION AND TRAINING

A very simplistic estimate (referred to here as “Scenario 1”) of the likely cost of increasing enrolments to 2.5 million (in 2014 rands) can be derived by assuming that the sector remains effectively as-is in terms of the relative enrolments in different programmes as well as the funding available per student in each programme. In particular, assuming that the cost per FTE is the average from our sample, as specified in Table 26⁴⁷, we can estimate the potential total annual operational costs under various enrolment assumptions. It is also assumed that there are no economies or diseconomies of scale, which might not be appropriate in practice.

Table 26: Average costs per programme

Description	NC(V)	N1 - N3	N4 - N6	Other Programmes
Cost per enrolment (average of 12 colleges)	R 29,220	R 7,134	R 9,862	R 15,690
Cost per FTE (average of 12 colleges)	R 29,220	R 21,401	R 21,401	R 31,381

These assumptions results in estimate of R36bn for Scenario 1 in Table 27. If however all 2.5 million enrolments are in NC(V) (Scenario 2), but still assuming the same costs per enrolment we obtain a total estimate of R73bn, i.e. more than double Scenario 1. This highlights the tremendous impact that the intended programme mix will have on the total cost of the sector.

Table 27: Estimated total TVET costs under different long term scenarios (in R millions)

Scenario		NC(V)	N1 - N3	N4 - N6	Other Programs	Total (in R millions)
Current	2014 TVET sector – approx. 650k enrolments	4,528	1,176	2,736	665	9,105
1	2.5m enrolments at current prog. breakdown	17,698	4,595	10,696	2,599	35,588
2	2.5m enrolments all in NC(V)	73,050	-	-	-	73,050
3	2.5m graduates all in NC(V) (assuming 40% certification rate)	1,141,406	-	-	-	1,141,406

Scenario 3 shows the extreme scenario where the 2.5 million target is interpreted not as a target for enrolments, but as a target for annual graduates. The exact estimate (R1.1 trillion) should not be interpreted literally, but acts as an illustration that at 40% certification rates (which is slightly above the current levels) it would financially (and demographically) be impossible to deliver 2.5 million graduates. This highlights the enormous difference in cost estimates when changing focus from targeting enrolments to target graduates

⁴⁷ Note that the estimation of the cost of “Other Programmes” was made on a relatively crude basis based on the total cost of the TVET sector less the costs attributed to NC(V) and NATED using our estimated costs for these programmes.

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