••• 2024 THE STATUS OF INNOVATION IN TVET COLLEGES





Department: Science and Innovation REPUBLIC OF SOUTH AFRICA



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ABBREVIATIONS

4IR	Fourth Industrial Revolution
AI	Artificial Intelligence
CET	Community Education and Training
CHE	Council on Higher Education
CIPC	Companies and Intellectual Property Commission
CIS	Community Innovation Survey
CoS	Centre of Specialisation
CIP	Compulsory Induction Programme
CSTP	Committee for Scientific and Technological Policy
DA	Data Available
DHET	Department of Higher Education and Training
DNRA	Data Not Readily Available
DONA	Data Often Not Available
DSI	Department of Science and Innovation
DTIC	Department of Trade, Industry and Competition
EIS	European Innovation Scoreboard
EU	European Union
GCI	Global Competitiveness Index
GII	Global Innovation Index
HEI	Higher Education Institution
HEMIS	Higher Education Management Information System
HRDC SA	Human Resource Development Council of South Africa
HSRC	Human Sciences Research Council
IAG-TVET	Inter-Agency Group on TVET
ICT	Information and Communication Technology
ILO	International Labour Organization
INSET	In-service Education and Training
IPRs	Intellectual Property Rights
ISCED	International Standard Classification of Education
ISO	International Organization for Standardization
ISS	Information System Strategy
KIESE	Key Indicators on Education, Skills and Employment
LFA	Logical Framework Approach
LLM	Large Language Model
LSS	Lecturer Support Service
M&E	Monitoring and Evaluation
MHESI	
	Ministry of Higher Education, Science and Innovation
MIS	Ministry of Higher Education, Science and Innovation Management Information System
MIS NACI	Ministry of Higher Education, Science and Innovation Management Information System National Advisory Council on Innovation

NCV	National Certificate (Vocational)
NDP	National Development Plan
NPC	National Planning Commission
NSA	National Skills Authority
NSF	National Skills Fund
NSI	National System of Innovation
NSDP	National Skills Development Plan
NSFAS	National Student Financial Aid Scheme
OECD-CSTP	OECD Committee on Science and Technology Policy
OIHD	Occupations in High Demand
PSET	Post-school Education and Training
PSI	Public Sector Innovation
OECD	Organisation for Economic Cooperation and Development
QCTO	Quality Council for Trades and Occupations
R&D	Research and Development
RBM	Results-Based Management
RPL	Recognition of Prior Learning
SDC	Swiss Agency for Development and Cooperation
SETA	Sector Education and Training Authority
SETMIS	Sector Education and Training Management Information System
SITVET	Status of Innovation in TVET Colleges
STI	Science, Technology and Innovation
ТоС	Theory of Change
ToR	Terms of Reference
TVET	Technical and Vocational Education and Training
TVET MIS	Technical and Vocational Education and Training Management Information System
UNESCO	United Nations Educational, Scientific and Cultural Organization
URS	User Requirement Specification
VET	Vocational Education and Training
WBL	Work-based Learning

FOREWORD >>

Mr Tilson Manyoni Chairperson National Advisory Council on Innovation

As the Chairperson of the National Advisory Council on Innovation (NACI), I am pleased to introduce the status of Innovation in Technical and Vocational Education and Training Colleges report (TVET). The goal of the report is to enhance the understanding of innovation in the South African TVET colleges through a set of specific indicators and international benchmarking.

The findings of the study suggest that challenges must be addressed to foster real change in the TVET sector. Prioritising areas such as apprenticeships and industry partnerships will allow the sector to move towards a more innovative and effective model of vocational education and training in line with the National Apprenticeship and Artisan development Strategy (2030). Analysing and comparing indicators reveals alignment, discrepancy, and data gaps in the current TVET systems and highlights the need for improved data collection practices for policy implementation and overall TVET institution performance.

As we adapt to the evolving educational and training environment in South Africa, it is crucial that we prioritise innovative, imaginative, and progressive approaches to provide our students with the necessary knowledge and skills to thrive in a dynamic world. I applaud the experts who conducted the study on behalf of NACI for sharing these valuable insights and am eager to witness the beneficial effects of these findings on the sector.

I call on all stakeholders to take the findings of this report forward to build an innovative and inclusive TVET sector aligned with the demands of the global knowledge economy.

Thank you for your dedication to excellence and innovation in the TVET sector.

Mr Tilson Manyoni Chairperson: National Advisory Council on Innovation



EXECUTIVE SUMMARY

This report, The Status of Innovation in Technical and Vocational Education and Training Colleges, hereafter referred to as 'SITVET II', provides an evidence-based assessment of innovation activities at technical and vocational education and training (TVET) colleges. A set of innovation indicators provides the basis for the assessment.

SITVET II extends the scope of the exploratory study 'SITVET I', which proposed 25 input, output, quality, and innovation indicators. 'The choice of SITVET I indicators was informed by established practices for measuring national systems of innovation.

SITVET II extends that set of indicators to reflect the intent of the national strategy for TVET and its expression in performance management and measurement. Where possible, the proposed set of indicators was benchmarked against international good practice and populated with national data.

To this end, SITVET II was structured as a design and feasibility study that drew on progress in measuring public sector innovation (PSI), with the recently published Copenhagen Manual (COI, 2021) serving as a declaration of the maturation of the field of inquiry. It is noteworthy that while this work is focused on the industrialised countries of the Global North, SITVET II extends the discussion to the emerging economies of the Global South by offering insights into the role of TVET innovation in South Africa's ongoing transition to an inclusive polity.

The design stage interrogates the Department of Higher Education and Training's (DHET) TVET policy, strategy, and planning documents to identify additional indicators. The feasibility stage then links operational strategy to performance management, information system strategy (ISS), management information systems (MISs), measurement, and indicators.

The SITVET II study entailed desk work, interviews, meetings with the National Advisory Council on Innovation (NACI), the NACI TVET Reference Committee, the NACI Monitoring and Evaluation (M&E) Reference Committee, and a round-table meeting with stakeholders.

The work was conducted as the COVID-19 restrictions were easing, although the disruptions to individuals, livelihoods, and organisations persisted.

The final stages of the study made use of a large language model (LLM) application for validation.

The use of TVET quality as a proxy for innovation potential was readopted.

The SITVET I indicator framework was extended to include a fourth category, Governance and Transformation, making the four categories similar to the typical perspectives of a balanced scorecard approach.

In total, 68 main and subsidiary indicators are proposed. The 19 Governance and Transformation indications could not be populated. Of the 48 Input, Output, and Quality and Innovation indicators, data was available for 31 items.

I http://www.naci.org.za/wp-content/uploads/2021/09/The-Status-of-Innovation-in-the-TVET-Colleges-Final.pdf

A summary assessment was applied using a Likert scale of attributes: a five-point Likert scale was used to assess the level of each indicator category – Absent (0); Emerging (1); Emergent/Promising (2); Progress to Success (3); and Embedded Change (4). On this basis, the following may be stated:

- Innovation activities in the TVET sector, the most 'transformed' education sector, are at a formative stage. While
 there are pockets of innovation excellence, there is little to no evidence of innovation occurring as 'embedded
 change'.
- The absence of any indicator that attains the level of embedded change is significant and calls for serious attention to be given to fostering an enabling innovation for innovation.
- Four indicators are scored as 'progress to success.' Of these, the gains in the awards of apprenticeship status are the most noteworthy, although the quality thereof is not directly measurable.
- Eight indicators score as 'emergent/promising.' Of these indicators, those that measure work-based learning (WBL), apprenticeship, and company placement are of vital importance.

The report concludes with 10 recommendations that are summarised as follows:

- I. Enhance innovative practice through a clearly articulated TVET Innovation Strategy.
- 2. Staff expertise must be enhanced at all system levels.
- 3. Establish mechanisms for sustained partnerships with the business community.
- 4. Develop a TVET ISS.
- 5. Progress the population of TVET indicators.
- 6. Update, extend, and deploy TVET Innovation Survey factors.
- 7. Progress in the attainment of 'green campus' and International Organization for Standardization (ISO) certification facilities.
- 8. Study the demographics of residents who obtain patent rights.
- 9. Anticipate the impact of the Fourth Industrial Revolution (4IR) and generative artificial intelligence (AI).
- 10. Recognise excellence.

These are early days for a sector that has yet to be tasked with innovation. That said, the diversity of TVET colleges is recognised, and pockets of excellence are celebrated. Innovation implies considerable initiative at the individual college level, and concerted effort needs to be given to sharing effective practices with all stakeholders.

This evidence-based assessment is a first for the South African system of innovation and those of the Global South. It represents a modest contribution to policy learning.



I. INTRODUCTION

The SITVET II provides an evidence-based assessment of innovation activities in South Africa's (TVET) colleges. The assessment is based on a set of agreed indicators benchmarked against generally accepted norms, where possible.

SITVET II follows the publication of SITVET I, which offered preliminary insights into the status of innovation in TVET in South Africa (NACI, 2021).

While it is assumed that the readers of this report are familiar with the exploratory study, it is helpful to repeat three important findings as they appear in the SITVET I executive summary:

- 'In essence, the study reveals a tale of two discourses. On the one hand, there is the labour market and skills formation, capability, and lifelong learning, with the individual at the centre. On the other hand, the study tells the tale of the economics of innovation, with a strong emphasis on the dominant macroeconomic paradigm, with framework conditions that enable private enterprises to flourish.'
- 'The literature review reflects TVET as a "Cinderella" sector not renowned for innovation capacity let alone
 exercising the role of an innovation actor and engaging in a limited amount of innovation activity through
 industry partnerships. The TVET sector has been essentially considered and is portrayed as a provider of entryand mid-level skills to respond to national social and economic development.'
- 'A central finding of the survey is that product innovation in the colleges is rare, with more cases of process innovation (in-college functional innovation). There is a small number of innovation 'leaders' among the colleges, which serves as a basis for optimism for further developments.'

SITVET I recognised the central role that TVET plays in providing scientific and technical education and training for economic and social development, drawing on the extensive literature and learnings on TVET. It was argued that TVET colleges are autonomous innovation actors within the quintuple helix of actors comprising South Africa's National System of Innovation (NSI). A set of 25 innovation indicators was proposed for further elaboration and use.²

This repositioning is in accordance with Moso-Diez's (2019) critique of the Organisation for Economic Co-operation and Development (OECD) and European Union's (EU) innovation policy that favours codified STI-led innovation over the more common doing, using, and interacting innovation activities that arise on the shop floor. Mozo-Diez advocates that '... an advanced conception of VET views the VET system as a key facilitator of learning and innovation'.

The interactions and linkages that lead to innovation are manifold. Indeed, the existence of linkages is central to the very notion of an innovation system. In particular, the 1996 White Paper on Science & Technology adopted a definition of the innovation system that expected our institutions, organisations, and policies to interact constructively. In contrast, where linkages are weak or broken, the innovation system may be described as 'disarticulated' or even non-existent (Freeman and Soete, 2007).

TVET colleges are linked to the following government entities: Sector Education and Training Authorities (SETAs), enterprises, public research organisations, and higher education institutions (HEIs). The importance of such linkages is echoed in the observation that 'countries with strong TVET colleges have good relationships between industry and the TVET colleges' (UNESCO, 2022).

² http://www.naci.org.za/wp-content/uploads/2021/09/The-Status-of-Innovation-in-the-TVET-Colleges-Final.pdf

SITVET I made use of the generally accepted tools for measuring innovation activity in firms, namely the Frascati Family manuals as developed by the Committee for Scientific and Technological Policy (CSTP) of the OECD and its partners, United Nations Educational, Scientific and Cultural Organization (UNESCO) and Eurostat.

Absent is an internationally agreed upon body of indicators that speak to innovation in TVET colleges. To fill this gap, SITVET I developed the provisional indicators with reference to the OECD guidelines on conducting surveys of research and development (R&D) inputs (Frascati Manual – OECD, 2015) and innovation outputs in firms (Oslo Manual – OECD, 2018). This measurement framework was adequate for the needs of the exploratory study.

It is necessary now to anchor the measurement framework in TVET policy, strategy, and management. Most importantly, the associated activities are best understood in the context of PSI. To this end, SITVET II adopted the methodology of a design and feasibility study. This approach was used to deepen the theoretical underpinnings guiding indicator development. The design stage contributed to two critical frames. The first drew on recent work on measuring public sector innovation. The second captured the main thrusts of DHET TVET policy, strategy, and planning. The feasibility stage drew on the principles of ISS to link DHET operational strategy and performance measurement.

The main body of work interrogated the viability and completeness of the SITVET I indicator set, expanded the set as needed, and identified and collated the data required to determine the state of innovation of South African TVET colleges.

SITVET II entailed desk research; interviews; meetings with NACI, the NACI TVET Reference Committee, and the NACI M&E Reference Committee; and a round-table meeting with stakeholders. The interaction with the M&E Reference Committee highlighted the need for the eventual set of TVET indicators to be included in the 2024 NACI STI (science, technology and innovation) Indicators report.

The scope of the work included a critique of the October 2021 Terms of Reference (Appendix A). This led to some changes to the study objectives, as set out below.

Objectives of the study
Conduct a design and feasibility study regarding the use-value and viability of the proposed indicator set.
Provide a finalised set of indicators duly ratified by selected stakeholders.
Provide benchmarking against international practice.
Determine the availability of, and barriers to, access to data for populating the indicators in South Africa.
Identify and propose such datasets to fill identified data gaps.
Use such indicators for which sufficient data is available to quantify the state of innovation in the TVET sector.
Table a report on the state of innovation in TVET colleges in South Africa using indicators currently available.

SITVET II thereby adopts a self-critical view of the SITVET I exploratory study. In particular, it is suggested that SITVET I could have given more attention to TVET colleges as entities whose primary functioning is conditioned by their role within the public sector ecosystem. In the course of the work, the terms of reference (ToR) were broadened to interrogate best practices in measuring PSI.

Significantly, SITVET II was conducted when the COVID-19 restrictions were easing, although the disruptions to individuals, livelihoods, and organisations persisted.

The final stages of the SITVET II study occurred in the context of generative (AI) and the dissemination of LLM applications. Together with the larger field of generative AI, these are expected to impact society, instruction, and learning significantly. In SITVET II, limited use was made of an LLM application for validation purposes.

This report is organised into seven sections. Following the Introduction, Section 2 addresses the methodology. The starting point is the policy framework for TVET and its agenda for change and improvement located within the emergent field of measuring PSI. This leads to considerations of the underlying ISS, MISs, and associated indicators and targets. Section 3 provides the necessary benchmarking, including international TVET innovation indicators, generative AI products, and consideration for intellectual property rights (IPRs). This is followed by a comparative analysis in Section 4, which appraises the proposed indicators. Section 5 provides the synthesis and refinement of the original SITVET I indicators and suggestions for additional indicators. The main body of the report is Section 6, which presents the revised and populated indicator set along with sources of data and, where possible, normative values for the proposed indicators. Section 7 offers concluding remarks and recommendations.

'The college sector is intended as a pathway for those who do not follow an academic path, but it suffers from a poor reputation due to the low rate of employment of college graduates.' National Development Plan 2030

2. METHODOLOGY

The methodology employed follows a design and feasibility study to understand the sources of the knowledge base for the assessment of innovation in the TVET system in South Africa.

The design stage locates the object under investigation, explaining the theoretical base underpinning the indicator development and population. The theoretical base consists of two interlocking frameworks. The first is the DHET policy, strategy, implementation, and performance framework for TVET colleges. By its very nature, policy expresses the intent to bring about change. In the case of TVET, this primarily refers to educational change. The second framework is the positioning of TVET colleges as part and parcel of the public sector, where change is increasingly understood in the emerging discipline of PSI.

The feasibility study examines the viability and practicality of the task at hand and proposes how the necessary evidence base will be produced. Specifically, it interrogates the goals for performance management by applying the principles of ISS as a prior condition for the development, population, and maintenance of the evidence base. The evidence base will support the performance indicators that assess outputs and outcomes, guiding policy learning and strategy and management changes.

Drawing on the SITVET I literature review and other results, SITVET II is primarily based on new secondary sources, enhanced with interviews with critical data gatekeepers; meetings with NACI, the NACITVET Reference Committee, and the NACI M&E Reference Committee; and a round-table meeting with stakeholders.

Appendix B documents the strategies and proposals of government strategy and implementation plans, including the Human Resource Development Council of South Africa (HRDC SA), the National Skills Authority (NSA), and SETAs. These structures seek to link TVET colleges with the labour market. The White Paper for Post-school Education and Training (DHET, 2013), the National Skills Development Plan (NSDP) 2030 (DHET, 2019), the HRDC (2021), and the Teaching and Learning Plan 2022 (DHET, 2022) are analysed to identify indicators and data sources.

3. DESIGN AND FEASIBILITY

3.1. **TVET Policy and Strategy**

TVET college governance has been in flux since the late 1990s. Most important was the shift in control of TVET colleges from the Provincial Education Departments (PEDs) to the national DHET, a division of the Ministry of Higher Education, Science and Innovation (MHESI) under its own accounting officer. The DHET sets policy and provides funding for the Post-school Education and Training (PSET) system of universities, universities of technology, and the various intermediary structures that were moved from the Department of Employment and Labour.

This shift of control and responsibility has entailed significant policy and organisational innovation, disruption, and pressure on information management and systems. The various components of the PSET system have degrees of mandated autonomy, each with its own policy goals, strategies, and objectives that are rolled out according to their own explicit or implicit Theory of Change (ToC). PSET institutional behaviours are shaped by the White Paper for Post-school Education and Training, the former economic development department's New Growth Path, the National Planning Commission's (NPC) NDP 2030, and the Department of Trade, Industry and Competition's (DTIC) Industrial Policy Action Plan. The most recent expressions of policy intent are the White Paper on Science, Technology and Innovation (DSI, 2019) and its companion, the Science, Technology and Innovation Decadal Plan (DSI, 2022). Figure I summarises the changing policy landscape of the democratic order.





The variety of symbols highlights the range of national ministries that have shaped PSET. The direct shapers are the Department of Labour (ellipse), the Ministry of Education (rectangle), and the DHET (right-pointing arrow). The indirect shapers (double arrowed) are the economic ministries, the former economic development department, and the DTIC. The NPC, standing above all, has no direct control. Policy coherence and coordination present ongoing

challenges. The placement of the DHET and the DSI under the MHESI has the potential to advance coherence across the PSET landscape.

PSET institutional behaviours involve direct, indirect, and complex interactions with other organisations within the NSI. The attribution of outcomes is, therefore, complex and uncertain. Changes can only be assessed in the medium to longer term as the sector stabilises and initial changes are cemented. Indeed, as argued below, innovation is not an ad hoc or once-off 'event.' An enabling environment is a sine qua non for continued viability. While disruptions may have a detrimental short-term impact on stability and, by implication, on innovation activities, these organisational innovations point to the potential for further innovation activities.

3.2. Public Sector Innovation

Understanding the determinants of economic growth saw considerable international attention given to theorising and quantifying innovation in firms. This work was centred on the OECD Committee on Science and Technology Policy (OECD-CSTP) and became codified in the guidelines of the first Oslo Manual (OECD, 1995). These guidelines then shaped the execution of innovation surveys in firms by OECD member and observer states. South Africa's first official business innovation survey following the Oslo Manual guidelines was for the years 2002–04.³

From the early 2000s, PSI has become a topic of intense discussion in the OECD-CSTP.A significant body of literature now covers organisational theory, the limits of change in the public sector, how to distinguish routine change from innovation, and, most importantly, developing a framework to measure the effects of PSI at organisational and societal levels. Survey and case study methods have been developed and deployed to build an empirical base for shaping government policy for PSI.

Given the prior adoption of the Oslo Manual and Eurostat Community Innovation Survey (CIS), it is unsurprising that the CIS served as the starting point for developing an instrument to measure PSI. Considerable effort went toward its adaptation to public service environments.

The fourth edition of the Oslo Manual defines innovation as (OECD, 2018):

'An innovation is a new or improved product or process (or combination thereof) that differs significantly from the unit's previous products or processes and that has been made available to potential users (product) or brought into use by the unit (process).'

This definition is agnostic regarding the sector and the identity of the 'unit', which may be any workplace, firm, or institute. A product innovation is understood to have been introduced when it is made available by its intended user. A process innovation is understood to have been introduced when it is brought into actual use in the unit's operations. The Oslo Manual defines the 'public service' as 'general government', with the 'public sector' spanning general government and entities reporting to government. In the case of South Africa, examples of the entities reporting to the government would be the Fisheries Management branch of the Department of Forestry, Fisheries and the Environment, and Denel SOC Ltd, which reports to the Department of Public Enterprises.

The reader is referred to the extensive review of public sector innovation by Arundel, Bloch, and Ferguson (2019). The above considerations and practices have now been compiled into the report titled 'Copenhagen Manual: A guide

3 HSRC employs the CIS instrument in its triennial business innovation survey.

on how and why your country can benefit from measuring public sector innovation' (COI, 2021). The Copenhagen Manual represents best practice advice to raise awareness of the importance of PSI. It also provides a questionnaire template that may be used to survey public sector organisations.

The SITVET I survey instrument was consistent with the Copenhagen Manual guidelines.

For SITVET II, the most valuable insights from the Copenhagen Manual are the following:

- There are overlaps and differences between the measurement instruments for the public sector and business innovation.
- PSI is mainly concerned with public goods; business is driven by profit.
- Governance and control of PSI are diffused, shaped by political agendas, and carry high political risks.
- PSI includes new products and processes, organisation methods, services, and methods of communication.
- The sources of information for PSI are concentrated within the public service.
- Changes in legislation often drive the need for PSI.
- PSI must be new to the workplace, but copying can often inspire it.
- The timelines for PSI are much longer than they are for business innovation.
- PSI generally requires employee buy-in, citizen involvement, and the satisfaction of consumers, clients, and partners.
- The outcome attribution of PSI is difficult.

The Copenhagen Manual does not propose a sentinel indicator that characterises innovation in the public sector PSI, nor does it advocate the development and use of composite indicators.

3.3. Information System Strategy

It is fundamental that corporate strategy determines that of the subsidiary business units. In the case of TVET, the DHET sets corporate strategy, and TVET colleges follow within the restricted autonomy they enjoy. Corporate ISS and associated MISs should enable the implementation and monitoring of corporate strategy. The highest-level organisational strategy would determine a consistent and comprehensive ISS (Ward and Griffiths, 1996; Chen et al., 2010). This sequential approach mitigates against an MIS being generated autonomously by information technology staff. The ISS and MIS alignment is supported by constructing and implementing a user requirement specification (URS). Ultimately, the MIS will be populated with relevant data to generate the specified indicators. Indicators are thus subordinate to strategy.

In the case of TVET Colleges, the DHET is the parent organisation that sets the overall policy, strategy, and management approach that cascades down to the MIS, its datasets and associated indicators.

Following Van Es, Guijt, and Vogel (2015), a check on information system completeness will involve the examination of policy statements, strategies, theories of change, objectives, indicators, and the associated management and measurement systems. A caveat applies: the collation of information is always subject to bounded reality (Simon, 1959).

The following question is posed: is a TVET information system strategy in place?



3.4. Management Information Systems and Indicators

This elicits the next question: is there a base document that informs the architecture of its MIS?

If the answer is negative, then a minimum requirement is for the DHET to construct a TVET ISS and associated MIS. What type of TVET MIS will best serve the needs of the TVET stakeholders? And, in particular, does the DHET, as a policy formulator and funder, require an MIS or an executive information system? Once this choice is made, other considerations apply. Who will be responsible for data generation and ownership, who will have access to the various levels of information, surface level or metadata, and for what purpose? For instance, will industry and business organisations have access to the raw data? The structures necessary for sustained information gathering will need to be established. A structure that will ensure that information is available to assess ongoing policy renewal and implementation challenges is a requirement for management at all levels.

MISs are the expression of stated (or unstated) performance frameworks and strategies and are dependent on the evidence base provided by indicators. An example is the logical framework approach (LFA) of the 1960s. The LFA and its variants are still in use as in the OECD results-based management (RBM) approach. A new analytical device is the ToC, a variant of the LFA and RBM (Bester, 2012). A ToC seeks to improve performance management by specifying interventions from inputs and activities to outcomes. These tools inform the MIS and should provide complete, relevant, reliable, timely, accessible, and reproducible information for policymaking, benchmarking, and corrective action. TVET colleges are components of the public service. The concept map of Figure 2 explores the interaction of TVET colleges within its network of suppliers, customers, and competitors.



Figure 2: TVET in the National System of Innovation

The concept map delineates the complex, multipath relationships among TVET colleges, agents, service providers, and stakeholders in the NSI. It depicts the main learning pathways of students, staff, and funding flows. In some cases, the absence of a critical link is highlighted with a dashed line. Rounded boxes signify the main sites of study in which students are supported by their households, government, the private sector, and other sources. The concept map includes the National Skills Fund (NSF), SETAs, and qualification oversight bodies – the Council on Higher Education (CHE), the Quality Council for Trades and Occupations (QCTO), and Umalusi (primarily school certification and TVET college theoretical or examination components). The latter two are the focus of the government's skills development initiatives. As skills levy and quality assurance institutions, they play a central role in linking education and training institutions with the world of work and the location of MISs. Curriculum and learning permeate the entire innovation ecosystem and are the locus of educational change and innovation.

It illustrates the complexities of constructing a PSET MIS that will serve all decision-makers, actors, and stakeholders (green diamonds). To this end, assessing the completeness, functionality, and interoperability of the Higher Education Management Information System (HEMIS), Sector Education and Training Management Information System (SETMIS), National Student Financial Aid Scheme (NSFAS), and TVET MIS databases will be necessary. A QCTO MIS will provide information on enrolment and completion, including flows to employment or further study. The Umalusi MIS provides enrolment and completion for TVET Levels I to 3.

As is standard practice, a future TVET MIS rests on agreement of the URS that must include specification of a data library and standards; protocols for the capture, collation, verification, estimation, imputation, rules for access and training; and the definition of indicators.

The indicators populated through the MIS must be specific, measurable, achievable, relevant, and time-bound. Best practice has transitioned from 'bottom line' to 'triple bottom line' to today's environmental, social, and governance (ESG) reporting, moves that have their origins in the balanced scorecard approach.⁴⁵⁶ Ten categories of indicators for innovation include:

- a. Inputs (financial: costs of licencing, buildings, machinery, and software)
- b. Outputs (volume, progression, retention, graduation rate, labour market efficiency, and compliance with the ISO)
- c. Process (efficiency, effectiveness, adherence to quality, drop-out rate, remote learning, and quality)
- d. People (stock, staff qualifications, productivity, staff development, time-on-task, and demographics)
- e. Stakeholder (governance, participation, customers, and client satisfaction)
- f. Organisational learning (upskilling rates, organisational change, adoption of AI, and the use of management dashboards)
- g. Innovation (product, process and organisational, customisation, obstacles, sources, R&D, and IPRs)
- h. Sustainability (sustainable development goals, energy and water use, and green pus)
- i. Impact (lifetime value, lifelong learning, and community engagement)
- j. Synoptic (data analytics, demand, and M&E)
- k. For comparative purposes, the SITVET I indicators are presented (Table I).
- 4 https://balancedscorecard.org/

⁵ https://www.globalreporting.org/

⁶ https://www.iso.org/home.html



Table 1: SITVET I Indicators

Indicator	Categories			
	Input			
1	Expenditure on formal TVET			
2	TVET expenditure per student			
3	% apprenticeship/other training in labour cost			
4	Expenditure on lecturer training			
5	Expenditure share on information and communication technology (ICT) training activities			
	Output			
6	Lifelong learning rate of the 25 to 64-year-old population			
7	TVET enrolment by economic subsector			
8	Transition rate from secondary school to TVET college			
9	WBL participation rate			
10	First-time PSET completion rate of 18 to 24-year-old group			
	Student-lecturer ratio in TVET colleges			
12	% completion of TVET programmes			
13	% of apprentices trade tested or certified			
14	% of fully qualified TVET lecturers			
15	% colleges with industry partnerships			
16	% student placement in industry during study			
17	% employment of graduates			
18	% companies providing apprenticeship or other training			
	Quality and Innovation			
19	Employer satisfaction with TVET graduates			
20	Quality of TVET according to Global Competitive Index (GCI) Pillar 6			
21	Technician: researcher ratio in the NSI			
22	% that introduced product innovation			
23	% that introduced significant curriculum changes			
24	% that introduced new e-learning and management tools			
25	% that introduced new partnerships			

Source NACI 2021

The SITVET I Input indicators (1-5) are congruent with those of category A; the Output indicators (6-18) include elements of categories B through D; and the Quality and Innovation indicators speak to categories B, G, and I.

The following section provides an overview of international TVET efficiency and effectiveness indicators. Generative AI is used to construct an overview of innovation practice in TVET systems. IPRs are also discussed.

4. **BENCHMARKING**

4.1. International Indicators

At the outset, reference is made to the Inter-Agency Group⁷ on TVET's (IAG-TVET) 'Proposed Indicators for Assessing Technical and Vocational Education and Training: Working Document' (IAG-TVET, 2014) and the Swiss Agency for Development and Cooperation's report on TVET indicators (SDC, 2013). These remaining works in progress are geared towards assessing the efficiency and effectiveness of national TVET systems. Table 2 compares indicators from IAG-TVET (2014) with those proposed by SITVET I. The 21 IAG-TVET indicators are clustered into three focus areas:

- Finance, Access, and Quality and Innovation. These provide the basis for characterising TVET systems through a typology of availability –data available (DA)
- Data not readily available (DNRA)
- Data often not available (DONA)

Table 2: IAG-TVET and SITVET I Indicators

Focus	IAG-TVET	Access	SITVET I
I. Finance	I.I. Spending on formal TVET	DA	1
	I.2. Total TVET spending by student	DNRA	2
	1.3. Share of companies providing apprenticeship and other types of	DONA	18
	training (by size of company)		
	1.4. Share of apprenticeship in labour costs (by size of company)	DONA	3
2. Access	2.1. Enrolment in vocational education as % of total enrolment	DA	7
	2.2. Enrolment by type of TVET programme		7
	2.3. Work-based participation rate	DONA	9; 15; 16
	2.4. Equity	DONA	-
	2.5. Unsatisfied demand for TVET	DONA	-
	2.6. Typology of admission policies to formal school-based TVET	DNRA	-
	2.7. Transition paths from schooling to HE	DNRA	
	2.8. Policies on articulation with schooling / higher education	DONA	-
		DONA	-
3. Quality	3.1. Student-teacher ratio in formal TVET and general programmes	DA	11
and	3.2. Completion rate in TVET programmes and in general programmes		12
Innovation	3.3. Apprentices completion rate		13
	3.4. Share of qualified teachers	DNRA	14
	3.5. Relevance of quality assurance	DNRA	-
	3.6. Investment in the training of teachers and trainers	DONA	4
	3.7. Utilisation of acquired skills at the workplace	DONA	-
	3.8. Share of ICT training activities in TVET	DONA	5
	3.9. Satisfaction of employers with TVET graduates	DONA	19
		DONA	

Source IAG 2014

The Czech IndiKit skills indicators provide another check on scope (Table 3).⁸

7 The Inter-Agency Group (IAG-TVET) comprises UNESCO, the International Labour Organization (ILO), the OECD, the United Nations Industrial Development Organization, the World Health Organization, the World Bank, the African Development Bank, the Asian Development Bank, the European Commission, the European Training Foundation, the European Centre for the Development of Vocational Training, and the Inter-American Development Bank. 8 https://www.indikit.net/sector/6-education-and-skills)



Table 3: IndiKit skills and SITVET I Indicators

Focus	IndiKit indicators	SITVET I
Skills:	Enrolment in VET	7
participation	Drop-out rate in VET	
and completion	Completion rate in VET	10
indicators	Participation of vulnerable groups	-
Skills:VET quality	Achievement of VET competency standards	
and relevance	VET quality standards	
indicators	Market-relevant curriculum	
	Successfully trained teachers/trainers	14
	Adequate VET Facilities	-
Skills: placement	Participation in WBL	9; 15
and employment	VET providers offering internships	9; 15
	Employment of VET completers	17
	Access to labour market information	-

Source: Czech IndiKit https://www.indikit.net/sector/6-education-and-skills

A third source for benchmarking is the 'Key Indicators on Education, Skills and Employment' (KIESE) of the European Union (Table 4).

Table 4: KIESE and SITVET I Indicators

Focus	KIESE Indicators	SITVET I
I. Education	1.1. Low-achieving 15-year-olds in reading	-
	1.2. Low achieving 8th graders in digital reading	-
	1.3. Early leavers from education and training	-
	I.4. Tertiary level enrolment (% aged 25–34)	10
	1.5. Exposure of VET graduates to work-based learning	9
2. Skills	2.1. % adults in learning – past 12 months	6
	2.2. % unemployed adults in learning – past 12 months	-
	2.3. Share of adults having at least basic digital skills	-
3.VET	3.1. Employment rate of recent TVET graduates	17
	3.2. Mobility of VET graduates	-

Source: adapted from KIESE (2022)

The KIESE indicators track the e ntire education pipeline from young learners to adulthood.

The fourth reference (Table 5) is the authoritative European Innovation Scorecard (EIS, 2022). It may be noted that the EIS served as the organising framework for the South African Innovation Scorecard of NACI.

Table 5: EIS Indicators

Category	Subcategory	Indicator
	Human resources	 I.I. New doctoral graduates in science, technology, engineering, and maths (STEM) I.2. Population aged 25–34 with tertiary education
		1.3. Lifelong learning
Framework	Attractive	1.2.1. 1.2.1 International scientific co-publications
conditions	research	1.2.2. 1.2.2 Top 10% most cited publications
	systems	1.2.3. 1.2.3 Foreign doctoral students
	Digitalisation	I.3.1. Broadband penetration
		1.3.2. Individuals with above-basic digital skills
	Finance and	2.1.1. R&D expenditure in the public sector
	support	2.1.2. Venture capital expenditure
		2.1.3. Direct government funding and tax support for business R&D
	Firm	2.2.1. R&D expenditure in the business sector
Investments	investments	2.2.2. Non-R&D innovation expenditure
		2.2.3. Innovation expenditure per person employed in innovation-active
	Llas of	enterprises
	Use of	2.3.1. Enterprises providing training to develop or upgrade ICT skills of
	tochnologios	2.3.2 Employed ICT specialists
	Innovators	2.1.1. SMEs with product innovation
	IIIIOvator S	3.1.2 SMEs with business process innovation
	Linkages	3.2.1. Innovative SME collaboration
Innovation	LIIIKages	3.2.7. Public-private co-publications
activities		3.2.3. lob-to-iob mobility in S&T
	Intellectual	3.3.1. PCT patent applications
	assets	3.3.2. Trademark applications
		3.3.3. Design applications
	Employment	4.1.1. Employment in knowledge-intensive activities
	impacts	4.1.2. Employment in innovative enterprises
	Sales impacts	4.2.1. Medium- and high-tech product exports
Impacts		4.2.2. Knowledge-intensive services exports
impacts		4.2.3. Sales of product innovations
	Environmental	4.3.1. Resource productivity
	sustainability	4.3.2. Air emissions by fine particulates (PM2.5) in industry
		4.3.3. Development of environment-related technologies

Source: European Innovation Scoreboard

Three EIS indicators (Table 6) are relevant to SITVET II and have been considered for inclusion in the modified TVET indicator set.



Table 6: European Innovation Scoreboard Indicators for SITVET II

Attribute	EIS Indicators	SITVET I
Digitalisation	1.3.2 Individuals with above-basic overall digital skills	-
Use of information	2.3.1 Enterprises actively increasing the ICT skills of their personnel	-
Linkages	3.2.3 Job-to-job mobility of human resources in science and technology	-

Reference is also made to the UNEVOC report titled 'Innovating technical and vocational education and training: A framework for institutions' (UNESCO, 2020), which was developed for and has been applied to EU member states and some other countries. The instrument (Table 7) reflects the long development of TVET systems in the highly industrialised countries of the EU.

Table 7: UNEVOC Innovation Framework Indicators

Strategy and Management	SITVET I
I.I. Innovation reflected in the TVET college vision/mission/strategy	-
I.2. The existence of an innovation action plan in the TVET college	-
1.3. Financial resources for innovation in the institution's budget	-
I.4. Income generated through innovation	-
I.5. Innovation-related competencies and skills in recruitment	-
I.6. Building staff capacity for innovation	-
I.7. Employee performance based on innovation objectives	-
I.8. Innovation supported by dedicated manager and staff	-
I.9. Physical space dedicated to innovation	-
1.10. Innovation culture embedded in internal communication	-
I.II. Organisational processes oriented to foster innovation	-
I.I2. Knowledge gained through innovation activities shared	-
Teaching and Learning	
2.1. In-service training opportunities provided for innovation skills	-
2.2. ICT tools systematically deployed in teaching and learning	24
2.3. Deployment of innovative teaching and learning experiences	24
2.4. Processes and resources for developing new curricula	23
2.5. New teaching and learning methods/equipment introduced	23
2.6. Innovation-related skills, competencies and themes mainstreamed	23
Products and Services	
3.1. Innovation projects and services developed	22
3.2. Patents registered	-
3.3. Multitask teams develop innovative products and services	24
3.4. Engagement in R&D activities	-
3.5. Development of products and services for ecosystem partners	22
3.6. Career guidance	-
3.7. Recognition and certification of competencies	13
3.8. Provision of innovation-related skills programmes	-
3.9. Support to students with special needs	-

Ecosystem Relationship Management	
4.1. Innovation incorporated in the external communication strategy	-
4.2. Broad-based M&E is institutionalised	-
4.3. Ecosystem monitored to identify new partners/opportunities	15
4.4. Ecosystem innovation skills, needs, and shortages monitored	16
4.5. Employability/employment outcomes of graduates traced	17
4.6. Engagement in networks with different stakeholders	18
4.7. Stakeholder engagement in the curriculum development	25
4.8. Existing network of diverse contacts and potential partners	25
4.9. Training for staff for partnership and collaboration management	-
4.10. Mechanisms for innovation capacity within the ecosystem	-
4.11. Innovative teaching, including WBL	9
4.12. Stakeholders part of governance, innovation strategy, and plans	-
4.13. Participation in local/national/international skills competitions	-
4.14. Engagement in international networks and learning opportunities	-

Source: UNESCO-UNEVOC, 2019

The UNESCO-UNEVOC framework deploys two empirical instruments. The first instrument is a balanced scorecard to measure innovation performance across strategy and management, teaching and learning, products and services, and ecosystem relationship management. The value of the innovation framework is that it serves as a best practice check for measuring TVET innovation. A five-level maturity model is used to score progress: Absence – Level 0; Beginning – Level 1; Some progress – Level 2; Satisfactory progress – Level 3; Embedded change – Level 4.

The second instrument is an ecosystem map of the strengths and potential of relationships with external stakeholders, including staff and student mobility, as well as the satisfaction of students, staff, and employers. The UNESCO-UNEVOC framework identifies 41 indicators that reflect the character of the highly autonomous TVET institutions of the EU member states. The complete UNEVOC set of indicators is thus not directly applicable to the South African TVET ecosystem, which is highly centralised and has no mandate for innovation nor the conduct of third-stream activities, R&D, or intellectual property registration. Indicators 1.1 through 1.12, 3.2 and 3.4 fall into these categories.

The SITVET I indicators show substantial overlap with 16 of the UNEVOC indicators that deal with TVETs core business, namely Teaching and Learning (5 out of 6) and Ecosystem Relationship Management (7 out of 14). The area without overlap is that of Strategy and Management. This gap mostly reflects the top-down relationship between the DHET and the TVET sector, which is quite different to the EU educational culture.

A sixth benchmark of TVET indicators is the OECD working paper 'Improving Evidence on VET: Comparative Data and Indicators' (Kis, 2020), which provides a framework for national comparisons that clusters VET indicators into five thrusts:

- Structure of VET
- Students and participation in VET
- Venues for learning (WBL; apprenticeships)
- Finance, including student and household
- Personnel

A close reading of Kis (2020) suggests that the specific issue of innovation still needs to be addressed. Actions to improve quality include data collection on trainers and teachers, comprising policy and practice, entry requirements, workplace activities, and the training of trainers. Further effort to collect data on progression is also advocated. The SITVET I indicators stand up well against this (unofficial) benchmark.

Last for consideration is the African Union Continental Strategy on TVET, which makes the case for the 'cross-cutting issues of governance, innovation and creativity, employability and relevance' (AUC, 2014: 38). The main thrust of the document is the development of TVET systems that prepare young people to be job creators rather than job seekers. However, little is documented as to what should be emphasised, bar the need to '... harmonise the statistical data collected and render the processing and interpretation comparable, it will be necessary to determine indicators commonly accepted at the national, regional, and continental levels' [emphasis added].

Regarding innovation per se, reference is made to the need to support innovation, ... including predictive and visioning research into occupations of the future' (idem: 35). An overall commitment to innovation, linking the construct with entrepreneurship, and the political environment and governance; quality assurance; employability; assessment and validation of skills; attractiveness of TVET and registration rates and employment data' is made (ibid: 36).

As summarised in Figure 3, the benchmarking shows good intersection of SITVET I indicators with IAG-TVET, INDIKIT, KIESE, and UNEVOC. Arrow thickness provides a measure of the overlaps between SITVET I and the international indicator sets.



Figure 3: Benchmarking SITVET I

The IAG-TVET, KIESE, IndiKit, EIS, and OECD indicator ensembles speak to the supply side of TVET but not to innovation activities per se.

4.2. Use of Generative Artificial Intelligence

A shared notion of the attributes of an ideal 'innovative TVET college' should be foundational to investigations of all aspects of TVET colleges – teaching, learning, interacting, and experimenting. In seeking best-practice thinking on innovation in TVET, the authors independently queried ChatGPT, a generative AI LLM developed by OpenAI. The free-to-use LLM system was asked to elaborate a response to two queries:

- Query I:What are the characteristics of an ideal TVET college in Africa?
- Query 2:What are the attributes of the innovative TVET college?

The responses to these queries are structured as 10 attributes (Table 8), with the SITVET I overlaps shown in the last column.



Table 8: Determinants of the ideal TVET college

	Attribute	Ideal TVET college in Africa	Attributes of an innovative TVET college	SITVET I
Ι.	Curriculum and learning	The college should have a relevant and up-to-date curriculum that is aligned with industry needs and incorporates the latest technological advancements.	Personalised learning experiences for unique needs and ways of learning, as well as adaptive and project-based learning.	DHET sets policy 23; 24
2.	Teaching staff	The college should employ qualified and experienced instructors who are familiar with the theoretical knowledge and practical skills relevant to the courses they teach.	Staff are capable, qualified, and committed, with recent relevant industry experience, communication skills, and an awareness of new economic imperatives. They also embrace innovative practices.	14
3.	Infrastructure	The college should have modern and well-equipped workshops, laboratories, libraries, and classrooms to support student learning and skills development.	Students and instructional staff explore, experiment, and innovate. The college has learning space and technologies that facilitate collaboration.	I—5
4.	Engagement with industry	The college should have established partnerships with relevant industries.	Partnerships with local and national industries ensure that offerings are aligned with the needs of the job market.	15; 16
5.	Inclusivity and diversity	The college must be accessible to a diverse range of students, embracing inclusivity and diversity in its staff and student body.		National norms 7; 13
6.	Employment (incl. self- employment	The college must place emphasis on improving the employability of its graduates.	Focus on student outcomes, as well as academic and practical curricula meeting industry expectations. Progress tracked with guidance.	17; 19
7.	Student support services	The college should offer career competing, academic advice, and financial assistance.		16
8.	Innovation culture	The college should encourage innovative thinking, research, and development.	Opportunities for students and instructional staff to study and collaborate with global peers.	DHET sets policy 22
9.	Capacity building – continuous improvement	The college should continuously invest in staff development, infrastructure enhancement, and curriculum updates to ensure that it remains competitive and relevant.	Commitment to continuous improvement.TVET colleges think 'change for the better'. Regular programme evaluation. Leaderships' recognition that the world of work is constantly changing.	DHET sets policy 14; 1
10.	Ethical and responsible practice	The college should adhere to ethical and responsible practices that promote integrity, honesty, transparency, and accountability in its operations.		Governance

Source: ChatGPT queries

There is a high similarity between the responses to the queries. While the TVET college purpose of 'self-employment' is not reflected in either search, the responses speak to the importance of curricula and student experiences.

The SITVET I indicators cover aspects of all attributes except for ethical and responsible practice and governance.

Attributes to be incorporated in SITVET II include up-to-date curriculum development, the quality of teaching staff (#2 and #9), college capacity (#3 infrastructure and #9 continuous capacity building), industry partnerships (#4) and employment/employability outcomes (#6).

Other aspects related to the core mandate include s tudent inclusivity (#5), student support services (#7), and ethical practice (#10), which are critical concerns among many African scholars and evaluators of TVET.

Innovation culture (#8) is a specific feature of the ideal TVET college – an institution that encourages innovative thinking and R&D in its pursuit of excellence.

4.3. Intellectual Property Rights

It has been argued that TVET should be an essential site for innovation activities. As public service entities, it is accepted that adapting the experience of peers will be standard practice, as emphasised in the Copenhagen Manual. How, then, is the relationship with the registration of IPRs?

Invention is not the same as innovation. Innovation requires disseminating a novel product or process; the invention is nevertheless an important starting point. It is also true that while many IPRs may be awarded, only some of these patents become successful innovations.

The Intellectual Property Rights from Publicly Financed Research and Development Act, 2008 (No. 51 of 2008), was introduced to regularise, promote, and incentivise IP generated from publicly funded R&D. In addition to scientific publication outputs, universities (and science councils) are now expected to produce, manage, and register IP. What are the implications of these demands for the TVET sector?

In some countries, TVET colleges and their staff are expected to and do register IP. This observation triggers yet another question: what are the personal characteristics of those who invent and patent?

Some answers to these questions may be found in the Australian Inventor Survey 2007, which revealed that just over half of those who registered Australian patents held university degrees (Beddie and Simon, 2017). In other words, those with 'only' a school-leaving certificate and many with International Standard Classification of Education (ISCED) post-secondary non-tertiary education qualifications were registering IP. More recent studies in Australia, Austria, Germany, the United Kingdom, and the United States corroborate this finding. In these countries, roughly 50% of patent holders and inventors still need degrees, implying that schooling and TVET are sufficient preparation for the creativity that invention and, hence, patenting require.

The above-mentioned countries maintain patent examining regimes that constitute a significant hurdle for clearance before a patent is accepted or awarded.

These findings have important implications for South Africa and show the potential of the TVET sector to enhance innovation in the country.

South Africa operates a non-examining patent regime, sharing this approach with at least 36 other countries, including Brazil, Russia, India, and China. ⁹The advantages of a non-examining system are its low cost, simplicity, and the speed with which an award is made.

South Africa's Companies and Intellectual Property Commission (CIPC) lays out a limited set of formal requirements for the granting of a patent. If these are met, the CIPC accepts the application, a process that usually takes six to nine months. The CIPC refuses an application when the invention falls under the category of an unpatentable invention. Once accepted, the application is published in the Patent Journal. The patent right takes effect on the date of publication of the Patent Journal (not on the date of acceptance of the application) and is valid for 20 years. This mechanism serves to establish priority, which is central in litigation should an infringement be detected and pursued. Under the non-examining system, even flawed applications that do not meet patentability requirements (i.e. substantive requirements) are likely to be granted.

The disadvantage of non-examining systems is that there is limited quality control, and the system is open to abuse. In 2022, following the introduction of incentive schemes in China and India, the CIPC was flooded with applications from those countries, overwhelming its administrative capacity and distorting the time series.

Since it is 'easy' to obtain patent rights in South Africa, it is to be expected that a significant share of South African patents filed by residents will emanate from among those with school and TVET qualifications. Innovation system assessment will need to take this into account in future. This matter is flagged for further research.

'Selecting the right measure and measuring things right are both art and science.And [key performance indicators] influence management behaviour as well as business culture.' *Pearl Zhu, digital transformation expert and author*

5. SITVET I AND DHET INDICATORS

The TVET sector is tightly embedded within the DHET and bound by the latter's monitoring and reporting systems. For TVET colleges, this has taken the form of the quarterly performance reporting system, in place since 2016. These reports are compiled according to a standard template, completed at each TVET college, and signed off by the relevant executive authorities. TVET college reporting includes items based on 'self-reporting' with minimal external review, a practice that might need reconsideration. Incomplete data necessarily manifests as MIS incompleteness.

At face value, TVET colleges are closely monitored. The DHET should, therefore, be collating verified data that may be used to answer key management questions such as student and staff demographics, programme offerings, student experiences and uptake, attainment, graduations and certification, and graduate destinations, including student support and linkages with the labour market.

In practice, however, there are considerable gaps in data on progression, retention and graduation, and little information on the private provisioning of TVET (at least in publicly available records). Graduate articulation with local and global

9 Algeria, Bangladesh, Bolivia, Brazil, Cameroon, China, Egypt, India, Indonesia, Iran, Iraq, Jordan, Kenya, Kuwait, Lebanon, Libya, Malaysia, Mali, Morocco, Mozambique, Namibia, Nigeria, Pakistan, Philippines, Qatar, Russia, Saudi Arabia, Senegal, Sudan, Syria, Tanzania, Thailand, Tunisia, Turkey, Uganda, and the United Arab Emirates labour markets needs to be better documented. Student experience, including their debt burden, is unquantified, and key indicators are not disaggregated by socioeconomic status.

The DHETTVET policy framework and its reporting and cognate entities are expected to set performance indicators that serve the needs of policy implementers, managers, staff, students, users, and communities.

Table 9 shows a comparison between DHET TVET indicators and the SITVET I indicator set. The DHET indicators were extracted from the DHET (2021) and the DHET Revised Strategic Plan 2020–2025 with numbering per original.

Table 9: DHET and SITVET I indicators

DHET	Source of data	SITVET I
3. Annual enrolments	Audited institutional TVET MIS sub-dataset from TVET college student production system	6
4. Received NSFAS funding	Audited NSFAS performance report for preceding academic year	4
8. Placed in WBL programmes	SETA quarterly reports, disaggregated by gender, race and disability	9; 15; 16
9. Registered in skills-development programmes	SETA MIS quarterly reports	-
21. Completed N6 Qualification	TVET MIS sub-dataset from TVET college student production system	10
22. Completed NCV Level 4	Examinations and assessment data hosted by SITA	10
23. Throughput rate of TVET NCV	Examinations and assessment data hosted by SITA	10
24. Enrolment in pre-vocational learning	TVET MIS sub-dataset from TVET college student	-
programmes	production system	
27. Artisans qualified	SETAs, Indlela, National Artisan Development	13
28 Completed learnerships	Ouartorly roports	Q.
20. Completed learnerships		12
29. Completed internships	Quarterly reports	9;12
30. Completed skills programmes	SETA reports	9;12
31. % lecturers with professional qualifications	Report on professionally qualified TVET college lecturers by the director-general	14
32. % governance compliance	Quarterly reports	-

The DHET indicators quantify supply and outputs. No process indicators are monitored. It is not possible to link a ToC with the implied objectives and the performance indicators.

Nineteen of the SITVET I indicators correspond with one or more DHET sets. It is essential to explain why the remaining six indicators showed no match. The 'missing' SITVET I indicators speak directly to quality, innovation potential, and innovation. They include the following:

- 20. Quality of TVET and Global Competitiveness Index (GCI) Pillar 6.
- 21. Technician: researcher ratio across the NSI
- 22. % that introduced product innovation
- 23. % that introduced significant curriculum changes
- 24. % that introduced new e-learning and management tools
- 25. % that introduced new partnerships

These six indicators cover elements that the DHET does not address. The six indicators are in alignment with the Copenhagen Manual guidelines.

In summary, there is a substantial overlap between the DHET indicators and those of SITVET I.

This overlap suggests that the data to populate the SITVET I indicators should be available from official sources. However, as mentioned above, there are acknowledged data gaps, validity, and reliability shortcomings. In practice, subunits in departments collect data for their specific purposes. Information not routinely compiled must be requested through official channels, and such external requests add to the administration's burden. External data requests might entail duplication of effort or, worse still, be inconsistent with the broad DHET imperative.

'Measuring innovation provides valuable insights for evaluation, quality assurance, continuous improvement, industry alignment, benchmarking, funding, and resource allocation to foster innovation and meet the needs of a dynamic job market.' *ChatGPT, 12 May 2023*

6. THE STATE OF INNOVATION IN TVET COLLEGES

6.1. Synthesis

The SITVET II work began in October 2021 when the COVID-19 pandemic was a reality in everyday life and compromised mobility and morale.

Feedback from key stakeholders revealed that while the SITVET I indicators were appropriate, the set could be expanded to determine the innovation potential of the TVET sector. The received wisdom was that in addition to a review of the indicators, there was also a need to identify what data existed. It was decided that a deeper consultation with individual stakeholders might point to further information on the indicators in use, which would provide the basis for further work.

To this end, the SITVET I indicators were shared with stakeholders to gauge whether the former were considered relevant to the sector and whether updated/verifiable information existed. This fieldwork was undertaken from 16 to 21 May 2022, with follow-up engagements undertaken electronically (via email where appropriate) and through virtual video meetings.

The stakeholder engagement led to additions to the indicator set and the reconfiguring of the project design. The intention to conduct a complete stakeholder survey had to be reviewed. It was also evident during the data gathering that colleges needed to be more relaxed and wearier of research and data collection due to the myriad of similar requests from government entities and non-actors. This resulted in TVET administrators feeling exhausted by the attention of the government, private sector, non-governmental organisations, and academia.

In addition, it became apparent that data and information critical to SITVET II were unavailable at college level. In fact, given the high response rate achieved (72%), the SITVET I survey results were more helpful than initially anticipated. An unfortunate learning was that TVET colleges do not and are not required to collect and store data on student graduates, let alone their final certification or employment post their training at the institution. In addition, information

regarding curriculum review is not a college-level competence.

The administration of the colleges (by the DHET) means that data pertinent to the state of innovation should reside at the central level in various DHET subunits. Therefore, following the qualitative fieldwork exercise, a concerted data-gathering exercise was conducted. This involved requests for documents that might reveal data not generally available in the public space and those still to be released, such as the annual performance reports of entities like the QCTO.

Data is located across various departmental units by design according to their mandates, priorities, and immediate needs.

Thus, while some data is available on TVET lecturers, this data is spread across the human resources, finance, and TVET lecturer development units. The TVET lecturer development unit has some data, but it is restricted to lecturers subject to skills development initiatives during the reporting period. The result is that the use-value of this data could be more questionable, save for the fact that some form of lecturer development is taking place. TVET lecturer personnel data resides in human resources and funding in finance, but the completeness and accuracy of this data are limited. This arises because of difficulties in tracking contract staff whose employment may be subsidised on an ad hoc basis by a provincial government.

Similarly, TVET college examination results are captured in Umalusi and the Department of Basic Education examinations section, with the former responsible for quality assurance of the theoretical/examinations component (of some programmes). Information on the practical components is expected to be located at Indlela, designated decentralised trade test centres, and SETAs.

This dispersion makes it difficult to locate the exact number of those assessed to be competent in critical national skill priority areas. Furthermore, skills are dealt with in two DHET units, TVET colleges, and skills development, with the latter responsible for, among other things, SETAs, the NSF (under the NSA) and the HRDC SA. In effect, the data on the skills development component, responsible for industry-level training, is located in two units. To obtain a complete picture of the apprenticeship and learnership system, there is a need to coordinate information from both units. There is, therefore, a need to rationalise the department's various divisions, at least for data purposes. Hence, the recommendation that a data library is an urgent requirement.

As indicated above, a significant concern is the need for more information on TVET instructional staff, such as the number of full-time equivalent staff employed and their qualifications. The employment relationship is such that many college-level personnel need to be reflected on the central PERSAL database. Some college personnel are 'employed' by the DHET, with many reportedly employed on short-term placements at TVET colleges. Engagement with the teacher (capacity) development division revealed limited data on staff who received some 'training' or 'development,' the various ongoing development projects, and the number of lectures involved.

Aggregated data is recorded in the annual 'Education at a Glance', which provides an invaluable source of education provisioning data. The 2020/21 edition was in the process of being finalised at the time of the fieldwork. It is to be noted that the TVET data gathered for this publication mainly relies on 'self-assessment' by TVET college management and tracks enrolment and programme data. Such information collection is performed according to Section 45 of the TVET regulations that empower the director-general to request information from TVET colleges. College principals

are thus required to submit the requisite information, which is to be ratified by TVET regional personnel if serious discrepancies are noted. In practice, this is a rare event. The unit responsible for TVET data collection funding allocation is an ad hoc source of 'programme funds', i.e. an annual non-permanent allocation. A more structured data-collection structure must be established.

6.2. Toward the SITVET II Indicators

The analysis suggests the retention of the three SITVET I categories – Inputs, Outputs, and Quality and Innovation, with the addition of a fourth category – Governance and Transformation. Refinements and additions follow in Table 10. SITVET I is expanded with another 37 subindicators; Governance and Transformation adds nine categories and 10 sub-indicators for a total of 69 indicators.

Table 10: Proposed SITVET II Indicators

INPUT
I. Expenditure on formal TVET
1.1 Disaggregate to provincial and local government level
2.TVET expenditure per student
2.1 Students receiving NSFAS awards
2.2 NSFAS awards by age, group, gender
3. % apprenticeship/other in labour cost
4. Expenditure on lecturer training
5. Expenditure on ICT training activities
5.1. Expenditure on cutting-edge technologies
OUTPUT
6. Lifelong learning % 25–64-year-olds
6.1 Individuals with above-basic overall digital skills
7.TVET enrolment by economic subsector; demographics
7.1 Recognition of prior learning (RPL)
7.2 Retention rate of prevocational learning programme
7.3 % in entrepreneurship training
8. Transition rate from secondary schooling to TVET colleges
9.WBL participation rate
10. First-time PSET completion (18–24-year-olds)
10.1. Student satisfaction
10.2 Support for students with special needs
II. Student-lecturer ratio in TVET colleges
12.% completion of TVET programmes
13.% of apprentices trade tested / certified
14. % of fully qualified lecturers in TVET
14.1 Induction completed; registration on lecturer support service (LSS) portal
14.2 Staff in industry-sponsored training; industry attachments
14.3 Staff pedagogic content knowledge gained in prior five years
14.4 Build staff capacity for innovation activities
14.5 Extent of staff training

15. % colleges with industry partnerships

- 15.1 Industry staff undergo in-service education and training (INSET) at TVET
- 15.2 Enterprises actively increasing ICT skills of their personnel
- 15.3 Job-to-job mobility of human resources in S&T
- 16. % student placement in industry during studies

16.1 WBL

16.2 Enrolments in occupations in high demand (OIHD) and priority-skill programmes

17. % employment of graduates

17.1 Graduate tracer studies

17.2 Career guidance

17.3 % in self-employment

18.% companies providing apprenticeship or other training

18.1.Analysis of skills demand

18.2 In-service education and training for industry staff at TVET colleges

QUALITY AND INNOVATION

19. Employer satisfaction with TVET graduates

20. Quality of TVET according to GCI Pillar 6

21. Technician: researcher in NSI

22. % introduced product innovation

22.1 Sources of information

22.2 Obstacles

23. % introduced significant curriculum changes at centres of specialisation (CoSs)

23.1 Personalised learning

23.2 Project-based learning

23.3 Collaborative learning

23.4 Programmes in renewable energy

23.5 4IR activities (competitions, prizes, hackathons, workshops, and open days)

24. % introduced new e-learning and management tools

24.1 Staff trained in new assessment tools

24.2 Staff trained in new management and leadership tools

24.3 Stakeholder involvement in curriculum development

24.4 Sources of information

24.5 Obstacles

25. % introduced new partnerships with industry, HEIs, and PROs

GOVERNANCE AND TRANSFORMATION

26. Innovation reflected in the DHET and TVET college vision/mission/strategy

26.1 Dedicated innovation manager in post

26.2 Dedicated space for innovation

26.3 Actions towards sharing innovative practice

26.4 Evidence of good ethical practice

26.5 % introduced significant organisational change

26.6 Strategic intent to curate curricula I for the 4IR and generative AI

27. Existence of an innovation action plan in TVET colleges

28. M&E of TVET output, outcome, and impact institutionalised

29. TVET ISS cascaded down to TVET colleges

29.1 TVET MIS availability, use, and completeness

30. Contribute to building a capable state

- 30.1 Apprenticeships, learnerships for public servants
- 30.2 Public servants trained in Compulsory Induction Programme (CIP)

30.3 Public servants trained in new approaches to administration, management, and leadership

31. In-house R&D expenditure

32. Registration of IPRs

33. Progress to ISO 14000 green campus certification

34. Progress toward ISO 9000 facility certification

The new category of Governance and Transformation aligns SITVET I with international best practices.

The four indicator categories correspond to a balanced scorecard as they address the perspectives of finance (input), process (output), product (quality and innovation), and stakeholders (governance and transformation). The four categories show good alignment with the Copenhagen Manual guidelines.

New indicators 26 and 27 emphasise the need to instil a culture of innovation across PSET. New indicators 28 through 34 are forward-looking.

There is no expectation that data is available to populate indicators 26 through 34.

Accordingly, Table 11 serves as evidence of the best available data but is restricted to Input, Outputs, and Quality and Innovation.

Subject to data availability, a five-point Likert scale is used to assess the level of each indicator: Absent (0), Emerging (1), Emergent/Promising (2), Progress to Success (3), and Embedded Change (4).

Expenditure on TVET (1.1) is disaggregated to provincial and local government level.

Similarly, the number of students receiving NSFAS awards (2.1) is an essential proxy for reflecting the expanding access to the sector from excluded and marginalised communities.

In the same way, the RPL (7.1) will, as an indicator for expanded admission criteria, serve as an essential deficit tracker for those entering the sector in non-traditional ways.

Tracking the number of students in WBL (9) is a marker of the adequate preparation of TVET students who require exposure to workplaces for their effective induction and occupational preparation.

Lecturer support and development (14.1-14.4) emphasises the importance of staffing expertise and quality in the TVET sector – a feature essential to the sector's overall innovation potential. Lecturers should enjoy ongoing and sustained exposure to industry using periodic industry attachments that will enhance their teaching and training delivery. The refinement relating to staffing focuses on the qualifications of staff, reinforced by ongoing in-house training and induction support, with continuous and ongoing web-based support (a support service portal could be established) and the necessary training in workplaces, referred to specifically as 'sponsored' by a company, reflects the importance of joint industry responsibility for staff development at TVET college level.

Refinements 15.1–15.3 address interactions with industry, with refinement 16.2 focusing on enrolment in OIHD that links TVET programmes to labour market opportunities.

Indicators 17.1–17.3 measure labour market engagement, with 18.1 and 18.2 measuring the needs and preparedness of the industry.

Indicators 23.1–23.5 are future-oriented, identifying curriculum changes necessary for innovation, such as renewable energy and 4IR, and on the kinds of activities that need to be embedded at TVET colleges to enhance both the profile of the TVET college and its links with outside entities (through partnerships, workshops, and open days).

Indicators 24.1–24.3 measure staff and stakeholder involvement. Indicator 25 is outward-looking.

Table 11: Innovation indicator values

		Value	Comment	Assessment
		INPUT		
١.	Expenditure on formal TVET I.I. Disaggregate to provincial and local government level	0.2% of GDP (National Treasury: Budget Vote 17) -	No international norm	Emergent/ Promising: 2
2.	 TVET expenditure per student 2.1. Students receiving NSFAS awards 2.2. NSFAS awards by age, group, gender 	R44,000 (TVET PSET Fig 24; 27; Table 44; Stats PSET Table 9.1) 346,270 (NSFAS) -	No international norm	Progress to Success: 3
3.	% apprenticeship/other in labour cost	48% % (NDP, 2020: 15)	No international norm	Progress to Success: 3
4.	Expenditure on lecturer training	-		Absent: 0
5.	Expenditure on ICT training activities 5.1. Expenditure on cutting- edge technologies	- Decline from R1,3 billion to R342 million (National Treasury: Budget Vote 17)		Emerging: I
		OUTPUT		
6.	Lifelong learning % 25–64-year- olds 6.1. Individuals with above-basic overall digital skills	0.45% % (authors from General Household Survey, StatsSA) -	UMIC values >2%	Emerging: I
7.	 TVET enrolment by economic subsector; demographics 7.1. RPL 7.2. Retention rate of prevocational learning programme 7.3. % in entrepreneurship training 	105,833 learnerships 19,107 apprenticeships TVET PSET Table 14/15 2017-2021 by subject L2-L4; N3; DHET TVET N6 Table 31; 5.8; 5.9 - 8,464 actual 19,835 intended Source: TVETMIS, 2017		Emergent/ Promising: 2

	Value	Comment	Assessment
8. Transition rate from secondary schooling to TVET colleges	N3 to N4 Approximately 33% (Statistics on PSET)		Emerging: I
9. WBL participation rate	158,651 of 657,133 = 24% (National Treasury: Budget Vote 17)		Emergent/ Promising: 2
 First-time PSET completion (18–24-year-olds) Student satisfaction Support for students with special needs 	120,107 of 467,500 = 26% (Labour Market Intelligence Partnership II 87.9% -	Labour Market Intelligence Partnership II	Emergent/ Promising: 2
11. Student-lecturer ratio in TVET colleges	2015: 737,800 to 10,592 = 70:1 (Statistics at a Glance 6.11; 5.1)	International varies from 10:1 to 30:1 HEIs 30:1	Emergent/ Promising: 2
12. % completion of TVET programmes	75% throughput in 2013 (DHET TVET PSET NC(V) L2 Table 41; Fact Sheet) 12% completion (2017-2021 by subject L2-L4 & N3)	International: Austria 83% in 2019 (Eurostat) UK 65% in 2019/20 (ONS) Australia 64% ¹⁰ (NCVER)	Emerging: I
13. % apprentices trade tested / certified ¹¹	24,029 of 30,000 (target for 2030) (Statistics on PSET 2017-2021, Table 8.7)	UK certification rate of 65.8% for 2019/2020 (ONS) Australia certification rate of 54% ¹² (NCVER)	Emergent/ Promising: 2
 14. % fully qualified lecturers in TVET 14.1. Induction completed; registration on LSS portal 14.2. Staff in industry- sponsored training; industry attachments 14.3. Staff pedagogic content knowledge gained in previous five years 14.4. Build staff capacity for innovation activities 14.5. Extent of staff training 	809 of 6,775 fully qualified = 12% (DHET.TVET Quarterly 3.4 Qualification audit) - - Trained 1,768 in 2015, but no detail (idem) - GCI Rank 40 of 141 (WEF, 2020)		Emerging: I

¹⁰ Certification rate in 2018 47,6% (Actual) Australia National Council for Vocational Education Research, Adelaide .https://www.ncver.edu.au/researchand-

statistics/data/all-data/vet-qualification-completion-rates-2022-data-slice 11 Statistics on Post School Education and Training 2020, DHET 2021) 12 UK certification rate of 65,8%. Statistical Release 2019/20, Department of Education

	Value	Comment	Assessment
 15. % colleges with industry partnerships 15.1. Industry staff undergo in-service education and training at TVET 15.2. Enterprises actively increasing ICT skills of personnel 15.3. Job-to-job mobility of HR in S&T 	- Target 1,686 achieved; 880 'highly suspect' (SETAS/TVET Colleges) -		Emerging: I
 16. % student placement in industry during studies 16.1. WBL 16.2. Enrolments in OIHD and priority-skill programmes 	4,657 student completions (SETAS/ TVET Colleges) - -		Emergent/ Promising: 2
 17. % employment of graduates 17.1. Graduate tracer studies conducted 17.2. Career guidance programmes offered 17.3. 3% in self-employment 	Statistics on PSET Fig 26 - - -		Emerging: I
 18. % companies providing apprenticeship or other training 18.1. Analysis of skills demand 	Global Innovation Index (GII) 5.1.2 value 36.8% rank 35 (WEF, 2020). 148 reports on companies partnered with universities and TVET colleges (HRDCSA, 2022:39) -	No time series available	Emergent/ Promising: 2
18.2. INSET for industry staff at TVET			
	QUALITY AND INNOVATION		
19. Employer satisfaction with TVET graduates	-		Absent: 0
20. Quality of TVET according to GCI Pillar 6	Rank 119 of 141 (VVEF, 2020)	No time series available	Emerging: I
21. Technician: researcher in NSI	Declining 4.0: I	Within upper middle- income country range	Progress to Success: 3
22. % introduced product innovation22.1. Sources of information22.2. Obstacles	Seven out of 33 = >21% - -	SITVET I survey	Emerging: I

	QUALITY AND INNOVATION		
 23. % introduced significant curriculum changes CoSs 23.1. Personalised learning 23.2. Project-based learning 23.3. Collaborative learning 23.4. Programmes in renewable energy 23.5. 4IR activities (competitions, prizes, hackathons, workshops, 	- 10% 7% - 42% 14%	SITVET I survey	Emerging: I
 24. % introduced new e-learning and management tools 24.2. Staff trained in new assessment tools 24.3. Staff trained new management and leadership tools 24.4. Stakeholder involvement in curriculum development 24.5. Sources of information 24.6. Obstacles 	50%	SITVET I survey COVID-19 anecdotal	Progress to success: 3
25. % introduced new partnerships with industry, HEIs, PROs		SITVET I survey	Absent: 0

The 25 assessment tallies are displayed in Table 12.

Table 12: Assessment tallies

Category	Tally
Absent	3
Emerging	10
Emergent/Promising	8
Progress to Success	4
Embedded Change	0

This scoring is an unweighted assessment of innovation indicator scores for the TVET college system as a whole.

The aphorism 'absence of evidence is not evidence of absence' is an overarching theme in this assessment of the TVET sector's innovation potential.

7. CONCLUSIONS

The TVET college operating environment has dramatically changed over the last three decades. In particular, the democratic order has ensured that TVET staff and student demographics have shifted from apartheid minority bias towards the new majority classroom.

In the techno-economic sphere, globalisation, the ICT revolution, deindustrialisation, and the 'gig economy' pose significant challenges and opportunities. The impact of generative AI on the workplace is making itself known as routine jobs are displaced and entirely new job types emerge. A bleak future looms for those lacking numeracy and literacy skills.

The assessment framework commences at the highest level of official TVET policy, strategy, and planning, and is linked to PSI activities. It is further argued that responsive and reliable performance management and measurement call for an information system strategy whose implementation is supported by a complete and user-friendly MIS that allows for the population of performance indicators.

Indicator benchmarking was carried out against six international sources. The SITVET I indicators passed this test satisfactorily, similarly for the comparison with the set of DHET TVET indicators. This testing laid the basis for expanding the SITVET I indicators that were then populated. The results were as follows:

Inputs

- The absence of international norms compromises the interpreting of the actual and desired level of input indicators.
- What is clear, however, is the need for increased expenditure data on lecturer training (4) and decreased expenditure on cutting-edge technologies (5.1).

Outputs

- The lifelong learning level (0.45%) is low by international comparison.
- It is difficult to interpret the level of learnerships and apprenticeship placements, similar to the N3/N4 transition rate, the WBL placement rate, and TVET completion rates that appear to be low.
- The 87.9% measure of student satisfaction must be treated with caution as this is based on a small sample.
- The lecturer-to-student ratio averages 1:70 with a range of 1:17 to 1:80. This average is high by international standards.
- The 24,029 trade tests awarded were a salutary achievement, which makes the 2030 target of 30,000 a near certainty. The GII concurs, with South Africa at a rank of 35 regarding company apprenticeships.
- Staff qualifications need to catch up, with just 12% deemed to be fully qualified. The GCI differs, ranking South Africa at 40 out of the 141 countries assessed.
- Measures of INSET participation are unreliable (15.1).
- There is an absence of data on graduate employment.

Quality and Innovation

- Data on employer satisfaction is absent.
- The GCI for TVET quality gives the country a low rank of 119 out of 141.
- Other innovation attributes were gathered for the SITVET I survey and must be accepted as signals rather than statistically reliable indicators.

- The assessment finds the following:
- Innovation activities in the TVET sector, the most 'transformed' education sector, are at a formative stage. While
 there are pockets of innovation excellence, there is little to no evidence of innovation occurring as embedded
 change.
- The absence of any indicator that attains the level of embedded change is significant and calls for serious attention to be given to fostering and enabling innovation.
- Four indicators were scored as 'Progress to Success.' Of these, the gains in the awards of apprenticeship status are the most noteworthy; however, the quality thereof is not directly measurable.
- Eight indicators were scored as 'Emergent/Promising.' Of these, those that measure WBL, apprenticeship, and company placement are of vital importance.

The indicators clustered as 'Emerging' and 'Emergent/Promising' are to be understood in the context of the top-down relationship between TVET colleges and the parent ministry in times of policy uncertainty and financial constraints.

The absence of any consideration of TVET in the national innovation discourse suggests that evidence of TVET innovation should be considered an achievement. Even if the levels of innovation activity are below what might be desired, progress is being made.

The imperative for innovative practice could not be stronger. The best practice theory of how innovation may progress identifies numerous disjointed activities and functions. Innovation in enterprises and public service differs from site to site, time to time, and country to country. Common factors that support innovation – institutional autonomy, the freedom to take risks, and rewards for taking such risks – are apparent (Rosenberg and Birdzell, 1987), but a general theory of innovation has yet to emerge (Edquist and Laatsit, 2022).

Applying these insights to the TVET sector, embedded as it is in public service culture, presents challenges already articulated in the NPC's 2011 Diagnostic Report. The following may be noted:

- The primary challenge facing the TVET sector refers to the 'parity of esteem' of TVET colleges compared with other institutional forms in the PSET section of the South African case. There is an enduring narrative that the TVET pathway is a less prestigious alternative for students who underperform in school-leaving examinations (Field, Musset and Álvarez-Galván, 2014).
- This disparity is reinforced by the limited employment opportunities available to TVET graduates as opposed to their higher-education counterparts.
- Some students cannot obtain certifications (and the associated qualifications) after training because they cannot secure workplace internships and experience. This undermines the sector's credibility.
- The changing nature of the labour market and the inability, or, as some argue, the unwillingness, of the business sector to respond to changing labour market needs is a constraint.
- Staff complement and quality have not kept pace with increases in enrolment and the changing nature of industry
 needs. Lecturers are either academically or vocationally qualified or have experience in employment and industry
 but rarely possess both components necessary for effective TVET teaching and learning. The deficit in personnel
 expertise represents a key constraint for effective provisioning. This hiatus is officially acknowledged.
- Curriculum responsiveness has lagged in changes in industry and markets. It is recognised that curriculum review has been undertaken, as in the 2007 introduction of the National Certificate (Vocational), or the NCV. Its focus on the academic track is now under review, especially since the NCV path has attracted students with a (predominantly academic) matric exit qualification. There has been progress towards eliminating the

National Accredited Technical Education Diploma in favour of the newly established QCTO competency-based occupational programmes. While this may be an essential step, the deep concerns of the business sector persist.

The DHET CoS programme represents an important initiative to strengthen the link between TVET Colleges
and the labour market. The programme is based on the dual system model of Germany and Switzerland with
alternating periods of theory (provided at selected TVET institutions) and practice (at designated workplaces).
Key to the initiative is buy-in from the industry, which is a partner in determining the features of the interaction.
In principle, the industry informs student enrolment with the possibility that their capacity to offer employment
opportunities will secure employment for CoS graduates. The initiative is currently run as a pilot/demonstrator
project whose choice of programmes has been informed by the Strategic Integrated Projects.¹³

¹³ https://infrastructuresa.org/wp-content/uploads/2022/01/Strategic-Integrated-Projects-July-2020.pdf

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APPENDIX A: TERMS OF REFERENCE

I. INTRODUCTION

NACI is a statutory body within the DSI. Its role is to advise the minister of higher education, science and innovation and, through the minister, the minister's committee, and the Cabinet, on all matters pertaining to STI policy and its impact on society, the economy, and the environment. The government relies on NACI's ability to network and partner with local and international experts in this regard.

In mid-2020, the minister mandated NACI to assess the state of innovation in the country's TVET sector. The study set out to understand the challenges of TVET colleges in applying, enabling, and promoting innovation in relation to skills development, the production of artisans and technicians, and job creation.

The first phase of the project involved an exploratory study that was concluded in 2021. The unit of analysis for this study was the set of 50 TVET colleges and their stakeholders. The methodology included an online survey of TVET college principals and a series of interviews with selected TVET college partners and stakeholders. A key outcome of the study was the identification of a set of 25 indicators that speak to the state of innovation in the TVET colleges.

The indicators are grouped into three categories, namely input indicators, future capacity indicators, and quality and innovation indicators. A partial bibliography is appended. The full list of indicators is provided in the Appendix below.

The second phase of the project will require a design and feasibility study regarding the use-value and viability of the proposed indicator set and, where possible, the identification and collation of the necessary data to determine the state of innovation in the South African TVET sector.

2. PURPOSE OF THE TERMS OF REFERENCE

Section 8(4)(a) of the NACI Act (No. 55 of 1997) provides that NACI can establish committees to assist it in performing its functions. The following subcommittees will be appointed for this project:

- 2.1. An expert committee to assess the state of innovation in TVET colleges in South Africa.
- 2.2. A critical reader task team to proofread the final report produced by the expert subcommittee.

The ToR clarify the roles, responsibilities, and deliverables of the expert committee, which will be known as the NACI Expert Committee on Innovation in TVET (the committee).

3. OBJECTIVES OF THE STUDY

The objectives of the study are to:

- 3.1 Conduct a design and feasibility study regarding the use-value and viability of the proposed indicator set.
- 3.2 Provide a finalised set of indicators duly ratified by selected stakeholders.
- 3.3 Provide benchmarking against international practice.
- 3.4 Determine the availability of, and barriers to, access to data for populating the indicators in South Africa.

- 3.5 Identify and propose such datasets that may be needed to fill identified data gaps.
- 3.6 Use such indicators for which sufficient data is available to quantify the state of innovation in the TVET sector.
- 3.7 Table a report on the state of innovation in TVET colleges in South Africa using indicators currently available.

4. DELIVERABLES, DEADLINES, AND PROJECT MANAGEMENT

Deliverables	Oversight	Due date
Inception report	Expert subcommittee	15/02/2022
State of innovation report (draft report)	Expert subcommittee	31/06/2022
State of innovation report (final report)	Expert subcommittee	31/10/2022

4.1 The expected time on task (excluding NACI meetings) will be a total of 200 (two hundred) days.

4.2 A committee member will be designated as the project manager.

5. ROLE OF THE NACI SECRETARIAT

In accordance with the Public Service Act (No. 103 of 1994), the role of the NACI Secretariat will be to:

- 5.1. Provide administrative and coordination support to the expert subcommittee towards an assessment of the state of innovation in TVET colleges in South Africa.
- 5.2. Contribute to technical and analytical services for the expert subcommittee in the production of a report on the state of innovation in TVET colleges in South Africa.
- 5.3. Organise and coordinate all communication platforms in the form of meetings or workshops to ensure the expert subcommittee's work is effective.
- 5.4. Contribute to the dissemination of the findings of the report using various platforms.

6. MODE OF OPERATION OF THE COMMITTEE

The committee is a group of experts working with the NACI Secretariat to deliver a report on the state of innovation in the South African TVET sector in support of NACI's advisory functions. In accordance with the guidelines for NACI and its operations, the following principles will underpin the appointment and work of the committee:

- 6.1. Members will be appointed for a period linked to the lifespan of the committee's designated tasks.
- 6.2. All work carried out by committee members will be subject to the approval of NACI's CEO.
- 6.3. Committee members will be acknowledged as authors of the work.All work developed will remain the property of NACI. Permission to use the study for academic publication purposes may be granted on application.
- 6.4. A NACI member, who will serve as the committee's chairperson, will provide leadership oversight over the committee.
- 6.5. The committee members will be Project Manager Prof. Michael Kahn and Prof. Salim Akoojee.

7. REMUNERATION OF COMMITTEE MEMBERS

Members of the committee will be remunerated based on daily or hourly rates. The remuneration will be taxable for services rendered in connection with NACI's functions.



Remuneration will cover the following:

- 7.1. NACI meeting attendance
- 7.2. NACI event attendance
- 7.3. Project management and roll-out, including fieldwork, research, and report drafting
- 7.4. Remuneration will be in accordance with National Treasury regulations and instructions in terms of the Public Finance Management Act (No. 1 of 1999) as amended.
- 7.5. The NACI Secretariat will cover approved fieldwork costs
- 7.6. The NACI Secretariat will be responsible for logging and processing remuneration for items 7.1 and 7.2
- 7.7. Committee members will submit invoices to the NACI Secretariat in accordance with the project roll-out (7.3) and at agreed milestones.

8. CONFIDENTIALITY

Confidentiality is crucial in undertaking NACI assignments, and all committee members are required to preserve any information generated in connection with NACI's work in the strictest confidence.

Accordingly, committee members will be obligated by a confidentiality agreement to prevent the unauthorised disclosure or use of any information regarding NACI's work or any of its activities to any other organisation or individual.

WP-PSET (DHET, 2013)	The NSDP 2039 (DHET, 2019)	HRDC SA (annual report)	DHET Teaching and Learning Plan 2022 (DHET, 2022)
Key purpose of TVET:	Key role: secure 'an educated, skilled,	The council is able to monitor the	Components (to be) evaluated
the growth of stronger	and capable workforce for South	implementation of the Human Resource	
TVET colleges will expand	Africa'	Development (HRD) Strategy Towards	Section 1: enrolment preparation
the provision of mid-level	Key purpose:	2030. As stated earlier in the report, there	
technical and occupational	improve access to OIHD and priority	are government departments that are	Illustrative example
qualifications. These will	skills aligned to supporting economic	implementing agencies of the HRDC SA. These	
articulate directly into	growth, employment creation,	departments are listed as the responsible	OUTPUT:
the world of work for the	and social development, while	departments under the objectives of the HRD	I.I Programme selection (programme
growing number of young	also seeking to address systemic	Strategy Towards 2030	and qualification mix) completed based
people leaving the schooling	considerations		on the DHET strategic plan outputs and
system		Programme 2: TVET and the rest of the college	aligned with a demand-driven model
		system	(programmes identified with motivation:
			why campuses chose to offer certain
		Key indicators:	programmes; number of groups
		 Strengthen TVET colleges to expand 	determined to register per campus
		access to quality technical and vocational	according to available resources, etc.)
		education	
		 Improve quality of teaching and learning 	EVIDENCE
		within TVET colleges	 Observation of strategic and
		 Mainstream access to community 	operational plans
		education and training (CET) colleges	 Operational plan (all programmes
			included)
			 Broken down into output and
			evidence

APPENDIX B: INDICATORS IN KEY POLICY DOCUMENTS

DHET Teaching and Learning Plar 2022 (DHET, 2022)	Section 2: classroom teaching and	support		Illustrative example		OUTPUT	2.4 Qualified lecturing staff deployed to	teach across programmes and subjects		EVIDENCE	Professional qualifications provided by	HR																						
HRDC SA (annual report)	Key indicators (determined from 2020/21	Annual Report)		Improving supply of TVET and intermediate-	level OIHD.	*Total of 15,106 learners have qualified as	artisans (65% pass rate) but expected 19,000	not realised as result of COVID-19; no trade	tests performed for a significant time.	Obtained from province (e.g. Gauteng)		Programme 2: TVET and the rest of the college	system''	 908 learners qualified as artisans with pass 	rate of 68%	 805 learners entered WBL opportunities 	 6,013 TVET students placed through 	 learnerships, and workplace learning and 	 experience 	 I,022 students placed by SETAs at TVET 	colleges completed their studies (Funding	cancelled as a result of, inter alia, levy	holiday)	 Northern Cape 	 30 students funded through NSFAS 	 I48 new artisan learners qualified 	 558 learners entered WBL opportunities 	(placements affected by COVID-19)	 891 students placed in learnerships, and 	workplace learning and experience	 I,932 unemployed youth registered in 	community college for 2021 academic year	 272 placed by SETAs at various TVET 	colleges (completion)
The NSDP 2039 (DHET, 2019)	Outcome: identify and increase	production of OIHD	Sub-outcome:	national enrolment and resource	ratios for the high, intermediate, and	elementary skills levels.	Performance indicator:	targets will be set for a three-year	period and annually determined	through service level agreements	with skills levy institutions, including	the following:	I. Percentage of levy resources to	be directed at developing high-level	skills by 2030, including managers,	professionals, and associate	professionals.	2. Percentage of levy resources to be	directed at developing intermediate-	level skills (including	target of 30,000 artisans produced	per annum by 2030); and	3. Percentage of levy resources	directed at developing elementary-	level skills by 2030									
WP-PSET (DHET, 2013)	Key objectives for stipulation	in the White Paper (idem: 12)	include the following:	 Improving access 	 Throughput rates 	 Management capacity 	 Developing MISs 	 Strengthening governance 	 Increasing responsiveness 	of colleges to local labour	markets	 Improving placement of 	college graduates in jobs	 Creating a mix of 	programmes and	qualifications that will	meet varied needs of	students	 Building partnerships 	with employers and other	stakeholders													

WP-PSET (DHET, 2013)	The NSDP 2039 (DHET, 2019)	HRDC SA (annual report)	DHET Teaching and Learning Plan
			2022 (DHET, 2022)
Partnership activities can	4.2 Linking education and the	Building strong linkages and relationships with	Section 3: student practical application
include but are not limited to	workplace	employers in delivery of priority programmes.	for on-course learning
(idem: 41):	Sub-outcome 2.1: opening of WBL	Key results:	
 Joint work on curricula to 	opportunities increased	 I14,796¹² learners entered WBL – 	Illustrative example
improve progression of	Performance indicator:	COVID-19 challenge	
students from colleges to	 Number of TVET students 	 6,008 TVET students placed through 	OUTPUT
universities	requiring work-integrated	learnerships, and workplace learning and	3.2 Student-to-plant/equipment
 Training new lecturers 	learning to complete their	experience.	ratios calculated and applied for
for TVET and community	qualifications provided with work	 4,657 students placed by SETAs in various 	each workshop/practicum room and
colleges	placements	 TVET colleges completed their studies 	adhering to COVID-19 regulations
 Upgrading existing 	2. Number of university of		
lecturers	technology and comprehensive		EVIDENCE
 Providing study 	university students requiring		Observe student-to-plant/equipment
opportunities for college	work-integrated learning to		ratio in the workshop/kitchen, etc.
management staff	complete their qualifications		Timetabling
 Research by universities 	provided with workplaces;		(all programmes)
on the post-school	Number of TVET lecturers		
system, including	exposed to workplace		
relationship between	4. Number of WBL experiences		
education and training	made available for graduates/		
institutions and labour	interns		
market	5. Number of learnership		
	opportunities for unemployed		
	provided		
	6. WBL policy and regulations		
	developed and revised		

WP-PSET (DHET, 2013)	The NSDP 2039 (DHET, 2019)	HRDC SA (annual report)	DHET Teaching and Learning Plan 2022 (DHET, 2022)	
Regarding the NSF, this was	4.3 Improving the level of skills in the	Demand for skills is researched, documented,	Section 4: student assessments, on site	
to:	South African workforce.	and communicated effectively	and continuous	
responsibility for skills development aligned with	number of workers participating in various learning programmes to a	*148 reports published on companies partnered with universities and TVET colleges	Illustrative example	
national development	minimum of 80% by	on experiential learning opportunities and	OUTPUT	
strategies and priorities	2030, address critical skills required	job placements of competent and qualified	4.2 Assessment plans and schedules	
 Be a "source of funding 	by various sectors of the economy,	students	available for each subject and can be	
to enable the linkages	transform workplaces, improve		adapted in case of COVID-19 (for	
between the skills system	productivity, and improve economic		the year in NCV, and trimester I and	
and the other post-	growth prospects in various sectors		semester I for Report 191)	
schooling subsystems that				
(idom: 63)	I The number of employees trained		Cubiort accordance above	
	1.1116 Halloel OF Shipioyees damed		outject assessment plans.	
 Fund youth programmes, 	and supported through skills		establish whether the required humber	
Duild small Dusinesses and	development interventions		of assessments were completed	
cooperatives, and support			according to the assessment plan. Actual	
rural development			dates of completion indicated on plans	
			(NCV and Report 191)	
Envisaged SETA role to	Outcome 4.4: increase access to	Programme 5: developmental / capable state **705 approxime bornerships and	Section 5: student academic support	
	occupationally all ected programmes			
and obtain data on workplace skills needs. Overall, SETAs	Sub-outcome: occupational qualification developed by quality	internships created in the public service (Gauteng)	Illustrative example	
would (idem: 67):	councils	**686 public servants trained in CIP	OUTPUT	
 Facilitate cooperation 	Performance indicator:	**I,I7I public servants trained in	5.3 Adequate resources (including	
between education and	the number of qualifications	administration; 456 trained in management and	remote learning resources) available to	
training institutions and	developed in line with the OIHD	leadership (training conducted online due to	provide academic support to students,	
workplaces	identified	COVID-19)	including the following:	
 Promote skills 			 Library to support investigative 	
development for			research and exploratory tasks	
workers within existing			assigned to students	
enterprises			 Study centres 	
Develop the skills pipeline			 Computers for student access, with 	
to such workplaces			proper spacing between students to	
			comply with COVID-19 regulations	

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WP-PSET (DHET, 2013)	The NSDP 2039 (DHET, 2019)	HRDC SA (annual report)	DHET Teaching and Learning Plan 2022 (DHET, 2022)
	Sub-outcome: increase access for		
	intermediate- and high-level skills		EVIDENCE
	Performance indicator:		 Online learning tools / gadgets for
	targets will be set for a three-year		students (where possible)
	period and determined annually		 Library/e-library/college website
	through service-level agreements		loaded with resources to support
	with skills-levy institutions, to include		investigative research and
	the following:		exploratory tasks assigned to
	 Number of artisans produced 		students
	towards meeting NDP target		 Study centres and open learning
	2. SETAs identify artisans and other		centres being utilised
	intermediate-level skills required		 Learning management system with
	by various economic sectors		collaboration of e-study and social
	through student sponsorship		media groups
	programmes		
	3. Dedicated grant set aside for		
	artisan development		
	4. Number of bursaries granted		
	5. Artisan RPL will be prioritised		
	6. Partnerships with TVET colleges		
	established, and universities		
	of technology working in		
	partnership with industry		
	7. Research encouraged that will		
	be relevant and have an impact		
	on occupationally directed		
	programmes		
	8. Standards, policies, and systems		
	to ensure that quality artisans are		
	produced		
	9. Implementation (and		
	improvement) of a single, national		
	artisan development data system		
	10. MIS		

WP-PSET (DHET, 2013)	The NSDP 2039 (DHET, 2019)	HRDC SA (annual report)	DHET Teaching and Learning Plan 2022 (DHET, 2022)
	Outcome 5: support growth of		Section 6: lecturer support and capacity
	public college system		building
	Sub-outcome 5.1: support TVET		
	colleges		Illustrative example
	Performance indicators:		
	targets will be set for a three-year		OUTPUT
	period and determined annually		6. I. Lecturer profiling conducted
	through service-level agreements		and documented (qualifications,
	with skills-levy institutions, to include		experience, professional teaching,
	the following:		strengths, weaknesses, and gaps)
	1. Support for and prioritisation of		6.2. Lecturer training needs identified
	CoSs, where practically possible		and documented, including training
	2. Support for TVET colleges in		on COVID-19 regulations.
	implementing occupationally		6.3. In-house lecturer training plan
	directed programmes		developed, documented, and
	3. Number of learners whose		implemented
	qualifications require work-		6.4. New lecturer subject induction (e.g.
	integrated learning will be		new lecturers trained on lesson
	supported by strong partnerships		planning, delivery and assessment,
	with industry		internal continuous assessment
	4. Number of lecturers receiving		guidelines, learning management
	workplace exposure		system, online teaching, etc.)
	5. Number of SETA offices		6.5. Lecturer subject content knowledge
	established and maintained		strengthened where necessary



WP-PSET (DHET, 2013)	The NSDP 2039 (DHET, 2019)	HRDC SA (annual report)	DHET Teaching and Learning Plan 2022 (DHET, 2022)
	Sub-outcome 4.5.2: support for		EVIDENCE (illustrative)
	community education and training		Documents indicating training dates,
	colleges		venue, content (programme)
	Performance indicators:		6.6 Lecturers registered on LSS portal
	I. Number of unemployed learners		hosted by DHET, and facilitation of
	participating in skills and		LSS packages conducted. Lecturers
	occupational programmes		registered and participating in
	2. Number of learners participating		Cisco Networking Academy project
	in youth, adult language, and		for information technology and
	numeracy skills to enable further		computer science, life orientation (ICT
	training		component, computer practice), and
	3. Number of local small businesses		in the International Youth Foundation,
	and co-operatives		Civics Academy, and GIZ (German
	4. Number of skills support		Corporation for International
	initiatives for community-based		Cooperation GmbH) projects for life
	organisations, non-governmental		orientation.
	organisations, and non-profit		6.7 Lecturers trained on COVID-19
	organisations		regulations for the training of students
			in practicum rooms
			Section 7: work placement (student and
			lecturer)
			7.1. College WBL policy in place
			for students and adherence to
			COVID-19 regulations
			7.2. Process in place for networking to
			identify industry partners and/or
			employers to place students
			7.3. Partnerships with institutions and/
			or employers established and on
			record for placement of students
			7.4. Partnerships with institutions and/
			or employers established and on
			record for placement of lecturers
			7.5. At least 50% of students at
			qualification / programme exit level
			placed in WBL in the previous year

WP-PSET (DHET, 2013)	The NSDP 2039 (DHET, 2019)	HRDC SA (annual report)	DHET Teaching and Learning Plan 2022 (DHET, 2022)
			EVIDENCE (illustrative)
			Signed-off declaration of completion
			document, e.g. logbook, one-page
			document signed by student and
			employer, register of students (and ID
			numbers) who have been placed, etc.
			7.6. At least 10% of students at pre-
			exit level placed in WPB across
			qualifications and programmes in
			previous year
			7.7. 10% of lecturers placed in WPB
			(NB: target of 30% annually by
			2022) (Note: signed-off document
			between employer and lecturer to
			be on file as evidence of WPB)
			7.8. Monitoring of students in WPB
			placements in the previous year
			7.9. Recording of students who
			completed WPB in previous year
			7.10. Recording of lecturers who
			completed WPB in previous year
			7.11. Process in place to ensure
			integration of WPB experience into
			pedagogical practices by lecturers
			visiting
			7.12. Incorporation of Higher Education
			and Training HIV/Aids Programme,
			International Youth Foundation,
			Civics Academy, GIZ, and Cisco
			projects (participative pedagogy
			training) into teaching and learning
			methodologies
			Broken down evidence

WP-PSET (DHET, 2013)	The NSDP 2039 (DHET, 2019)	HRDC SA (annual report)	DHET Teaching and Learning Plan 2022 (DHET, 2022)
			Section 8: innovation and
			responsiveness
			8.1. Programmes in renewable energy
			offered at the college – Enrolment
			planning.Type of programme/subject
			offering e.g. renewable energy
			technologies
			8.2. College activities in renewable
			energy sector, e.g. evidence on
			recycling of waste and consumables,
			harvesting of water, use of solar
			energy, reuse of consumables,
			greening initiatives
			8.3. Programmes providing skills
			for the digital economy are
			offered at college e.g. IT and CS
			programmes/subjects/ offerings.
			Cisco technologies partnerships,
			WorldSkills competitions
			8.4. College participation in activities
			related to promoting skills for 4IR
			(competitions, workshops, open
			days, partnerships, etc.)
			Broken down into outputs and evidence

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Indicator Values	
: nnovation	
C: Extended Table	
APPENDIX (

Category	Value	Source	Comment	Assessment
ture on formal	0.2% of GDP.	(National Treasury: Budget Vote 17	- No international norm	Emergent/Promising: 2
	TVET Spending 13 million (2021)	Quoted in Viliers et al p.1		
	Year PSET TVET % 2017/8 69 10 14.2% 2017/8 69 10 14.2% 2018/9 90 14 15.15% 2018/9 90 14 15.15% 2019/20 107 18 16,5% 2019/20 107 18 16,5% Billion Billion Billion 16,5%	DHET (2021) Post-School Education and Training Monitor – Macro Indicator Trends, Table 43 (p. 82)	Derived from DHET Statistics on Post-School Education and Training in South Africa (2019); National Treasury Estimates of National Expenditure (2021), cited in	
gregate to ncial and local nment level	NOT AVAILABLE			
xpenditure per				Progress to Success: 3
expenditure per int	YEAR Expenditure P/student p/student (TVET average) 2010/11 2019/20 R 44 000.00	DHET (2021) Post-School Education and Training Monitor – Macro Indicator Trends, p. 83, Fig. 24.	Figures estimated to i reflect the average cost of producing an NCV graduate (increase as the result of NSFAS funding.	
ents receiving AS awards	2018 – 255205 students assisted 2020 - 497,123 students assisted in 2020 TVET college (vs 426268 university students)	NDP (2020), p. 5 NSFAS (2024)		

Category	Value	Source	Comment	Assessment
2.3. NSFAS awards by age, group, gender	Not Available	Not Available	2020 NSFAS – 426 268 university students assisted (NSFAS 2024) increase in funding increasing from R441 million assisting 29 176 students in the 1999 academic year to R41 billion (total spend)	
. % apprenticeship/other in labour cost	48%	(NDP, 2020: 15)	No international norm	Progress to Success: 3
. Expenditure on lecturer training	Not Available			Absent: 0
 Expenditure on ICT training activities 5.1. Expenditure on cutting- edge technologies 	- Decline from R1,3 billion to R342 million (National Treasury: Budget Vote 17)	National Treasury: Budget Vote 17)	UMIC values >2%	Emerging: I
		DUTPUT		
 Lifelong learning % 25–64-year-olds 6.1. Individuals with above-basic overall digital skills 	0.45% (authors from General Household Survey, StatsSA) -	(authors from General Household Survey, StatsSA)	UMIC values >2%	Emerging: I
. Enrolment 7.1. Total Enrolment	Total Annual Enrolment Year Enrolment 2010 358 393 2013 612 621 2016 705 397 2019 673 490 Annual Growth Rate over period – 7.3%	DHET (2021) Post-School Education and Training Monitor – Macro Indicator Trends, Table 14 (p. 49)		Emergent/Promising: 2

demographic	FTE: 2019				
				DHET (2021) Statistics on	
	Type	FTE		PSET in South Africa Fig. 5.1	
	PLP	3 396		p.38	
	NC (S)	127 968			
	Report 191	180 469			
	TOTAL	311 832			
		_			
		2010	2019		
	African	74.4%	92.2%	DHET (2021) Post-School	
	Coloured	8.8%	6.7%	Education and Training	
	Indian	1.1%	0.2%	Monitor – Macro Indicator	
	White	4.4%	0.8%	Trends, Table 14 (p. 49)	
				Ibid Table 15, (p. 50.)	
Type	GER by Gen	der (2010-19	(
	YEAR	Male	Female		
	2010	7.3%	12%	DHEI (2022) Macro	
	2019	6.5%	17.1%	Table E0 - 04	
				Table 51, p. 95	
	2019 - NC (V)) L4. – 10 920			
	N6 –	113 393			
	Artisanal P	rogrammes		TVETMIS. 217 and SETMIS	
	Electrical		36%	2017 cited in Rogen	
	Mechanical fit	tter	%II	(2022) Analysis of the	
	Diesel Mecha	nic	10%	Responsiveness of TVET	
	Plumbing		%6	PQM, LMIP (p. 6)	

Assessment									
Comment									
Source								DHET (2022) National report: 2021 Report on TVET Colleges Performance, p. 15 (Achievement of planned retention of students placed in PLP)and p.6 (Achievement) of planned progression)	DHET (2022) National
ilue	2017	19 107	17 049	105 833				4 (Retention 6 placed on PLP ning Programmes) int of 92% nned progression of	85 - annual achieved
Va	ТҮРЕ	Learnerships	Apprentieships		NOT AVAILABLE		NOT AVAILABLE	As per indicator 2.4 rate (%) of students (Prevocational Learr National achieveme Achievement of plar PLP students is 77%	Annual Target 15 83
Category	7.4. by economic subsector				7.5. RPL	7.6. Retention rate of prevocational learning programme		7.7. Retention rate of prevocational learning programme7.7. % in entrepreneurship training	

Assessment	Emerging: I	Emergent/Promising: 2		Emergent/Promising: 2		Emergent/Promising: 2
Comment						International varies from 10:1 to 30:1 HEIs 30:1
Source	(Statistics on PSET)	(National Treasury: Budget Vote 17)	DHET 2022 National report: 2021 Report on TVET Colleges Performance, p. 27.	DHET 2022 – National report on TVET College Performance, p. 13	Viljoen, K. & Cilliers, L. (2021). Technical and Vocational Education and Training Student Satisfaction Report. A report produced under the Five-Year Research Programme on TVET Colleges, commissioned by the Department of Higher Education and Training (DHET) and funded by the National Skills Fund (NSF). Pretoria Unavailable	UNAVAILABLE
Value	N3 to N4 Approximately 33% (Statistics on PSET)	158,651 of 657,133 = 24%	57% (of a planned total of 40 000) (with a high placement for N6 Students)	Overall 64% - No. of students completing college programmes and exiting – Overall -	 Overall, 80% satisfaction 80% - attractiveness of surrounds + Learning man system 75% IT services 77% - learning resources 67% - library 20% use TVET wifi (most -61%mobile) 75% - data availability - unaffordable 75% - data availability - unaffordable 	Unavailable
Category	8. Transition rate from secondary schooling to TVET colleges	9. WBL participation rate		10. First-time PSET completion (18–24-year-olds)	10.1 Student satisfaction10.2 Support for studentswith special needs	II. Student-lecturer ratio in TVET colleges

Category	Value	Source	Comment	Assessment
12. % completion of TVET programmes	NC(V) – 2016-2018 – 9.2% (Male 6.4% - Female 11%)	DHET 2021 PSE Monitor Macro Indicators report, Table 41.p. 77	International: Austria 83% in 2019 (Eurostat) UK 65% in 2019/20 (ONS) Australia 64% (NCVER)	Emerging: I
	Throughput off NCV L.4 student ranging from 9%-50% (as quoted questionable)	- DHET 2022 National report: 2021 Report on TVET Colleges Performance, p.14		
		(2017-2021 by subject L2-L4 & N3) 12% completion (2017-2021 by subject L2-L4 & N3)		
 % apprentices trade tested/ certified 	YEAR Achieven	Ient(DHET (2021) PSET Statistics2 300at a Glance: 2019: Table 8.7,0 000p. 83,	Data for those entering artisanal programmes Data for 2019/20 impacted by	Emergent/Promising: 2
	2019/20 (Covid-19	7 702 24,029 of 30,000 (target for 6 218 2030) (Statistics on PSET proxy) 2017-2021, Table 8.7	Covid UK certification rate of 65.8% for 2019/2020 (ONS)	
			Australia certification rate of 54% (NCVER)	
	Number of artisans exiting a TVE College 63% (3 052 achieved of a annual target of 4 807) as per Ou indicator 2.1.	r DHET 2022 National report: put 2021 Report on TVET Collores Porformation 201	Artisans are referred to as those having completed the theory. Practical	
			components, together with the appropriate and relevant	
			trade test.	

Category	Value	Source	Comment	Assessment
14. % fully qualified lecturers in	809 of $6,775$ fully qualified = 12%	(DHET.		Emerging: I
TVET	(DHET.	TVET Quarterly 3.4		
	IVET Quarterly 3.4 Qualification audit)	Qualification audit)		
-	1			
14.1. Induction completed; registration on 1 SS	Trained 1 768 in 2015, hurt no detail	(idem)		
portal				
	GCI Rank 40 of 141 (WEF, 2020)			
		(WEF, 2020)		
14.2. Staff in industry-				
sponsored training; industry attachments	Data Unavailable			
14.3. Staff pedagogic				
content knowledge gained in previous five	Data Unavailable			
years				
14.4. Build staff capacity for	Data -Unavailable			
innovation activities				
14.5. Extent of staff training				
	Data Unavailable			

Category	Value	Source	Comment	Assessment
 % colleges with industry partnerships 				
15.1. Industry staff undergo in-service education and training at TVET	60% (I 317 of the annual target of 2 212) (figures for 2021) -	DHET 2022 National report: 2021 Report on TVET Colleges Performance, Fig. 13 p. 21/22.	Indicated as Output indicator 3.5 - Number of partnership agreements for exchange and placement of students and lecturers (national) –(DHET 2022, p.	Emerging: I
15.2. Enterprises actively increasing ICT skills of personnel	Data Unavailable			
15.3. Job-to-job mobility of HR in S&T	Data Unavailable			
16. % student placement in industry during studies			4,657 student completions (SETAS/ TVET Colleges) - (SETAS/ TVET Colleges)	Emergent/Promising: 2
16.1. WBL (or WPBL- Workplace Based Learning)	Target of 41 193 – achievement of 23 355 (56.6%) - 2021	DHET 2022 National Report 2021:TVET College performance, pp. 23-24 (Table 8. Fig. 16)	Output Indicator 4.3: Number (n) of students placed for WBPL at exit levels – figures for NCV L4	
16.2. Enrolments in OIHD and priority-skill programmes	35 082 of annual target of 40 873 (86%) for 2021 (exclNCV, Report 191 or PLP Programmes)	DHET 2022 National Report 2021:TVET College	Output Indicator 4.1: Number (n) of students enrolled in programmes	
		performance, pp. 23-24 (Table 6. Fig. 14)	relating to OIHD and priority skills	

Assessment	Emerging: I			Emergent/Promising: 2				Absent: 0	Emerging: I	Progress to Success: 3	
Comment	Employed disaggregated as follows: - 34.4% were in internships or apprenticeships, - 50.2% were in permanent employment or long-term contracts, - 15.4% were in short-term contracts.			No time series is available					No time series is available	Within the upper middle- income country range	
Source	Papier, J., Powell, L., McBride, T. and Needham, S. (2017) Survey Analysis of the Pathways of Public TVET College Learners through NATED Programmes. LMIP Publication, quoted in Reddy,V LMIP Update 2022,	p. 32		(WEF, 2020).	(HRDCSA (2022): HRDC Annual Report 2020/21, p.39)		ND INNOVATION		(WEF, 2020)	HSRC, 2021)	
Value	Overall: telephonic survey cited in Reddy, 2022, 52.3% (of 3000 graduates) in 2013 employed	Data Unavailable	Data Unavailable	Global Innovation Index (GII) 5.1.2 value of 36.8% rank 35 (WEF, 2020).	148 reports on companies partnered with universities and TVET colleges	Data Unavailable	QUALITYA	1	Rank 119 of 141 (WEF, 2020)	Declining 4.0: I (HSRC, 2021)	
Category	17. % employment of graduates 17.1. Graduate tracer studies conducted	17.2. Career guidance programmes offered	17.3. % in self-employment	18. % companies providing apprenticeship or other training	18.1. Analysis of skills demand	18.2. INSET for industry staff at TVET		 Employer satisfaction with TVET graduates 	20. Quality of TVET according to GCI Pillar 6	21. Technician: researcher in NSI	

Category	Value	Source	Comment	Assessment
22. % introduced product	Seven out of $33 = >21\%$	SITVET I	SITVET I survey	Emerging: I
innovation	1			
22.1. Sources of	1			
information				
22.2. Obstacles				
23. % introduced significant	1	SITVET I	SITVET I survey	Emerging: I
curriculum changes CoSs	10%			
23.1. Personalised learning	7%			
23.2. Project-based learning	I			
23.3. Collaborative learning	42%			
23.4. Programmes in	14%			
renewable energy				
23.5. 4IR activities				
(competitions, prizes,				
hackathons, workshops,				
open days)				
24. % introduced new	50%	SITVET I	SITVET I survey COVID-19	Progress to success:
e-learning and management			anecdotal	e
tools				
24.1. Staff trained in new				
assessment tools				
24.2. Staff trained in new				
management and				
leadership tools				
24.3. Stakeholder				
involvement in				
curriculum development				
24.4. Sources of				
information				
24.5. Obstacles				
25. % introduced new			SITVET I	SITVET I survey
partnerships with industry,				
HEIs, PROs				

Other:



Those entering Artisanal Programmes)

"The total number of learners who entered artisanal learning programmes in the 2019/20 financial year was 16 218, reflecting a 13 764 (45.9%) decrease when compared with the 2018/19 financial year. The main contributor to the decrease in number of learners entering artisanal learning programmes between 2018/19 and 2019/20 financial years was CETA and MERSETA (7 101 and 5 829 less learners respectively). Despite the overall decline, INDLELA recorded the highest number of learners entering artisanal learning programmes (3 056), followed by CHIETA (2 543), while LGSETA enrolled the lowest number of learners (44 learners)." – DHET (2021) PSET Statistics at a Glance. p. 83, Table 8.7).

*TVET Enrolment Context (from DHET, 2021, PSET Statistics at a Glance, DHET, p. 32.)

"In a TVET college context, it is important to understand the different enrolment cycles with programme enrolment and how students are counted and reported. There are six enrolment intakes/ cycles at TVET colleges during an academic year – i.e., annual, trimester and semester. Enrolment into the NC(V) and PLP and often occupational qualifications is annual, for Report 190/1 Engineering Studies enrolment is per trimester and for the Business and General Studies programmes of Report 191, the intake is per semester. The TVET colleges enrolment figures reported in this section reflect a cycle count of student records where a student record is counted only once in an enrolment period/ cycle and counted at the highest level of the programme they are enrolled into."

*Cost of Training an artisan. Programme Development Artisan National the of Review Performance and Expenditure The artisans. training of costs the assessed 2014 in Treasury National by commissioned is R 400 000. (DHET, 2018. National Artisan Development Strategy and Implementation Plan 2017, Chief Directorate INDLELA) Moderating Body (NAMB) Plan, p. 41).

17.1 Employment outcomes;: The results indicated that there is evidence of employment across the programmes, with 69% (20/29) employment rate in the artisan programme, 62% (32/52) employment rate in the internship programme, 61% (31/51) for the bursary programme and 58% (114/197) for the learnership programme.(p.30) – cited in DHET (2020) Research Bulletin on Post-School Education and Training Number 9., (Daphney Mogopudi and Bulelwa Plaatjie) DHET Track and Trace Study 2019/20: A Descriptive Analysis of Learners that Found Jobs

Indicator 18.2 - % of TVET college lecturers placed in industry. National performance indicator is 23%. Wrt Output indicator 3.4 referring to TVET College Lecturers(PERSAL and college paid) who are placed in industry for specified periods for the purpose of gaining relevant experience and improve the quality of teaching and learning (p. 19/20), DHET 2022 National Report: 2021 Performance of TVET Colleges, May 2022.



NOTES



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