



**ROADMAP TO STRENGTHEN DIGITAL
AND INFORMATION TECHNOLOGY
TRAINING IN THE POST-SCHOOL
EDUCATION AND TRAINING
SYSTEM**

ACKNOWLEDGEMENTS

The Fourth Industrial Revolution will inspire new ways of working and new skill sets will be required to create, maintain, and leverage new technologies. For South Africa to remain competitive within 4IR, the country requires a reliable pipeline of technical skills to fill emerging technology sector roles. The formal Post-School Education and Training (PSET) system will need to partner with government, employers, and private training institutions to develop and support curricula that address the digital skill sets needed for the future job market and in the process create a more agile PSET system that is responsive to new skill sets.

IYF believes that creating a roadmap to integrate a high-quality digital skills curriculum into the PSET system will demonstrate a model for strengthening the system to respond to skills misalignments in the digital economy. By capacitating the PSET system to appropriately train youth for critical roles in the IT sector, this work can significantly increase the number of youths employed in the ICT sector.

IYF in partnership with Michael & Susan Dell Foundation (MSDF) embarked on a research project to deliver on a clear roadmap that will guide the process of integrating and implementing digital programming within the PSET system. IYF would like to thank MSDF for funding the initiative as well as JET Education Services who conducted this critical research piece.

A note of appreciation to The Department of Higher Education for their participation and support of the initiative. The findings and roadmap developed will guide future strategies and add value to the development of the information technology curriculum within the South African PSET system.



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1. EXECUTIVE SUMMARY

This study is produced in response to high youth unemployment and the growing demand for digital skills in the South African economy and abroad. At the intersection of these two contextual realities lies the potential for an effective intervention - a dynamic systems change initiative focused on the improvement of digital skills in South African youth, and preparing them more efficiently, effectively and at a larger scale for jobs in the technology sector, or for technology jobs in other sectors.

This initial research into the current state of digital skills integration in the South African Post School Education and Training System (PSET) and models for potential integration was commissioned by the International Youth Foundation (IYF) in partnership with the Michael & Susan Dell Foundation (MSDF) and the Department of Higher Education and Training (DHET) and carried out by JET Education Services. Over the course of six weeks, JET Education Services supported by the IYF conducted a literature review, sector mapping and 31 key informant interviews, four focus groups and two surveys. The research involved the following: In total, 64 individuals were engaged in the research, spanning four government departments, three sector education and training authorities (SETAs), two funders, two associations, three employers, four higher education institutions (HEIs), nine TVETs, one community education and training college (CET), ten community learning centres (CLCs), nine private training providers and eight students.

The findings of this research demonstrate:

The complexity of the South African PSET system, and critical leverage points including work-integrated learning requirements, practical requirements, movement towards the inclusion of industry micro-credentials into qualifications, and the funding mandates of the SETAs. Existing systems and structures allow for flexible delivery of digital skilling programmes to youth.

- There is a significant digital skills gap in South Africa, and between existing skills and the demands of the current and future economy. Skills in demand include software developers, technicians, engineers, security experts and analysts, while changes in the economy are being driven by technologies such as artificial intelligence, cloud computing and big data.
- There is significant coverage of ICT training and qualifications within Universities and TVETs, with many programmes leveraging flexibilities in qualifications requirements to incorporate industry credentials for digital skills such as AWS or CISCO. There is existing capacity in the system to create and deliver ICT courses in line with qualifications expectations, but this is stronger in universities than TVETs.
- While there are examples of partnerships with NGO and industry in digital skills programmes across universities and TVETs, there is a limited appetite from universities to engage with third sector provider content outside of industry certifications. They prefer to rely on their own expertise. Community Education and Training Colleges are still struggling with basic infrastructure, lecturer suspicion of technology and security concerns. While there are infrastructure gaps across the PSET system, these are most acute in CETs.
- Private training providers have identified gaps in existing digital skilling programmes, including their length, admission requirements and content, and have their own accredited or non-accredited courses.

Additional gaps in the PSET system identified include the limited and inequitable access to tertiary education institutions and particularly degree programmes, low completion and job placement rates of learners, poor alignment of the curriculum to industry needs, a need for more lecturer and institutional capacity and infrastructure constraints. These challenges offer points of opportunity for the proposed public-private partnership intervention.

On the funding side, the research demonstrates existing shifts towards outcomes-based contracting and social impact investing. Skills levy funding is explored as another potential avenue for sustainable funding at-scale, and the literature as well as the three SETAs consulted confirm that there is a large pool of available funding, and that SETAs are already invested in digital skills development. MICT SETA is responsible for the ICT sector, but the EDTP SETA and merSETA both also indicated that they engage in digital skills initiatives.

A number of working models are also demonstrated through the research. Some of these are private training provider models, which are functional and have demonstrated results, with all citing graduation and placement rates above 80%. Proof-of-concept models which do not yet have demonstrated results include programmes run by the Durban University of Technology to upskill community members, a TVET-private provider delivery model, and a model targeted to 'interrupted learners' at the University of Cape Town. The research indicates that public-private partnership models between private providers and PSET institutions already exist and are viable solutions to the challenges faced by the sector. These PPP models have the potential to greatly reduce youth unemployment and contribute to ICT sector skills.

Ultimately, six potential entry points for an intervention are explored:

- Community Education and Training Colleges, focused on basic digital skills and non-accredited programmes;
- TVETs, focused on accredited certificate and/or degree programmes;
- Universities of Technology, focused on accredited certificate programmes;
- Universities, focused on accredited degree programmes;
- TVET and/or University 'interrupted learners', who were not able to complete their degree programmes and can be routed to digital skills
- Tertiary education graduates who have not been able to find employment.

Of these, TVETs and Universities of Technology are supported as the most viable, based on criteria including the intended objectives of the intervention, theoretical soundness and proof-of-concept, and the intended timeline for intervention. A third model which leverages tighter integration between TVETs and private providers for more extended degree programmes is also presented.

Two instruments were developed to facilitate the integration of a digital skills development public-private partnership. The PSET Integration Readiness Framework outlines the attributes of a PSET institution (from any branch of education and/or training) which should be developed in order to successfully integrate such a digital skills programme and partnership.

The Partner Assessment Matrix outlines the criteria and indicators for the selection of a successful and impactful training provider. All of the above provided vital insights into formulating what would eventually become a consolidated roadmap.

1. BACKGROUND AND INTRODUCTION

The International Youth Foundation (IYF) in partnership with the Michael & Susan Dell Foundation (MSDF) and the Department of Higher Education and Training (DHET) is planning to implement an initiative focused on the improvement of digital skills in South African youth, and in particular the creation or strengthening of preparation/education efforts to develop youth prepared for jobs in the tech sector. The partnership wishes to determine the available and/or necessary channels through which coding and programming can be integrated into the post schooling and education and training (PSET) system, as well as the readiness of the system and potential funding mechanisms to enable the integration.

The focus on coding and programming in the tech sector itself constitutes an important point of departure for this research, and was mutually agreed to between the research team, MSDF and the IYF. This is not to say that the opportunities for coding and programming in non-ICT sectors (e.g., agriculture, health, tourism, engineering, etc.) was deemed as less important. The research aimed to elicit a greater understanding of these avenues and mechanisms, and therefore support the initial stages of planning for the initiative, including planning for scale.

This document brings together two reports: the PSET Integration Report and the Impact Assessment Report. The former report focused on the PSET system in South Africa; the current state of digital skills training across universities, TVETs

and Community Education and Training (CET) centres; existing or potential funding models for digital skills programmes; the exploration of points of entry into the PSET system for digital skills development; and the development of a PSET Integration Readiness Framework, which is intended to outline the attributes of a PSET institution (from any branch of education and/or training) to integrate digital skills programmes and partnerships.

The latter report considered digital skills in South Africa more from the demand side, having explored the requirements for digital skills in South Africa; challenges in integrating digital skills programmes into institutions; the development and attributes of impactful digital curricula; public-private partnership models in South Africa; and the development of a Partner Assessment Matrix, which is designed to outline the criteria for a successful and impactful training provider. Both reports draw from a common research pool including a literature review, interviews, focus groups and survey data.

The intention of the research is for the findings of both reports to inform a programme design document and roadmap for implementation of digital skills training at scale in South Africa.

2. METHODOLOGY

A literature review was undertaken to provide a synopsis of the importance of digital skills in PSET in South Africa, existing knowledge about digital skills development, and research into innovative funding models that could be positioned to support both further research and a new programme to integrate digital skills in PSET in South Africa. Lessons were drawn from international case studies and examples as well as existing South African research. The literature review informed the instrument development, and sections of the literature review feed into one or both reports.

Two variations on desktop mapping were undertaken in order to describe the ICT qualifications landscape in South Africa. The qualifications landscape is considered important not only as information to provide context to and foreground the PSET Institution Integration Readiness Framework but also to serve as a baseline that can be checked against after implementation. The first approach to mapping was to evaluate the registration of ICT-related qualifications on the NQF.

The second approach to mapping was to follow a bottom-up approach and map existing initiatives and qualifications listed on the websites of South Africa Universities and TVETs.

While there is no guarantee that all courses, qualifications and initiatives are necessarily represented on the organisational websites, this analysis provides us with useful information about those initiatives which are considered important enough to advertise. University and TVET websites were mined for information using multiple methods. First, qualification programmes were sought out using faculty and department websites and programme information. Second, the search terms 'ICT' and 'digital skills' were used across websites for which a search function was available.

In addition to looking at general characteristics of programmes, such as duration, faculty and qualification level, where possible the rationale and learning outcomes of these programmes were also captured and analysed, to provide some indications from the PSET institution side regarding the content and purpose of digital skills training.



An initial list of over 120 potential organisations deemed relevant to the research which included the below: a list for potential interviews which included six funders and foundations; two youth focus groups; four TVETs; eight higher education institutions; three community education and training colleges; nine training companies/NGOs; three SETAs; one professional body; and six government institutions (see figure 2).

A total of 33 remote interviews took place as well as three student focus group discussions (comprising eight students in total). In addition, the research team received 20 survey responses from employers and training organisations, including nine community learning centres (CLCs), one CET, the E3 Programme of the Department of Basic Education, five training organisations and one private HEI.

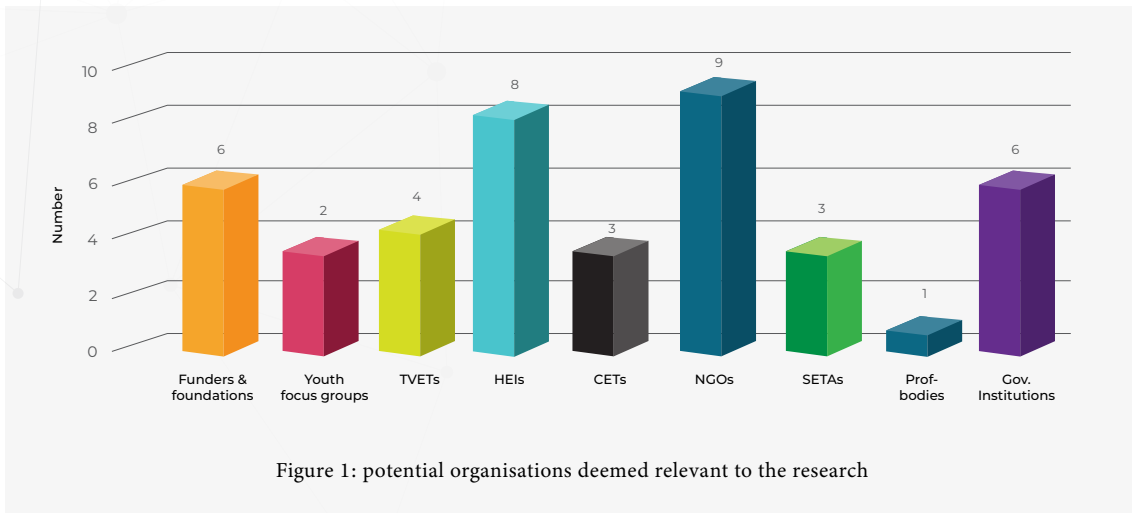


Figure 1: potential organisations deemed relevant to the research



3. DIGITAL SKILLS IN SOUTH AFRICA

In South Africa, the composition of the ICT sector is not unanimously agreed. According to the Independent Communications Authority of South Africa (ICASA), the ICT sector comprises of telecommunications, broadcasting and postal services. The Media and ICT Sector Education and Training Authority (MICT SETA) on the other hand considers media, information technology, telecommunications and electronics as being part of this sector (MICT SETA, 2019). Gartner refers only to information technology (hardware, software and services) while Statistics SA says it is a subset of Transport and Communications (*Schofield and Dwolatzky (2022)*).

Regardless of its nomenclature, the ICT sector has the potential to significantly contribute to most facets of the 21st Century, as is the demand for the skills to enable that contribution (Schofield and Dwolatzky, 2022, p.3). According to the ICASA's 2022 State of the ICT Sector in South Africa, South Africa's ICT sector continues to demonstrate signs of growth, recording R243.6 billion in revenue in 2021, up from R243 billion in 2020, which represents an overall increase of 0.3% (*ICASA, 2022*). The report also reveals a 22.4% employment decline in 2021 in telecommunications, broadcasting and postal services, which mirrors SA's overall unemployment rate (ibid).

Before discussing digital skills needs, it is useful to establish a shared definition and understanding of what digital skills are. This section presents the DigiComp framework and the framework under discussion for widespread adoption in South Africa, DSFOne. Both are presented for comparative purposes.

With the accelerated development in technologies, digital skills requirements have also accelerated, blurring boundaries between personal and work contexts and posing challenges in terms of a structured approach towards digital skills categories (*Claasen, 2021a*). In some areas, such as the more professional world of ICT operations, professional organisations have actively maintained structure in the rapidly developing digital skills world, ensuring that new skills are regularly identified and are fit into a logical structure or framework. Over time, and through research and the active collaboration between industry/business, academia, government and civil society organisations, various thought frameworks were developed to manage the complexity, amongst them also digital skills frameworks. One of the most cited for general digital skills is the European Union's Digital Competence Framework for Citizens (DigComp) 2.13. According to this framework, digital skills include twenty-one competencies grouped under five areas as outlined in Table 1 (Mouselli and Hassan, 2022).

Table 1: Digital Competences Framework (European Commission, n.d.)

Area	Competence
Information and data literacy	<ul style="list-style-type: none"> • Browsing, searching and filtering data, information and digital content • Evaluating data, information and digital content • Managing data, information and digital content
Communication and collaboration	<ul style="list-style-type: none"> • Interacting through digital technologies • Sharing through digital technologies • Engaging in citizenship through digital technologies • Collaborating through digital technologies • Netiquette • Managing digital identity
Digital content creation	<ul style="list-style-type: none"> • Developing digital content • Integrating and re-elaborating digital content • Copyright and licences • Programming

Area	Competence
Safety	<ul style="list-style-type: none"> • Protecting devices • Protecting personal data and privacy • Protecting health and well-being • Protecting the environment
Problem solving	<ul style="list-style-type: none"> • Solving technical problems • Identifying needs and technological responses • Creatively using digital technologies • Identifying digital competence gaps

In South Africa, however, the current thinking in relation to digital competency is leaning toward the Digital Skills Framework One (DSFOne) that was developed by Prof. Walter Claasen in the Western Cape CoLab for eInclusion and Social Innovation at the University of the Western Cape. This framework provides a comprehensive digital skills framework that accommodates the widest possible range of digital skills. This includes digital skills required for activities in everyday life and those belonging to the world of work; general and basic digital skills to the highly specialised skills in different professions; from those required to use digital devices, to those necessary to develop the code that makes these devices work (*Western Cape CoLab, 2021*). Due to the wide international acceptance, many aspects of the EU DigComp framework were incorporated into the user component of the DSFOne, with some adaptations regarded as necessary for local conditions in South Africa and for ease of use.

Conversations with DHET are underway to recognize this as the official competency framework and is therefore suggested as a point of departure for defining digital skills in the context of this research. The following types of digital skills are proffered by the DSFOne (*Claasen, 2021a*):

1. **Digital literacy or e-literacy**, which involves more than just a very basic level of digital skills, specifically digital skills that can lead to meaningful use in life, work and learning, both for individuals and in small organisations.
2. **User digital skills**, which include “both generic, and sector- (or profession-) specific, more complex skills. These are handling information, data and digital content (incl. search, evaluation, storing); communication and collaboration; digital content creation; safety, security; problem-solving; and transacting”.
3. **ICT practitioner skills**, “which include capabilities required for researching, developing, designing, strategic planning, managing, producing, consulting, marketing, selling, integrating, installing, administrating, maintaining, supporting and servicing ICT systems”.
4. **Digital leadership skills**, which refer to “the capabilities needed to exploit opportunities provided by ICT, notably the Internet, digital devices and the new media, to ensure more efficient and effective performance of different types of organisations, to explore possibilities for new ways of conducting business and organisational processes, to establish new businesses, organisations, platforms, applications or interventions, to accomplish goals that rely on ICT through the direction of human resources and uses of ICT, and to effect innovation (incl. social innovation) through digital means”.

According to this framework, the list of competences for each of the “competence areas and at the various proficiency levels might appear to be unrealistic and unreachable for a broad population in order to qualify them as digitally literate. However, in many digital skills training programmes a selection will be made from the comprehensive list of competences, according to what is realistically applicable to the group for which the training programme is developed” (*Classen, 2021, p. 6*)

KEY POINT

The six competence areas under 'User Digital Skills' include the five competence areas of the DigiComp Framework, plus the area of 'transacting'. The DSF-One can thus be considered an elaboration of the DigiComp Framework, and is fully aligned to the learning areas including in this internationally prominent framework.

According to a recent study by the Joburg Centre for Software Engineering (JSCE) and the Institute of Information Technology Professionals South Africa (IITPSA), there has been a slight improvement in the ICT skills gap over the last two years; however, the struggle to fill tens of thousands of vacancies in the sector persists (*Schofield and Dwolatzky, 2022*). According to the report, the rapid digital adoption driven by the pandemic and other factors resulted in SA's ICT skills gap narrowing but only by a small margin (+3%) (Ibid).

To narrow the ICT skills gap, South Africa "requires a vast improvement in the education pipeline – with more pupils taking up careers in the science, technology, engineering and maths fields", asserts Schofield in a media briefing in October 2022 (*ITWeb, 2022*). He further points out that, "[t]here will always be an ICT skills gap in South Africa, simply because the older generation takes their skills to retirement pastures and we are not filling these skills fast enough from the bottom level. Employers are yet to understand that young people can be very effective in this industry without having to go through 16 years of the formal schooling system" (Ibid).

But which skills are in demand? To answer this question, the ICT-relevant information available in a number of SETA Sector Skills Plans (SSPs), was reviewed, with a particular focus on the MICT SETA as this is the key SETA under which the programme that is being considered by the IYF and MSDF has bearing. However, this report also looked at technology skills or jobs in demand in the other SETAs as "approximately half of the country's ICT practitioners are operating in non-ICT sectors" (*Schofield and Dwolatzky, p 13*).

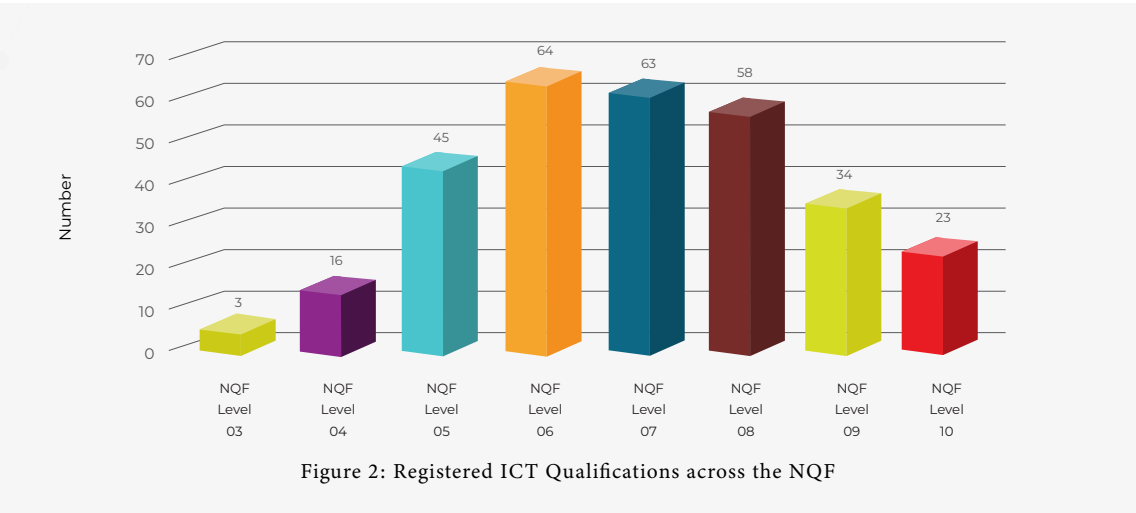
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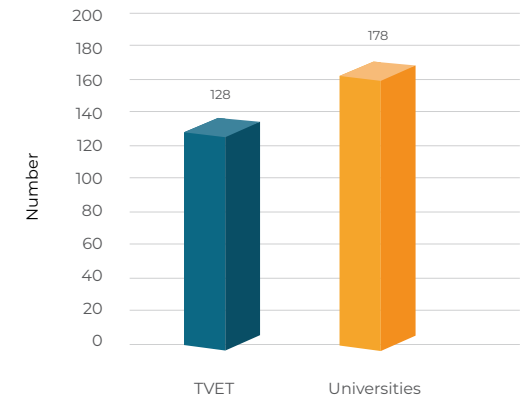
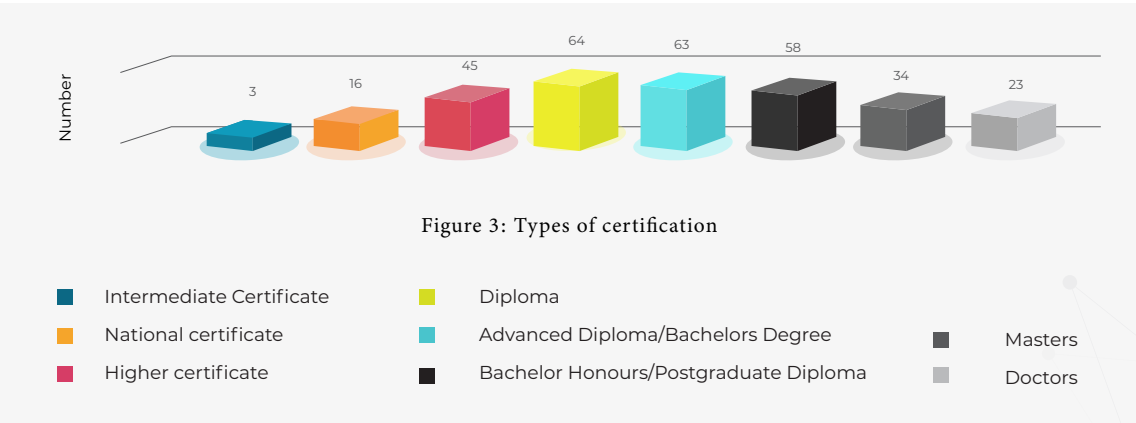
4. RESEARCH FINDINGS

THE CURRENT PSET DIGITAL SKILLS LANDSCAPE

Figure 3 gives a breakdown of ICT qualifications registered on the NQF by level. A total of 306 qualifications were found on the database. A majority are registered between NQF levels 6 and 8.



Mapping this NQF level breakdown into certification type, the below picture emerges (Figure 4). A majority of these qualifications lead to certification at diploma/advanced diploma, bachelors and postgraduate diploma levels.



Given the above spread, it is apparent that most of these qualifications are offered at university level (178) while the TVET space is responsible for 128 qualifications (Figure 4).

There are also 161 private FET colleges offering some of these qualifications based on the database pulled from Umalusi. There are well over 300 private providers accredited by the MICT SETA to offer qualifications between NQF levels 2 and 5. The largest share of these institutions is in Gauteng, followed by KZN and Limpopo (see Figure 6).

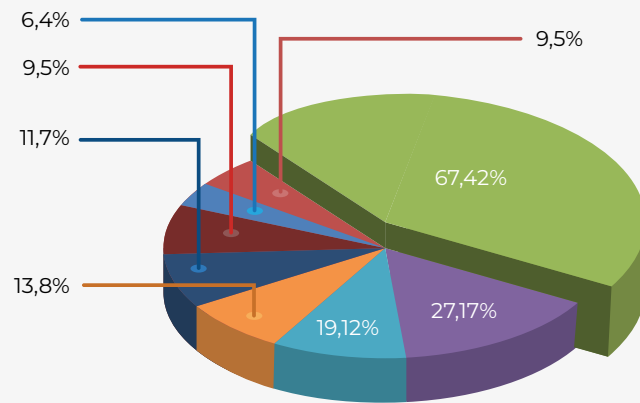


Figure 5: Private FET Colleges Spread

- Eastern Cape
- Gauteng
- Limpopo
- North West
- Free State
- KwaZulu Natal
- Mpumalanga
- Western Cape

South Africa's NQF system is segmented into sub frameworks governed by three quality councils: Umalusi, Council for Higher Education and the Quality Council on Trades and Occupations. The spread is mainly across two systems – the HEQSF quality assured by the CHE and the OQSF governed by the QCTO.

A total of 270 qualifications are on the HEQSF and 36 on the OQSF. While there are three qualifications on the GETC bend, these do not have active registrations on the National Learner Records Database (NLRD) (see Figure 7).

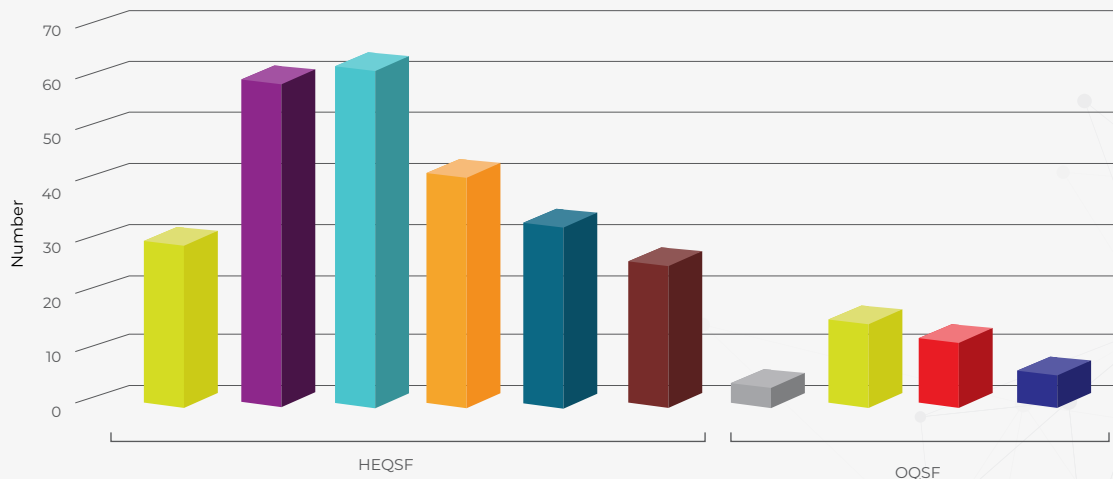


Figure 6: Spread by Qualification Band

- NQF Level 03
- NQF Level 05
- NQF Level 07
- NQF Level 09
- NQF Level 04
- NQF Level 06
- NQF Level 08
- NQF Level 10

Over and above the analysis on current qualifications, it was also possible to draw data from the National Career Advice Portal, which maps ICT qualifications to priority ICT occupations identified by the Media, Information and Communication Technologies Sector Education and Training Authority (MICT SETA). Figure 6 below maps priority ICT occupations to current qualifications being offered by public TVETs and Universities. Essentially, these qualifications offer entry points into employment opportunities within ICT occupations. There are 3 qualifications at certificate level, 15 diplomas, 12 BTechs and 16 bachelor programmes that are mapped to ten priority ICT occupations.

Over and above the analysis done on public offerings of accredited ICT qualifications, additional desktop analysis was undertaken to identify vendor specific certifications that are prominent across industry, from leading vendors such as Microsoft, AWS, Cisco, CompTIA, Google, PMI, ITIL, and more. In reality, there is a plethora of vendor specific training programmes, due to ever changing technology and software programmes that constantly emerge due to innovation. A basic internet search yields over 4000 certifications that are available to ICT practitioners. These certifications cover the following ICT domains across 21 vendors. There are over 300 certifications that are in demand across the ICT landscape. The list is not exhaustive but covers the most prominent certifications.

Table 2: Vendor certificates

<i>ICT Domain</i>	<i>Vendor</i>
1. Explore our Domain Specific Course Portfolio	1. Adobe
2. Cloud	2. Amazon Web Services
3. Security	3. Autodesk
4. Networking	4. CAP/CISSP
5. Design & Multimedia	5. Cisco
6. Data & AI	6. CompTIA
7. Application Development	7. DASA
8. Business Application	8. EC-Council
9. Business Process	9. IBM
	10. ISACA
	11. ITIL®
	12. Microsoft
	13. Oracle
	14. PMI®
	15. Red Hat
	16. Salesforce
	17. Sarder Learning
	18. Tableau
	19. Vendor Neutral - Leadership & Management
	20. Vendor Neutral – Technical
	21. VMware

For the universities and TVETs whose websites could be accessed, 62 of 75 (84%) offered ICT related qualifications and/or courses. This included 100% of public universities (26), and 73% of TVETs (36 of 49) (See figure 7).

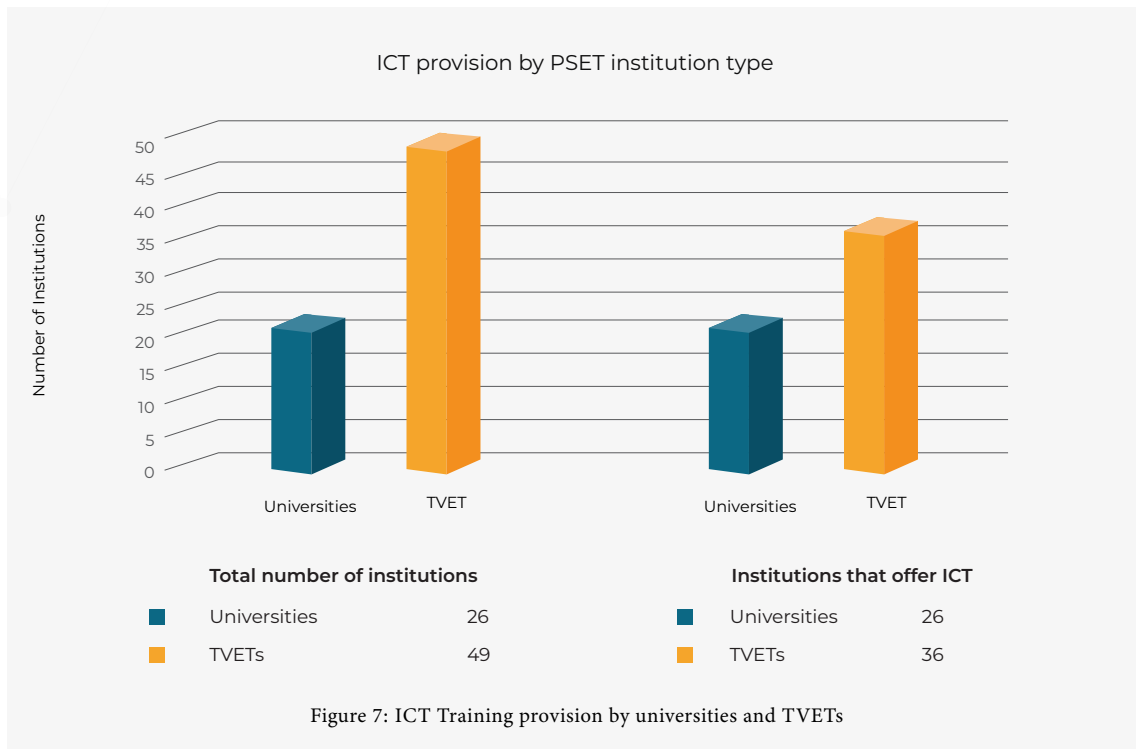


Figure 7: ICT Training provision by universities and TVETs

TVETs offered the National Certificate Vocational (NCV) Qualifications (offered at 31 institutions, or 42%) and short courses (offered at 10 institutions, or 14%). Within universities, a Bachelor's qualification in ICT was the most common, offered by 17 universities (65%). The second most common ICT qualification offered was the Masters qualification, offered by 54% of universities. Exactly half (50%) of universities offered Diplomas, while 46% offered PhDs, 38% offered Honours and 34% offered short courses. All universities offering short courses offered them in addition to other degree programmes.

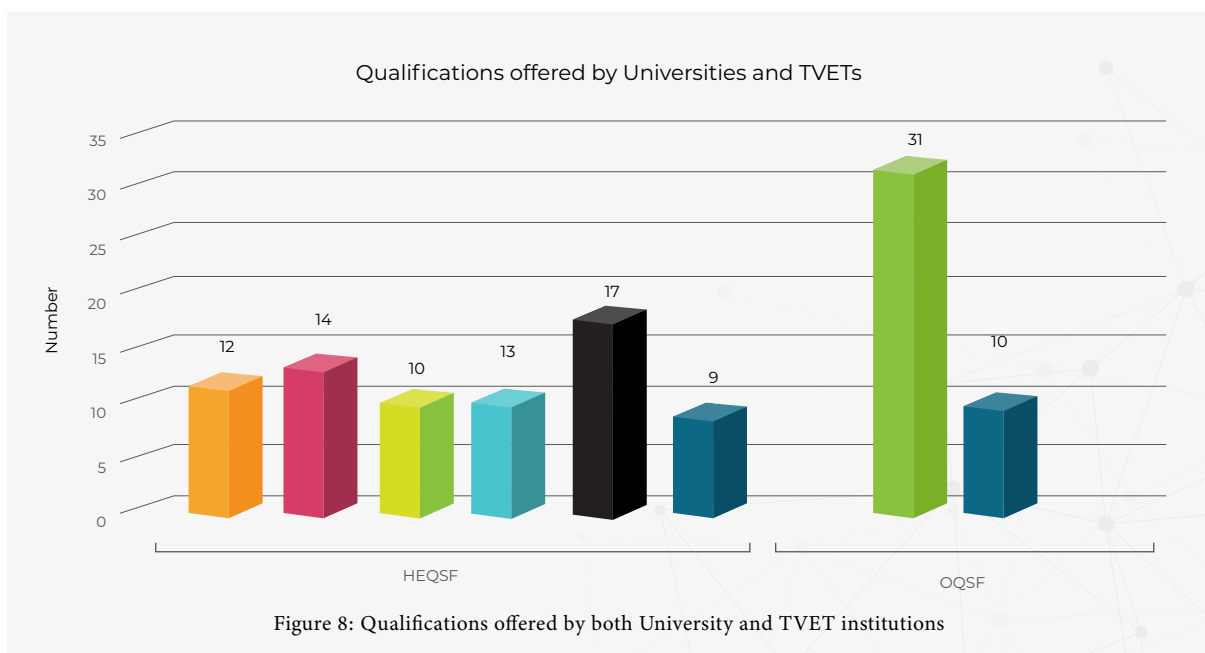


Figure 8: Qualifications offered by both University and TVET institutions

Thirty-seven of the 75 mapped PSET institutions reported active engagement with partners. While 35% of universities were involved in partnerships, 59% of the TVETs were². However, while the universities engaged in partnerships with numerous partners, including NGOs (UMUZI), SOEs (NEMISA), global consortiums (iSchools) and companies (Amazon and Oracle Corporation), most of the TVET partnerships listed on the websites were with the Department of Higher Education and Training (DHET). Only four partnerships were listed that were not with DHET, comprised of another government department (the Department of Health (DH)), the NPO CompTia and the most popular non-governmental partner for both universities and TVETs: Cisco. In fact, all TVETs are mandated to integrate CISCO qualifications into their programmes. The offerings from CISCO include basic digital skills training such as end user computing and cybersecurity as part of the life skills subject which is compulsory across all public TVET courses. One TVET college mentioned that the partnership with CISCO³ “puts the college on the map” as students are enticed by the high-tech facilities on offer.

KEY POINT

As the section above demonstrates, there is already significant coverage of ICT training and qualifications within Universities and TVETs. Many of these programmes already integrate industry credentials, signalling both an understanding of industry demand and specialisation requirements as well as a willingness to work with external partners. Universities as well as TVETs have their own levels of expertise, and while it takes four or more years to create a new qualification, these institutions leverage existing flexibilities such as electives and specialisations to incorporate industry certifications. There is a degree of capacity in the system aligned to the expectations of qualifications, and enough talent in particularly the Universities to develop content programmes (for example, the University of Johannesburg and the Durban University of Technology were both cited as creators of community outreach programmes funded by the ETDP-SETA).

However, there is limited appetite from universities to engage with third sector provider content outside of industry certifications, as Universities have their own subject matter experts to develop content and do not particularly see either misalignment to labour market needs or lecturer skill as particularly challenging. This does not mean that partnerships with the third sector do not exist. One HEI elaborated on a training model they have for their students, in which the content is developed by the University and implemented by an NGO. However, another model elaborated in a University of Technology was exactly the opposite. The Durban University of Technology both runs its own student and community training programmes, but also delivers for NGO partners when these partners have content or programmes but lack the expertise, capacity or equipment to carry them out.

Overall, the interviews indicated that Universities of Technology may have more appetite to integrate and roll out third or private-sector programmes at scale, particularly through community engagements. For example, one institution runs programmes in the community which leverage industry certifications and can be aligned to qualifications. When asked about the motivation for engaging in this sort of programme, one stakeholder responded, “One of the pillars for the University is community engagement - this is a bible. It is very important to us.” However, a profit motive was also evident, as the institution receives a 30% administration fee for any ‘third stream income’ programmes, such as those funded by the SETAs or collaborations with NGOs.

² Note that the absence of listed partnerships does not necessarily mean institutions do not have industry partners or involve industry credentials. It does mean that these partnerships are not a highlighted or advertised feature of their offerings

³ See https://www.cisco.com/c/en_us/about/csr/esg-hub/global/digital-skills.htmls

FUNDING MODELS

PSET institutions interviewed relied on government funding, and augmented available national treasury allocations with SETA funding and partnerships with industry. The Gauteng CET, for example, reported that a partnership with MICT SETA was responsible for developing the infrastructure in 12 of their college centres, with an industry provider potentially slated to fund one more.

Among training providers, funding models were either enrolment-based or donor-driven. Donor-driven models are susceptible to funding fluctuations that can impact on delivery as well as the specific demands of donors. Whether this is a positive or a negative likely depends on perspective and specific donor demands, but one example given was a donor-funded programme that required a partnership with a very specific provider.

The responsibility for addressing the skills development needs in the country lies with the PSET system, which consists of entities under the Department of Higher Education and Training (DHET, 2019a). Within this system, the planning, funding and facilitation role lies with the National Skills Fund (NSF) and Sector Education and Training Authorities (SETAs). Both institutions are mandated to fund various solicited and unsolicited projects identified as national priorities or that contribute to the achievement of skills development objectives set by government.

Despite the amount of funds available and the various funding channels, a key challenge affecting the efficient delivery of ICT education and training in South Africa is the lack of funding. Although funding for the overall ICT education and training ecosystem has increased in the previous years, it is still not sufficient for the full functioning of public education institutions, leading to increased university fees and reduced research funding. The challenge for education institutions is to invest more in new technological advancements and to prioritise the use of funding (Kayemebe & Nel, 2019).

The MICT SETA is the SETA responsible for funding and facilitating ICT related skills development and training within the PSET system. It does so by partnering with industry, Universities and TVET

colleges (both public and private), government and non-governmental entities in the delivery of respective learning programmes in its endeavour to address identified scarce skills. In the financial year 2020/21, the entity received R988 million in skills development levy income. The MICT SETA disbursed mandatory grants of R176 million and spent R437 million on discretionary grants. The amount includes the SETA's 20% contribution portion towards implementing the labour activation project with UIF. Furthermore, the entity has incurred R22 million as 80% (UIF portion) of the labour activation project.

According to the MICT SETA Annual Report (2020/21), funding, formalised training and overall development of emerging occupations are hampered by limited recognition of emerging 4IR occupations in the OFO such as an IoT specialist within the IoT realm, cloud architect for cloud computing and Artificial Intelligence specialist within artificial intelligence. To this effect, the SETA is actively engaged with stakeholders such as the QCTO, training providers and industry in the development of new qualifications and improvement of existing qualifications to meet 4IR demands.

More broadly, DHET is projecting that the skills levy in the 2021/22 will increase to R20.6 billion compared to last year's R18.9 billion. In effect this means that translates to additional budgets towards rapid skilling and training of youth, particularly within the ICT space. Given the ICT value chain and downstream industries requiring nascent technology skills and competencies, it is fair to assume that a relative portion of the public PSET funding system - DHET and its legislated funding agencies - will strategically plan for and allocate budgets towards ICT training be it generic or industry related.

The challenge for education institutions is to invest more in new technological advancements and to prioritise the use of funding

(Kayemebe & Nel, 2019).

Therefore, there exists a substantial pool of resources which can be allocated to skills training, and SETAs are already engaging in ICT-related funding and activities, even outside of the MICT SETA, which would be the SETA directly linked to the ICT sector. ETDSP-SETA, for example, conducted research to determine the demand for digital skills and sees this as a critical component of its own skilling programmes, while merSETA similarly sees the demand for digital skills as a prominent feature of its own sector, manufacturing, engineering and related services. They are currently working with unions to upskill their personnel on the use of digital tools.

In terms of accessing skills levy funding, SETAs indicated that there is a strong preference to fund public entities, and that to access SETA funding programmes have to be aligned to the National Qualifications Framework, and registered with SAQA and the SETA. However, it is possible to fund private sector entities, just to a lesser scale, and there is no challenge if private sector institutions are then sub-contracted by public-sector institutions.

KEY POINT

The skills levy is a viable funding source which can be 'tapped into' for funding a potential partnership model, and there exists a substantial pool of resources which can be allocated to skills training. While this is focused on MICT SETA, other SETAs in sectors such as agriculture, tourism and health, do engage in digital skills development programmes, particularly for low-income community members. Key funding points for the SETAs include:

- A strong preference to fund public entities. It is possible to fund private sector entities, just on a lesser scale, and funded public sector entities may sub-contract private or third-sector partners with no restrictions.
- SETA funded programmes must align to the National Qualifications Framework, and organisations receiving funding must be registered with SAQA and the SETA.
- The preference of SETAs is to engage in split-funding arrangements, with industry providing matching funds with the SETA.
- Geographic limitations or preferences may apply to SETA funding.
- SETAs will generally only fund projects which have not commenced prior to the approval of the application for funding.
- SETAs will not fund training for learners who are already funded through other programmes.
- SETAs do not generally fund set-up, start-up or infrastructure costs, existing operating costs such as employee salaries, or policy development.
- SETAs prefer outcomes-based contracts, for example based on the number of learners trained or placed in work environments, and will not fund programmes without such outcome targets.
- Administrative costs are capped at 7.5%.

CHALLENGES FACING TERTIARY EDUCATION PROVIDERS IN SOUTH AFRICA

The literature review undertaken for this exercise has demonstrated both the need for digital skills and some of the current assets and liabilities of the digital skilling ecosystem in South Africa. The value of these skills is widely acknowledged, and in fact there is a deep interest and investment in ICT provision and digital skilling from the South African government. One of the manifestations of this is the National and Future Digital Skills Strategy of South Africa, adopted by the Cabinet of the Republic of South Africa in August 2020. In addition to connectivity and basic education mandates, the strategy calls for reforms to TVET and university education, including:

- Implementation of the revised National Certificate (Vocational) Information Technology and Computer Science (NCV-IT&CS) curriculum in TVETs
- The addition and growth of degrees in cybersecurity, data science and innovative technology topics
- Developing university-TVET-industry consortia in innovative technology topics
- Complementing digital skills with creativity, problem-solving, critical thinking & communication
- Focusing on the use of digital skills to advance and innovate in other sectors

Stakeholders universally agree on a need for more digital skills in South Africa, citing low STEM enrolment rates and low graduation rates as concerns in the PSET sector. The Digital Skills Strategy also seeks an improvement in these statistics, aiming for 20% increases in participation and graduation rates in ICT-related topics (expanded for the purposes of that document to 'STEAMIE' - Science, Technology, Engineering, Arts, Mathematics, Innovation and Entrepreneurship). The existence of an inter-sectoral strategy creates a foundational point as well as a clear justification for the integration of digital skills into tertiary education. However, the crux of implementing the national strategy will be mitigating the significant challenges that still exist across different types of institutions.

While South Africa spends more on education than any OECD or partner country, the majority of this spending is allocated to basic education, with only 0.6% of GDP allocated to tertiary institutions, 0.3% below the international average. South African tertiary attainment levels remain the lowest of any OECD or partner country at only 7% while the level of NEETs (Not in Employment, Education or Training) is the highest at 48.6% (OECD, 2019). These statistics point to chronic underfunding and inefficiencies which hamper the PSET system in attaining its considerably lofty goals.

Higher education in this country remains in flux as institutions of higher learning attempt to recalibrate their practice to meet the aims of social, financial, and political equity to which the government is committed. Inevitable fluctuations of a structural nature are the outward proof of the hardship of adjusting centuries-old establishments of colonial and apartheid authority to a new model of democratic fluency. The interdependence of tertiary, secondary and primary education means that dysfunction in one

area ripples back over the others. Much of this dysfunction can be seen as the after-effect of separate development pre-1994. The subdivision of the country into physical areas along racial lines ran counter to the impetus of urbanisation and multiracialism that results from urban co-existence. Rural areas were especially deprived of resources, the effects of which are still felt today both in terms of development and education. The end result of historic injustices and persistent inequities in quality education is readily observed in enrolment statistics: only 11% of black youths and 7% of coloured youths in the 18- to 24-year age bracket are in university (*Chetty and Pather, 2015, 1*).

Gender also remains a core concern, particularly in the technology sector. A significant challenge around gender and inclusion was noted by multiple stakeholders as an inhibitor in the technology sector broadly as well as within training institutions.

In addition to equity concerns, there remains a need for improvement in the quality of the PSET system in South Africa in terms of the alignment between education and work, which may be facilitated by increased involvement of industry in curriculum development and lecturer training (*Keevy et al., 2021*) as well as better opportunities for and closer monitoring of workplace-based training and/or work-integrated learning (*Rajab et al., 2020*). The increased portability or mobility of credentials and more flexible learning pathways can also play a role by enabling youth to leverage less expensive or non-traditional higher education pathways.

LOW COMPLETION RATES

Further challenges stem from the fact that many South African students entering universities do so from positions of disadvantage in terms of both schooling and financial and other resources. Students from poor and disadvantaged backgrounds often lack not only the skills but also 'cultural capital', which includes access to the networks that enable youth to build experience and their own professional networks.

DHET (2021) shows that graduation rates are improving in higher education institutions and especially in TVETs. For higher education institutions, the graduation rate improved from 17.2% in 2010 to 20.6% in 2019. Many stakeholders have also expressed concern about the low numbers of students completing the full NCV qualifications within expected time frames with completion rates noted below:

The TVET college with the highest throughput rate for the 2017 NCV Level 2 cohort was Waterberg TVET College, standing at only 21.4%. This means that no TVET college in the country has at least a quarter of their students completing their qualifications within the stipulated time frames.

For those that do end up graduating, however, there are still concerns around the employability of the TVET graduates. Statistics South Africa estimates that around 33% of TVET graduates are still unemployed (Statistics South Africa, 2021), an improvement over the general population but still a high proportion.

Historic inequities and interdependence of basic and higher education also play a role here, and it is difficult to find students with the required prerequisites for success in a coding and technology programme.

LECTURER AND INSTITUTIONAL CAPACITY

Institutional challenges also arise, including a high teacher attrition rate and the imminent shortage of teachers in the country. This subsequently has a negative impact on the quality of teachers who exit training institutions and subsequently enter the teaching profession as an uninspired teacher (Wolhuter et al., 2012). This situation is not limited to basic education, and particularly in fields with competitive industry pay quality instructors can be difficult to lure to education and training (Shiohira, 2021). The qualifications and experience of staff in training institutions was also raised as a challenge facing PSET institutions in delivering quality digital skills training, as was the willingness of particularly TVETs to engage in digital skills training.

KEY POINT

The weaknesses in the PSET sector translate into opportunities for the proposed programme - each challenge is a problem to solve, and many of them can be addressed by the capacity that can be added through a private training provider partnership. In particular, a proposed public-private partnership model can provide additional spaces for placement, and many deliver industry-aligned micro-credentials.

These efforts are likely to be more supported by policy in the future, as government representatives have indicated that discussions are underway to allow more of these flexibilities into national frameworks.

The variety in private training also provides a range of models to try at varying levels of scale. And while PPPs are unlikely to be more efficient than a public education programme (with some citing annual costs nearly as high as a university degree), in comparable cases such as TVET certificate programmes private providers have a higher cost-benefit ratio since they more than triple the placement rate of an average TVET.

CURRICULUM ALIGNMENT TO INDUSTRY NEEDS

Other challenges raised included curriculum and alignment to the needs of the world of work. It must be noted that public training institutions interviewed so far have not expressed the curricula offered to be disconnected from industry or otherwise outdated, stakeholders outside the public education system perceive this to be a significant challenge.

INFRASTRUCTURE

Infrastructure was reported to particularly be a challenge in both TVETs and the Community Education and Training centres, with the situation more acute at CETs. According to one CET interviewed, while there are plans to implement ICT infrastructure in all centres, currently only twelve can be accommodated due to funding and resource constraints.

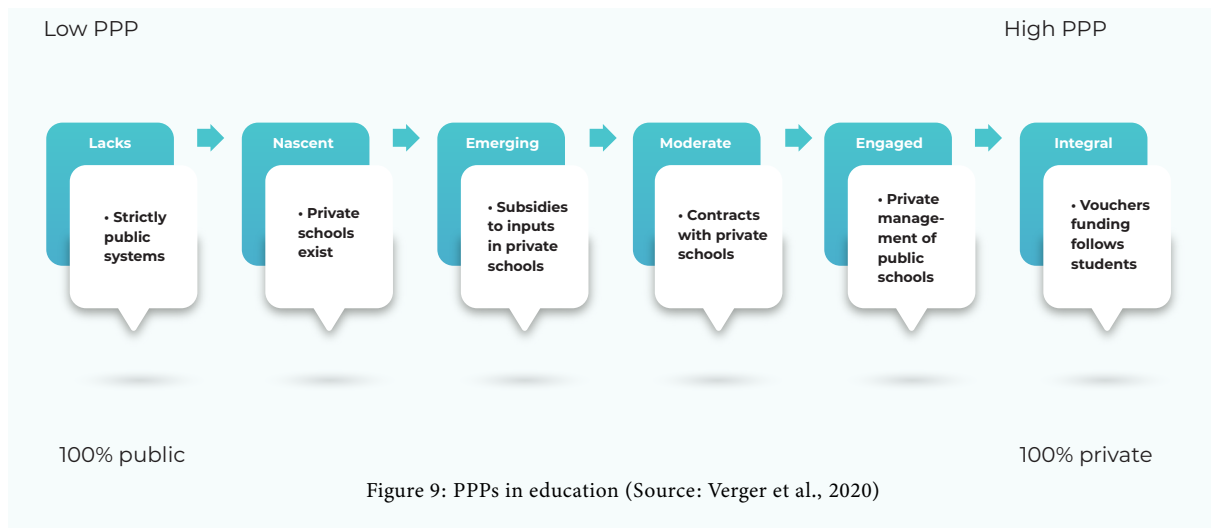
The CETs serve the broader community outside of the formal education system, and can be considered as a foundational entry point into further learning. The college plans to provide blended learning courses as well as access to foundational learning, both of which are significantly hindered by a lack of technology infrastructure. Further, theft and vandalism were reported to be serious concerns of the college, threatening the infrastructure they are able to procure. Infrastructure is an area of investment for SETAs, with ICT infrastructure projects undertaken by MICT SETA as well as ETDP-SETA.

5. A SCALABLE PARTNERSHIP MODEL FOR IMPACT

Successful cases of digital skills-based learning in TVET are developed through stakeholder partnerships that focus on quality, low cost and accessibility (Pavlova, 2020). Such partnerships could include the target beneficiaries of TVETs, such as students, parents and employers (#DE4A, 2021). There is, however, no one-size-fits-all digital skills curriculum for all education systems, schools, or classrooms, with regional contexts playing a major factor (Vegas and Fowler, 2020).

While perhaps the most straightforward models of digital skills training are government-funded, there are other models of partnership and particularly funding models which can be considered.

Public-Private Partnerships (PPPs) are increasingly viewed as innovative models that are able to impact on the quality of education systems internationally (Verger et al 2020). PPPs are certainly not uncontested in developing world contexts, often being placed within the broader basket of neoliberal instruments that intend to commodify education systems. A useful model of PPPs that contextualises these partnerships in an education context - specifically in relation to the ownership and governance of school, from low to high PPP - has been developed by Patrinos et al (2009 cited in Verger et al, 2020).



PPPs are seen as long-term contracts that are established between the public and private sector for a specific project. These projects can range from five to 30 years in length. The value of PPPs is created through the private sector sourcing most or all of the initial finance that is required. Where repayment occurs through the completion and validation of agreed outputs. This essentially transfers the risk of wasteful expenditure to the private sector. The authors point out that PPPs can provide access to non-profit organisations, but that in such cases "...they intend to foster competition on a bigger scale and therefore, ultimately, expose public schools to more intensive private competition" (2020, p.4). With this caution, they provide some important insights from a sample of 200 cases into the global impact on education of PPPs which shows mixed results when linking PPPs to learning outcomes.

EXAMPLES OF PPP IN THE DIGITAL TRANSFORMATION SPACE

MICT SETA, which has engaged in several partnerships with TVET colleges and institutes for sectoral and occupational excellence to improve delivery of training programmes. Furthermore, it has mapped occupations against career pathways so that it is easy to identify Sectoral Priority Occupations interventions, and in that way, ensure seamless funding of skills development through the 80% Sectoral Priority Occupations allocation of the discretionary grants. Tech companies are at the forefront of innovation, creating new platforms and opportunities for students to learn every day.

By partnering with boot camps (like WeThinkCode) and other initiatives (like Harambee's large scale partnership initiative), they can translate this innovation into educational content that can be used to teach and train fresh talent. This creates an ongoing ecosystem between educators, enterprises and students.

PROPOSED SCALABLE MODEL

Considering the identified role players and essential stakeholders needed to implement this impactful project, and also their viewpoints on partnership and funding models, we offer the below partnership model (see Figure 11) as one starting point to consult with stakeholders. The partnership model identifies the stakeholders, together with their need, responsibility and accountability.

Given the potential novelty of this partnership model, and the lack of longitudinal studies in the South Africa PSET system, this model should not be considered static, and should be updated and refined as new partners are identified, consulted with, and more accurate accountability percentages confirmed. This can only be ascertained during the pilot and implementation phases. As such, the identified ratios should only be considered as a starting point for further consultation.



Figure 10: Proposed scalable model

■ Roleplayers ■ Stakeholders ■ Need ■ Responsibility ■ Accountability

Citizens in this partnership are represented by current and disengaged students in the PSET system. These individuals could potentially join the tech training during practical's, learnerships, and afterwards. Their needs include training, support, and placement in the tech sector. Their responsibility is to maintain a positive attitude and complete the necessary steps to ensure they get employed in the tech sector, within 6 months of training completion. Their accountability is potentially 20% of the training fee, should they not find employment in the tech sector within six months of completion.

The focus group interviews with four students highlighted that students felt somewhat prepared by the training they had received. One participant specifically said that "I wouldn't say enough but it gave me some insight" indicating that it gave them an entryway into the labour market and allowed them to either further their education or apply for jobs. Another student mentioned that "bosses can walk over you if you don't have the paperwork because you can't take the necessary action".

After undergoing the Google training offered by IYF, the students reported that it opened many doors for them and gave them a better understanding of the IT sector, which is very broad, and allowed them to focus on a particular area that they might be interested in.

One of these students further mentioned that "the Google programme that we done last year actually opened up a lot more doors and made things easier this year actually. It gave me a lot of training prior because I was more hands on with desktops, laptops, hardware replacements, upgrades and such. But then I lacked the software side. The Google programme actually helped me quite a bit with regards to learning a bit of coding, programming and such and getting a bit more used to and familiar with other aspects of the IT industry."

With regards to the training needs in the current economy, the students felt that the South African schooling system is limited in that it does not focus greatly on technical skills training - which many students may lean towards as they are not academically oriented. When speaking about the training needs of the future, students reported that "everything will be AI controlled" and "technology is going to be everyday life from now on" or "everything will be on a digital space" so there is a need to focus on the development of ICT related skills. One of the students mentioned that the digital divide with regards to access to the internet and technology has to be bridged and computers have to be introduced in schools at "a very early stage".

The students were also very welcoming of other courses that may be offered through third parties at their colleges as they believed that these trainings opened many doors for them and were thus valuable to engage in. During another focus group discussion with four other students, the need for practical training to supplement theoretical learning was highlighted, as students stated "mostly what we've learned is a work-related activity... So, what we need is an opportunity to embrace what we have learned is like nailing the theory".

CIVIL SECTOR

The civil sector in this partnership is represented by education quality management organisations. Their needs include open, transparent, and efficient communication channels between the various stakeholders. These organisations are responsible to provide backbone support in terms of monitoring, evaluation, and relationship management. They are accountable to identify risks within the partnership and mitigate those risks, together with the relevant role players. The civil sector is largely funded through donations due to their public service. This sector should potentially enjoy the same benefit as the official public sector, as high placement costs for tech support is not an option for the majority.

PUBLIC SECTOR

The public sector in this partnership is represented by the Quality Councils (QCs), Media, Information and Communication Technologies Sector Education and Training Authority (MICT SETA), PSET institutions, and employers. The need of QCs is to receive quality industry driven micro-credentials, short courses, and

qualifications. Their responsibility is to accredit such education opportunities in a timely manner. They are accountable to accredit such education opportunities only for the duration that they remain of district, national and international value.

The need of MICT SETA is to manage its percentage of the Skills Development Levy (SDL) to fund related education and training programmes in a manner that ensures optimal opportunity for employment within their respective sectors. They are responsible to remain agile in terms of funding evolving training requirements in the tech industry. They could potentially be accountable to provide 50% of industry training cost needs.



The need of PSET institutions is to ensure students are able to complete their practicals, Work Integrated Learning (WIL) and learnerships to receive their final qualifications. Their responsibility is to ensure students receive industry relevant training and are employable. In this partnership, PSET institutions are potentially accountable to provide infrastructure and institutional support towards ensuring students receive effective training, support, and placement into employment.

The need of employers in the public sector is to receive graduates who have been trained and oriented to meet their operational demands immediately. Their responsibility is to provide the best possible environment for the graduate probation to articulate to employment. They are potentially accountable to provide 50% of the training fee, should the graduate be employed after probation.

Government interviews have yielded valuable feedback on current changes in the PSET accreditation processes, and in terms of flexibility

being created to ensure students complete their practicals, work integrated learning (WIL) and learnerships. Part-qualifications registered on the National Qualifications Framework (NQF) are currently being phased out, with quality assurance bodies such as SETAs no longer providing the accreditation of providers. The mandate for short course accreditation has been assumed by the QCTO, who are currently accrediting short courses which are longer than two weeks. These short courses are not registered on the NQF, but accredited by the QCTO for notional hours. While discussions around accrediting micro-credentials are in their early phases between the QCs, they are being considered.

The MICT SETA has in response to the changing industry landscape established a 4iR [department] Advisory Committee that has as part of its role, provision of inputs and guidance on skills planning and implementation. The QCTO will shortly be communicating their plans to enable practicals, WIL and learnerships to become more flexible. These plans are based on using PSET institutions as full-service institutions, thereby enabling practicals, WIL and learnerships to be completed onsite. As MICT SETA funds up to 50% of learnerships or related WIL, it is possible for 50% of the cost of training to be covered. The funding is available for providers who are able to improve the supply of qualified and competent people for scarce and critical skills and enterprise development.

All government stakeholders interviewed have affirmed the need for, and their commitment to support partnerships that strengthen the linkages between students and employers in the digital space and 4iR. They emphasised that urgent and targeted action needs to be undertaken by South Africa in order to secure advanced technologies, and establish a workforce equipped with the skills to cater for the changing economic dynamics influenced by the 4iR. And for this to happen, multiple skills are required. Amongst others, these skills include emotional intelligence, creativity and problem-solving skills in order to meet the demands 4iR, not only production but also management and administration. In this regard, public servants will also need digital upskilling to be able to deliver public services and products in ways that are operationally convenient and efficient.

The TVET interviews highlighted that the institution has sufficient infrastructure, although “there could always be more”, and expounded on existing partnerships with industry, including the provision of a Cisco certificate programme available to students and graduates alike. A TVET representative interviewed suggested that the main enabling factors for TVETs to integrate partners like Cisco and adopt technology as a whole were good leadership and a willingness on the part of both leadership and staff to commit to using technology. The representative indicated that digital skills were an important area of learning for all students, but that the rates of non-completion for ICT courses were very high. Mathematics skill is a prerequisite for the college, which suggests that students who are successful at maths will also be successful in coding and programming.

The CET college interview indicated that there is a commitment to providing blended learning courses for CET students, and that twelve of the Gauteng centres were currently being equipped with ICT labs. This is, however, a small proportion of the centres, and the respondents noted that financial constraints were a big contributor to the lack of ICT infrastructure in other centres. The CET college is actively seeking partnership with SETAs and industry to try and source funds and resources for these centres. Theft and vandalism were also reported as challenges faced by some of the centres. The digital skills that the centres provide are intended to support livelihoods, for example focusing on cell phone repair.

PRIVATE SECTOR

The private sector in this partnership is represented by investors, employers, and training providers. The need of investors is to receive a return on investment (ROI), that justifies the risk. Their responsibility is to release payment tranches in a timely manner for training providers to maintain their placement rates. The accountability of investors in the partnership could be 15% if the graduate did not find employment within 6 months. Investors would calculate this risk and factor it into their loan interest rate. This would assist to further balance the financial risk between partners.

The need of employers in the private sector is to receive graduates who have been trained and oriented to meet their operational demands immediately. Their responsibility is to provide the

best possible environment for the graduate on probation to articulate to employment. They are potentially accountable for 50% of the training fee if the graduate is successfully employed after probation.

From the interviews conducted, it is clear that corporates support a partnership of this nature. They are aware of the untapped potential within the PSET system, and are interested in strategies to unlock such talent. Some of the key findings include the need to include PSET institution leadership early in the process, and to institutionalise the partnership within the WIL unit or Student Support Services unit. It was suggested that the partnership should ensure integration into the institution, with shared roles and responsibilities, as opposed to operating independently to institutional structures. While the responsibility and accountability of corporates is still to be further explored, it was confirmed that employers would be willing to contribute financially to graduates from the PSET system, who are employed after their probationary period. The need of training providers is to have the cash flow to maintain their placement rates. Their responsibility is to manage the selection, training, support, and placement of graduates in the tech sector. They are potentially accountable for 15% of their fee, should the graduate not be employed in the tech sector within 6 months.

Findings from interviews with prominent tech training providers indicate their strong relationship with employers. These relationships are reflected in their high placement rates, of over 80% on average. These placement rates are achieved through an intensive selection process, which includes aptitude and attitude assessment. The placement rates are also achieved through industry relevant training and support that is agile to the ever-changing needs of their employer partners, and wrap-around support services, which ensure their students develop holistically through the training. It is evident that private training providers have a pivotal role to play in the proposed partnership model suggested in this report. They are acutely aware of employer needs, and therefore prepare students to provide immediate value when entering the tech sector, as opposed to employers having to do extensive orientation programmes, and on the job training for newly graduated employees. Such training providers meet with their clients (employers), on a regular basis, as a type of recruitment agent, and agree a set of skills that will most suit positions,

which may soon become available. They act as the bridge between prolonged education pathways, and immediate industry skill placement requirements, in real time.

No entity can accurately predict market changes in skill demands over the longer term. This process can only be managed through sustainable relationships and trust that comes over time. These relationships are created through producing results that impact the employer's financial baseline positively. The view of training organisations seems to be that the PSET system offers partnership potential for reach and infrastructure. In compensation, these partners offer a current and direct placement channel for national and international opportunities. A suggestion could be made, that these training organisations should also consider local and district employer partnerships as a sub-indicator in the partnership assessment matrix, in the medium to long term.



6. ENTRY POINTS & EMERGING MODELS

The research conducted demonstrated a number of potential entry points and focus areas for digital skills. The table below outlines the findings and implications for each of these entry points. One of the critical considerations for a programme at scale is which of these entry points to pursue, noting that more than one could be pursued concurrently.

Table 3: Possible entry points for digital skills

Entry point	Rationale
Community Education and Training Colleges	<p>There is a need for broad-based digital skills to be developed among the South African population, particularly skills related to computers from a user perspective, the use of productivity software and the internet. These skills enable individuals to increase their own productivity in both formal and informal work environments, and better manage their own affairs such as finances and self-directed learning. CETs target the large percentage of South Africans with no tertiary education.</p> <p>There is investment in this branch from MICT SETA, but overall, the infrastructure at CETs is the least developed to date and a large infrastructure investment would likely be necessary to deliver meaningful digital skills programmes through CETs. There are over 3,000 CET centres in South Africa. Safety and security of the colleges is another concern. The implementation of digital skills in the Coding and Robotics curriculum is designed to mitigate the current lack of basic digital skills in South Africa, but it will be at least ten years for this to begin making a significant impact.</p>
Interrupted Learners	<p>Learners who were previously selected for universities and/or TVETs but were unable to complete their coursework are seen to be a cost-effective investment outside the system, as they have already been established as academically capable and can be upskilled with certificate programmes in a relatively short amount of time. Some training providers report that their students are able to secure positions after these certificate programmes, even without a formal degree. Lists of these individuals have been accessed from universities by training providers. Bringing in interrupted learners from a range of disciplines could dramatically increase the ICT talent pool available in South Africa.</p> <p>There is investment in this branch from MICT SETA, but overall, the infrastructure at CETs is the least developed to date and a large infrastructure investment would likely be necessary to deliver meaningful digital skills programmes through CETs. There are over 3,000 CET centres in South Africa. Safety and security of the colleges is another concern. The implementation of digital skills in the Coding and Robotics curriculum is designed to mitigate the current lack of basic digital skills in South Africa, but it will be at least ten years for this to begin making a significant impact.</p>
TVET student training	<p>TVETs have a mandate to provide shorter training courses for those in both initial and continuing training. Many TVETs offer digital skills programmes, with some offering industry certifications or other industry partnerships. Embedded industry credentials are one model which can support closer links between TVETs and industry, and work-integrated learning components of TVET programmes should provide practical experience. With a shortage of work placements, an alternative practical through a private or third-sector training provider is one avenue that could be considered.</p> <p>Formally gazetted trades require a minimum amount of workplace-based experience to become qualified, which can be a stumbling block due to a shortage of workplaces. However, most IT trades are not formally gazetted, so the practical and work experience components can be more flexibly delivered. Negotiations would likely still be required with the QTCO. A lack of lecturer and administrative capacity have been cited at TVETs, which might make the oversight or inclusion of a private provider more complicated. Some TVETs also lack the required infrastructure.</p>

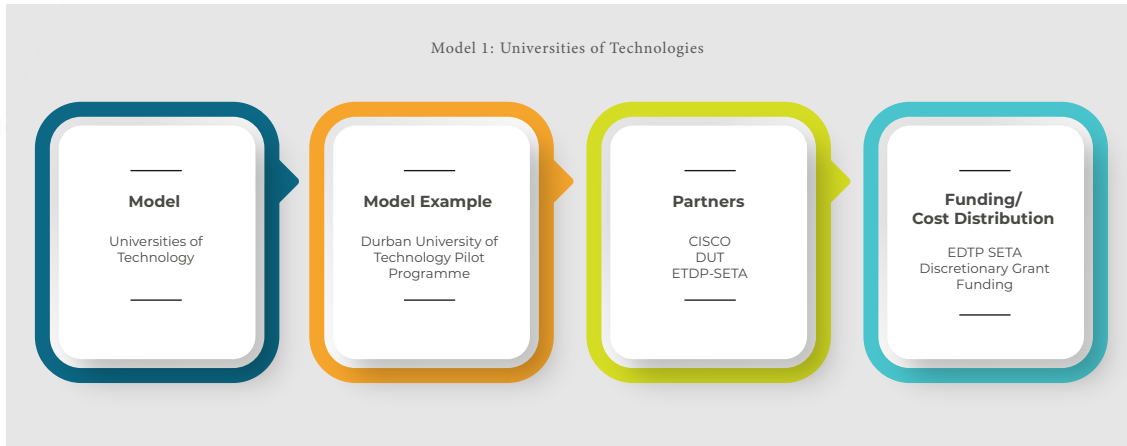
<p>University student training</p>	<p>All South African public universities currently offer ICT qualifications, and nine public universities also offer short courses. Five of these short courses leverage partnerships with industry or third sector providers, all with industry certifications of some type. Industry certifications are seen as ways to help students become more employable through a demonstration of practical skill.</p>	<p>There is little research demonstrating whether short courses increase employability or the talent pool, as they are targeted towards students already enrolled in ICT. However, the success of the ETD-SETA short skilling course delivered through UJ should be closely monitored, as this could be a successful short-term model worth scaling to other universities.</p>
<p>Universities of Technology</p>	<p>The Durban University of Technology runs training programmes in partnership with ETD-SETA targeting low-income community members, with industry-aligned certificate programmes. DUT also engages in other training partnerships, including delivering programmes for NGOs and private providers who are unable to deliver at the scale required by funding grants. One successful implementation model includes using DUT technology students as mentors to community members taking certificate courses.</p>	<p>While early results are promising and suggest that about 5% of students were placed before the programme ended, unfortunately the placement results for graduates are not yet available. It is also unclear if other Universities of Technology are as willing and able to partner as DUT. Nevertheless, this model is another viable entry point which can be considered, if proven effective at achieving labour market outcomes.</p>
<p>ICT Graduate</p>	<p>An investment in graduates such as business incubation can assist to grow the ICT sector in South Africa. Connections between ICT graduates and other sectors could lead to advanced innovations across different economic domains (health, education, law, etc), improved productivity and ultimately economic growth. Business incubation models such as the one explored by the National Business Institute (NBI) provide support to entrepreneurs through establishing hubs that provide training, infrastructure and the network support needed to connect to markets and grow a business, a model that is easily adaptable to the IT sector.</p>	<p>The shortage of digital skills in South Africa and abroad means that very few graduates of ICT related programmes are unemployed, or unemployed for very long. While innovation and entrepreneurship are aims of the digital skills strategy, the larger concern may be growing the available talent pool in ICT as quickly as possible to supply existing demand.</p>

To determine which models should be pursued further for this intervention, the following factors were considered:

- The demonstrated effectiveness of the model, as shown by actual graduate placements in IT. Some models were theoretically sound but did not have evidence of effectiveness.
- Whether the models were theoretically sound, ethical and provided for equitable access to training and development for South African youth.
- The alignment of the model to government systems, including the National Qualifications Framework, and the requirements of the National and Future Digital Skills Strategy of South Africa, adopted by the Cabinet of the Republic of South Africa in August 2020.
- The potential timeline for the implementation of the model. The IYF/MSDF indicated that the timeframe for implementation was expected to be between 1 and 3 years, meaning the programme must demonstrate results within this time frame.
- The cost-effectiveness of potential models. 2021 SETA funding to TVETs was roughly one-fifth of the funding allocated to universities, but TVETs served nearly half the number of students of universities. Therefore, the per-student commitment for universities was just under R85 000, while for TVETs the cost was just under R34 000 per student. In short, the cost-effectiveness of a TVET-centred model is far greater than that of an HEI model.

EMERGING MODELS

Of the entry points mentioned above, the three models outlined below were the most promising as they respond to the research and meet the criteria as set out by IYF and MSDF. Each model is explained in further detail below.



OVERVIEW OF THE MODEL

With ETDP-SETA funding, the Durban University of Technology is running a 12-month pilot programme with 200 unemployed youth in rural and deep rural areas. The programmes focus on basic accounting, how to run a business to add value, design thinking and entrepreneurship. The programme includes CISCO industry credentials (in the form of certificates) and ICT repair. The goal of the programme is that youth will be either employed or start their own businesses, and that they will be able to give municipalities IT support.

Students are given tablets, three months of data, SD cards and all other required resources. DUT sends students and teachers to the community to do practicals, for example stripping and putting together a PC, and also to provide initial instruction on using the devices at the start of the programme. DUT students act as tutors, with one DUT student for every 10 learners. The students must have previously completed the material and the course, and are selected based on aptitude and interest.

A DUT professor will provide a remote lecture each Monday, and on Tuesday the student tutors will hold sessions with their ten community members to go over the material again. Each student tutor also has a WhatsApp group for general questions and communication. Tracking attendance, DUT has found a 70% turnout per lecture.

Professors at DUT designed the programme, but embedded international CISCO (industry) certification. DUT gets free of charge content from CISCO and offers these courses to learners. CISCO is a chosen partner of DUT as the University only uses CISCO networking products (so graduates can find employment at DUT with the certificates), and the certificates are in-demand in industry.

DUT has also partnered with private providers in the past, and run programmes for community members with up to 3 000 participants. Generally, DUT is approached by these providers because they have won SETA contracts and cannot deliver due to the required scale or equipment, and DUT assists with expertise and delivery.

CHALLENGES IN THE PROGRAMME

Twelve out of the 200 students have dropped out due to employment opportunities. As students are in rural and deep rural areas, connectivity and data are still major problems, as are electricity and load-shedding. DUT records all the lectures and puts them on the SD cards, and also uploads them onto a shared drive so there are multiple points or possibilities for students to access the material.

The learners from the rural and deep rural areas have never had a module class before, or a re-mote class before. While some enjoy it, some find it difficult and prefer an in-person lecturer. Students were also unfamiliar with the devices, and although they had mobile phones, they did not all know how to leverage them optimally. So initial practicals to orient participants to the devices were held. Additionally, on a separate programme, to solve the device familiarity challenge DUT developed "Mobile literacy", a certification course rolled out to 3 000 community members in mobiles and how to use them for business. The rationale was that many people in the rural communities are making products on a small scale, but cannot market them. This course aimed to assist those in rural areas to bridge that gap. It was funded by the government organisation NEMISA.

The largest challenge to the model is a lack of published results – as the pilot programme only ends this year, it is unclear what the results will ultimately be, although initial indications are promising.

ROLES OF THE PARTNERS:

1. **DUT:** Offered a 12-month program; accredited skills program and mentorship/coaching from college students to community members. Also offered on-site support in using the technology and accessing online materials. DUT also delivered training videos and resources on SD cards to ensure access for all enrolled.
2. **ETDP-SETA** provided the funding for the programme, and selected the applicants to meet the criteria of low-income community members without access to tertiary education.
3. **CISCO** industry credentials are embedded in the model. CISCO provides content for the course and certifications, which are facilitated through the University on an existing partnership

OBTAINING FUNDING FROM THE SETAS AND OTHER FUNDERS

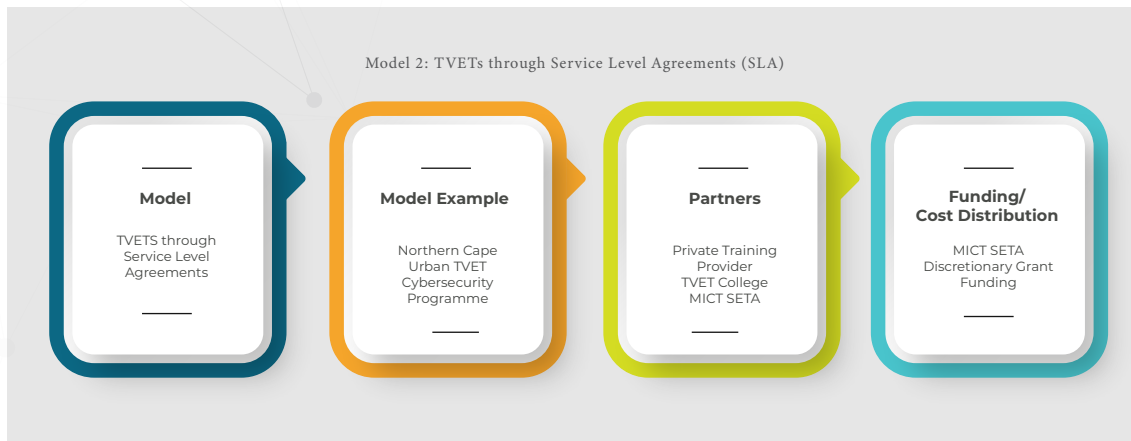
1. **DUT** was approached by the ETDP-SETA to run the programme, which was implemented with Discretionary Grant Funding for Pivotal programs to meet the needs set out in their Sector Skills Plan. ETDP-SETA funded a similar programme at UJ at the same time; both are concluding now.
2. In partnerships implemented by NGOs, funding was brought into the University through already awarded grants.

DISTRIBUTION OF COSTS

The administrative costs for DUT are 30%. Programme costs related to delivery are excluded, but DUT staff time is included in this amount.

POTENTIAL TIMELINE

DUT indicated that it takes about a week to sign an MOU, and the existing materials and industry credentials can be integrated quickly. The selection of learners historically has fallen to the SETAs or implementing partners. The programme could be initiated and launched within a year.



OVERVIEW OF THE MODEL

In 2020, the Northern Cape Urban (NCU) TVET applied to the MICT SETA for Discretionary Grant Funding to run a cybersecurity occupation programme (12 months) to support 30 learners. This was an area that the TVET College saw as an opportunity to respond to and address a market need in the digital space and when it saw the invitation from MICT SETA to apply, the college did not hesitate. As the NCU TVET College is not yet accredited to offer such programs - it is currently in the process of obtaining the accreditation - NCU TVET College partnered with (outsourced the training and placement) a private training provider to achieve the objectives of the program.

THE FOLLOWING PARTNERSHIP STEPS WERE TAKEN:

1. NCU TVET College applied for MICT SETA Discretionary Grant Funding during the open funding window (normally end Feb every year).
2. An MOU between the College and MICT SETA was signed to signal confirmation of the award and the funding amount, expected deliverables, roles and responsibilities, targets to be achieved, and the payment schedule⁴. The fact that the training will be outsourced is declared upfront and the expected roles of the provider are agreed upon upfront with MICT SETA during this stage. Each deliverable is attached to a tranche, so targets need to be met before the claim can be made.
3. Following this, an advert seeking training providers is then placed, followed by an intensive assessment and screening process of all submissions received (similar to a tender process) to identify the most suitable training and placement partner. Critical qualifying criteria include: a highly reputable, well-established company with proven results in upskilling/reskilling/skilling youth/individuals in the digital space that is accredited with NQF Level 5 (at a minimum), a solid WIL and mentoring program, and a high placement rate of learners post the training and WIL phase, and cost per learner.
4. Once identified, the College enters into a back-to-back agreement with the training provider to fulfil the expected mandate by MICT SETA.
5. Ongoing monitoring of work carried out to ensure quality standards met and deliverables are being achieved as planned.

ROLES OF THE PARTNERS:

1. Private Training Provider: Offers 12-month program; accredited skills program, mentorship/coaching, short internship stint, followed by placement (at least 3- 6 months after the internship). Training is done onsite at the private provider's premises and supplemented with remote support (blended model). The internship is done at host companies (identified, arranged, and managed by the training provider) as is the placement of students. They are also required to assess their competency and submit the marks on the MICT SETA system.

⁴ Per regulations, SETAs need to consider carefully the payment schedules for discretionary grant disbursements. The principle that should be applied is that funds need to flow early to enable training to take place on a funded basis, and therefore to be a link between full payment and successful completion. Successful completion must include evidence of progress in achieving the SETAs intended objective. In other words, monitoring and evaluation need to be factored into the grant payment process. Grants must be seen not as a mechanism for reaching numerical targets, but as a means of achieving impact in the sector

2. TVET College: Recruits students, screens students jointly with the training provider, uploads students' details on the MICT SETA system, manages and monitors delivery by the training provider, moderates the assessments conducted, quality assures the training from start to end, doing regular check-ins with students, identifies challenges and support needed, and verifies placement of learners within the workplace.
3. MICT SETA: Provides funding, oversees delivery, and verifies placement of students who must be registered on their system.

OBTAINING FUNDING FROM THE MICT SETA

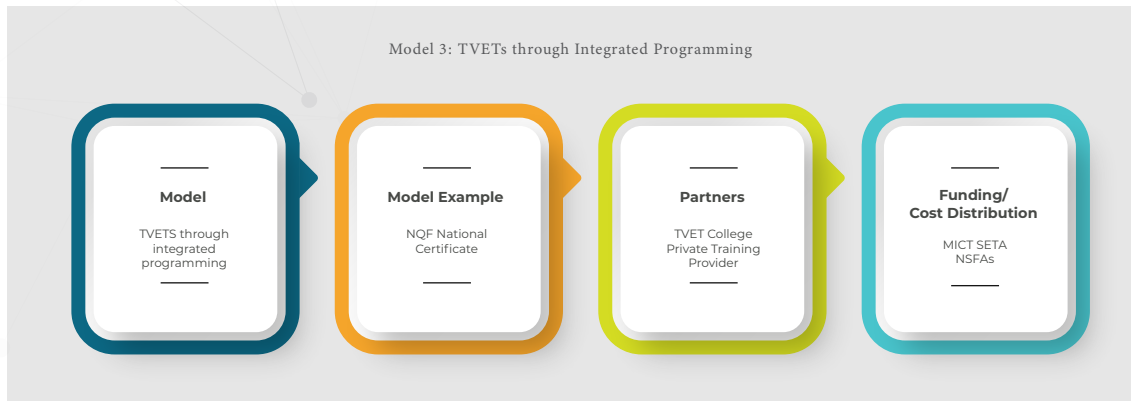
1. In response to the MICT SETA invitation for eligible stakeholders within the MICT sub-sectors to apply for Discretionary Grant Funding for Pivotal programs to meet the needs set out in their Sector Skills Plan.
2. Given the special nature of skills development broadly and with regard to SETAs specifically, the MICT SETA's discretionary funding is applicable, in the main, to MICT SETA Levy paying companies; MICT SETA Constituent SMMEs; MICT SETA Constituent Non-Government Organisations (NGOs) and Non-Profit Organisations (NPOs); MICT SETA Constituent Community-Based Organisations (CBOs); Public Institutions, Technical Vocational Education and Training (TVET) Colleges, Public Universities, and Higher Education Institutions registered with DHET; MICT SETA Constituent Trade Unions associated with the MICT SETA and/or in the MICT sector; Government Departments; MICT SETA Constituent Professional Bodies; MICT SETA Constituent ISOE (Institute of Sectoral Excellence); and Constituent Associations and Employment Hubs.
3. Preference is given to entities that are based in the province applied for, specifically in the geographical focus areas mentioned in that province.
4. Stakeholders who applied during any previous DG window are welcome to apply during this window of funding irrespective of the outcomes of their previous applications.
5. The MICT SETA will not award funding for:
 - a. Projects that have already commenced prior to an approval of the application;
 - b. Set-up costs, e.g., start-up costs;
 - c. Capital expenditure, e.g., building costs, equipment such as computers, etc.;
 - d. Existing operating expenses e.g., salaries of current employees who will undergo training;
 - e. Organisational policy development;
 - f. Blacklisted entities;
 - g. Entities that defaulted to pay learner stipends;
 - h. Interventions that result only in "awareness" for participants;
 - i. Training of learners that are currently funded through other programmes;
 - j. Stakeholders who submit fraudulent compliance documents.

DISTRIBUTION OF COSTS

The costs associated with the training per student were unclear however the administration related costs can reach a maximum of 7.5% only.

POTENTIAL TIMELINE

The KII noted that because NCU TVET is a public teaching institution, this process of getting MICT SETA funding for a pilot program was quite seamless. The application for funding was made in the same year the programme was offered, indicating a launch time of under a year. The turnaround time is ultimately dependent on the SETA processes. As it was an off-the-shelf course, with no integration into TVET Curriculum, quick implementation was possible once contracts were signed.



OVERVIEW OF THE MODEL

The National Certificate (Information Technology and Computer Science) is a programme at Levels 2, 3 and 4 of the NQF. This programme is designed to provide both the theory and practice of Information Technology and Computer Science. The practical component of the study may be offered in a real workplace or in a simulated workplace environment. It will provide students with an opportunity to experience work situations during the period of study.

TVET Colleges experience challenges in establishing and maintaining relationships with industry that ensure the practical component of the qualifications are completed. The practical component can be completed in a real workplace or a simulated workplace environment, even on campus. Supporting the completion of the practical component of qualifications is a priority for the government

Private providers could form partnerships with TVET colleges, to support students to complete employer-linked, simulated workplace training. The first level of training and support could be largely hybrid and low-cost, given the high number of students, and lower probability for completion. The second level of training and support, could be for those students who successfully completed their NQF 2 practicals, and passed initial private provider screening. The third level of training and support could be for students who successfully completed the NQF 2 and 3 practical's and made it through the more stringent bootcamp challenges.

The first level of training and support could essentially be provided through micro-credentials, and made available on zero-rate platforms for students to complete in their own time, even using mobile devices. These micro-credentials could be developed to cover the practical requirements. The cost to provide this level of support would then be very low, and allow for students who have shown commitment to enter the application pool for second level training and support.

ROLES OF THE PARTNERS

The TVET college would continue its responsibility to provide the NQF Level 2, 3 and 4 Information Technology and Computer Science qualification. The private provider would be responsible to develop employer-linked micro-credentials that relate to the practical requirements of the qualification at each of the levels. These micro-credentials would need to have adequate detail, even in the form of videos.

OBTAINING FUNDING

The MICT SETA seems to be experiencing challenges in ensuring students complete qualifications and short learning programmes. The MICT SETA 4IR Unit could be engaged to fund a pilot of such nature, where the micro-credentials would be conducted physically at a college onsite. The micro-credentials could then be filmed and enhanced, to reach larger numbers when placed online. The Discretionary Grant (DG) windows open approximately twice a year, so the process could be tested within a year.

DISTRIBUTION OF COSTS

Taking a low-cost approach to the first level of support will ensure TVETs, private providers and other funders mitigate many of the cost risks from the onset. The costs can then be determined based on the level of support, and actual placements. These agreements would take place with MICT SETA. In line with the referenced statistical report, NSFAS could also be in a position to partially fund deserving students. It is therefore suggested that NSFAS and MICT SETA be engaged from the onset, should this option be piloted.

POTENTIAL TIMELINE

The first step would be to determine the exact amount of time, and necessary outputs for practical's at NQF Level 2, to start. To then determine a set of practical modules together with industry. Next would be to engage MICT SETA to fund the pilot, which will ensure quality micro-credentials are developed as an output. To then use those micro-credentials to reach all students, and create a selection pool for level two training and support.

A PSET INSTITUTION COLLABORATION READINESS FRAMEWORK

Whichever model is selected for digital skills integration, it will be necessary to determine the level of institutional readiness to integrate ICT training. The framework in Table 4 provides the components that have been suggested by literature and research engagements. This framework may be further augmented as future additional research is conducted.

Table 4: PSET institution collaboration readiness framework

<i>Area of interest</i>	<i>Criteria for consideration</i>	<i>Nice to have</i>
Infrastructure	<ul style="list-style-type: none"> The institution has at least one computer laboratory, with functional computers that are accessible to students Students can access the computer lab at any time during the institution's operational hours The institution has electricity/power, with the exception of scheduled load-shedding The institution has connectivity in its computer lab The institution has an administrative unit to maintain ICT infrastructure 	<ul style="list-style-type: none"> The institution has connectivity which students can access campus-wide The institution has budget set aside to replace and/or repair ICT equipment which may be damaged or lost Students are required to have a personal computer, and/or are provided one by the institution Students are given a data allowance by the institution
Security	<ul style="list-style-type: none"> The institution has adequate security on its campus, and is not at a high risk of vandalism The institution has a secure fence, with controlled access The institution has its own dedicated security 	<ul style="list-style-type: none"> The institution has additional security measures for high-risk areas such as computer labs The institution has invested in cybersecurity
Policies and protocols	<ul style="list-style-type: none"> The institution has completed 'digital migration' and maintains digital student records The institution has a code of conduct for technology use The institution has a policy or policies which address data privacy and security The institution has a policy or policies which address cyber security, including actions to be taken in case of a breach 	<ul style="list-style-type: none"> The institution has a policy or policies which address maintenance and repair of technology on campus The institution has a policy or policies which address data management The institution has a policy or policies which address equitable access to technology on campus The institution backs up its digital records in the cloud

<i>Area of interest</i>	<i>Criteria for consideration</i>	<i>Nice to have</i>
Management and leadership	<ul style="list-style-type: none"> Internal quality assurance processes are in place A partnership office is in place Management values and pursues ICT integration through a dedicated strategy 	<ul style="list-style-type: none"> The institution has additional security measures for high-risk areas such as computer labs The institution has invested in cybersecurity
Finance	<ul style="list-style-type: none"> The institution has an office for fundraising and/or proposals The institution has submitted a Workforce Skills Plan to MICT SETA The institution submitted an Annual Training Report to MICT SETA last year 	<ul style="list-style-type: none"> In the last five years, the institution has delivered previous projects with SETAs/NSF or other funding partners, with promising results In the last five years, the institution has engaged in the delivery of training on behalf of self-funded industry projects
Partnerships and industry collaboration	<ul style="list-style-type: none"> The institution has a department, office or individual in charge of partnerships The institution requires internships or work-integrated learning as part of its ICT qualifications or courses The institution leverages industry or NGO-developed certificates as part of its ICT qualifications or courses 	<ul style="list-style-type: none"> The institution engages the following partners to develop courses: <ul style="list-style-type: none"> Industry or NGO partners with technology expertise MICTSETA or other technology related SETAs State-owned enterprises (e.g., CoLabs) Students The institution updates its ICT courses with new technology at least every two years
Curriculum	<ul style="list-style-type: none"> The institution has a department for ICT, IT systems, or similar The institution offers at least one ICT qualification aligned to the NQF The institution utilises a learning management system 	<ul style="list-style-type: none"> The institution offers industry certifications in ICT The institution requires students to use ICT in order to complete assignments or coursework The institution offers blended or remote learning options for students The institution leverages open educational resources and learning packages
Personnel and human resources	<ul style="list-style-type: none"> The institution has personnel available to source and maintain partnerships with industry The institution has instructors who are trained in computer systems and hardware, productivity software, media and website development, coding and programming, cybersecurity 	<ul style="list-style-type: none"> The institution has a personnel development and skilling plan which includes development in ICT/computers The institution offers training for lecturers and other staff in ICT topics The institution provides secondment, industry attachment, or similar arrangements to ensure lecturers are up to date on ICT The institution has joint appointments with ICT companies, so that ICT practitioners regularly offer lectures to students

7. PARTNER ASSESSMENT MATRIX

One of the stakeholders identified in any of the models being considered for implementation are private training providers. When a PSET institution or the DHET considers partnering with these providers, it is important that they can determine the quality of their services, and effectiveness towards ensuring timely placement into the tech sector. Some of the key quality indicators have been identified through this initial research. These indicators aim to ensure students receive quality training and support that leads to timely employment in the tech sector. While the matrix may seem simple, it addresses the key indicators of placement rates, employer partnerships, cost effectiveness, wrap-around support, training provider capacity, and accreditation status. The actual baseline averages and further sub-items will likely be developed once the matrix is tested.

These key indicators are expanded upon below, with explanation on how the weightings are assigned (figure 12).

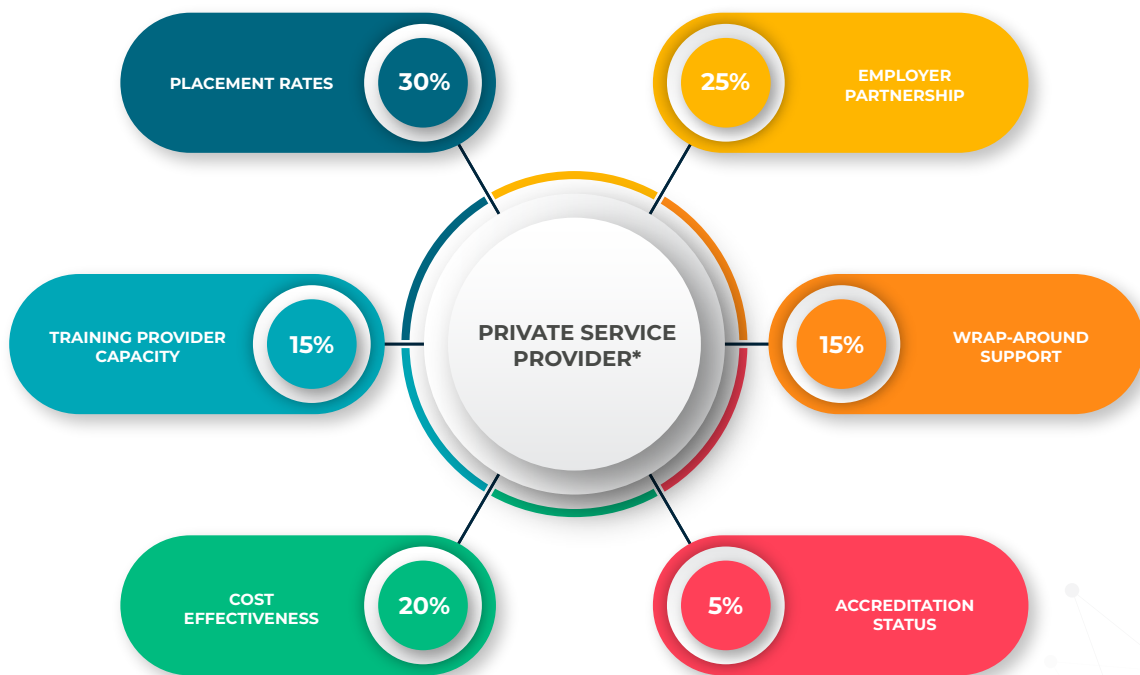


Figure 11

*The partnership assessment matrix weightings require further consultation and continuous adaptation based on implementation realities.

PLACEMENT RATES

The main objective of the proposed partnership is to ensure the highest ratio of graduates are placed into the tech industry as quickly and effectively as possible. While throughput rates show completion, placement rates are a measure of effectiveness. The fundamental purpose of tech related training is to ensure placement and effectiveness in the tech industry. A training provider who has the highest placement ratio, ensures that highest use of resources, as graduates who are not placed in the tech industry following their training, will not provide the expected return on investment made for their training costs. The most effective placement percentage will be determined by the DHET or PSET institution when

comparing private training providers in the current round of submissions. Training providers with the highest proven percentage would then score highest in this section. It is for this reason that the placement rates of training providers have been made the priority, and allocated the highest rating of 30%, as this is the main intended result. The most effective placement percentage will be determined by the DHET or PSET institution when comparing private training providers in the current round of submissions. Training providers with the highest proven percentage would then score highest in this section.

EMPLOYER PARTNERSHIPS

While placement rates speak to effectiveness, employer partnerships speak to reach and potential for placing a larger number of graduates in the tech industry. These partnerships should eventually be specific with contracted amounts for placement, and not just generic agreements. These partnerships should also represent the priority of linking skills to district, national and international opportunities. This balance is needed, as only international employer partnerships will lead to a further drain on tech skills needed at district and national level. Employers will also be responsible for financial contribution when placement has been successful. It must be reiterated that the costing model must be carefully tested, to ensure the partnership is affordable. The amount of 50% of the training fee has been included at this stage, as there is a possibility that MICT SETA would fund the other 50%, allowing for the full cost of training to be covered between the two partners. Should further funding partnerships be secured, this percentage could be significantly reduced, making placement more affordable. Much like the Harambee and WeThinkCode partnership models, including multiple partners will make the suggested model more affordable for all partners (along with other indirect benefits of knowledge sharing and capacity building). In line with the main objective of the proposed model, the issue of reach in terms of placement potential is critical to address the supply side in the skills pipeline. As such, this indicator has been given an equal weighting to placement rates, of 25%.

TRAINING PROVIDER CAPACITY

The capacity of training providers to deliver quality training and wrap-around support is pivotal to ensuring placement ratios are maintained, as the number of their students begins to scale. As training will likely be provided through a hybrid approach of onsite and offsite training and support, it is essential that training providers have adequate onsite and offsite training and support capacity both at the PSET institution and online. This capacity also speaks to the ability to provide support in the home languages within the various provinces. Training provider capacity would then be assessed based on the specific needs within and surrounding the PSET institution site. Training provider capacity is therefore linked to sustainable placement rates, and of high priority. It has therefore been listed as the third highest priority and given a weighting of 15%.

WRAP-AROUND SUPPORT

One of the main reasons for untapped talent in the PSET system is due to socio-economic challenges. Students from marginalised communities do not have the same access to resources and support that those from affluent communities enjoy. These students struggle with challenges such as access to transport, computer hardware, and the internet, to name a few. They also have difficulty in accessing technical support and coaching due to reasons of access, and other barriers. Wrap-around should therefore include these basic needs, and more. They will ensure students have the best possible opportunity for well-rounded development, and therefore a greater chance for sustained employment. In this proposed partnership model, the provision of wrap-around services is the responsibility of both the PSET institution and the private training provider.

The PSET institution would be responsible to support the student in terms of personal and social related matters, whereas the training provider would provide the wrap-around support necessary to ensure the student is capacitated to complete the programme. As wrap-around services are an essential component

of an effective tech programme that aims to address socio-economic barriers to entry. These services are a significant reason for higher placement ratio and have therefore been given a weighting of 15%. This is a fairly low weighting, as it is seen as an input towards the placement ratio which has a higher weighting. It should, however, have a higher weighting to equal training provider capacity. These weightings are largely a hypothesis at this stage until they are tested.

COST EFFECTIVENESS

The sustainability of this partnership model comes down to affordability for each partner who is sharing the cost. A lower overall cost will ensure a larger number of students can be taken through the programme. With that being said, cutting down costs too low, will reduce the quality of training and support, and yield lower placement ratios. There is therefore a point where the lowest cost becomes counterproductive. Furthermore, the nature of the training programme will need to be taken into account for equitable comparisons. For instance, if a short course is being offered, it should not be compared with another provider who is offering a further qualification. This alludes to the need for detailed terms of reference on the duration and type of training required to be published by the PSET institutions. It is for this reason that the weighting of the cost has been made lower than that of placement rates and employer partnerships, with a weighting of 20%.

ACCREDITATION STATUS OF THE TRAINING PROVIDER

Accreditation in the PSET sector is complex due to the number of quality assurance bodies, and their differing requirements. While accreditation as a private training provider is reasonably structured with the DHET, accreditation with SETAs and the QCTO is in flux. Part-qualifications registered on the NQF are currently being phased out, with quality assurance bodies such as SETAs no longer providing the accreditation of providers. The mandate for short course accreditation has been assumed by the QCTO, who are currently accrediting short courses which are longer than two weeks. These short courses are not registered on the NQF but accredited by the QCTO for notional hours. While discussions around accrediting micro-credentials are in their early phases between the QCs, they are being considered. The types of responsive short programmes needed by the tech industry might not be accredited at this stage but should be considered at this stage as they allow for a significantly large number of students to access the first phase of the programme at a low cost. This will support the credibility of the programme, as it will not be seen as only a small few who benefit after the extensive screening processes required in the final intensive support phase. These short programmes may be included as practicals while learners are completing their formal qualifications. It is for these reasons that accreditation has been given a rating of 5%.

8. CONCLUSION

The research and consultations resulted in six potential leverage points and associated models through which an intervention could reasonably be expected to achieve the aims of the planned IYF/MSDF project, which seeks to develop public-private partnerships to deliver quality ICT training to youth at scale and place them in employment in the IT sector. These included partnerships with CETs, TVETs, and universities; targeting 'interrupted learners' who had started qualifications but left school before finishing; and targeting recent graduates.

Against a set of criteria, which included effectiveness of the model as shown by graduate placements, whether models were theoretically sound, ethical and provided for equitable access to training and development for South African youth, the alignment of the model to government systems, in particular the NQF and the National and Future Digital Skills Strategy of South Africa, and the potential timeline for the implementation of the model and cost-effectiveness, three models emerged for consideration. Two focused on public-private partnerships in TVETs, with one a 'service provider' arrangement and the other a more integrated and longer-term investment on both parts. The last model focused on direct implementation by Universities of Technology, based on a proof of concept in the Durban University of Technology.

After some deliberation, the second TVET model was deemed to be too theoretical at this stage, and further had no practical implementation example to draw on. Models 1 and 2 are both in operation in South Africa and seem to have some success. Unfortunately, impact findings are not yet available due to the fact that both have been running for just over one year. However, as model 2 operates in a more controlled environment and with a larger potential for scope given the number of TVETs as compared to Universities of Technology, this model was identified as the preferred model and forms the basis of the theory of change and roadmap which is provided separately as the Deliverable 5 output.



9. TOWARDS A ROADMAP AND NEW THEORY OF CHANGE

As noted at the outset of this report six potential entry points for an intervention are explored:

- Community Education and Training Colleges, focused on basic digital skills and non-accredited programmes;
- TVETs, focused on accredited certificate and/or degree programmes;
- Universities of Technology, focused on accredited certificate programmes;
- Universities, focused on accredited degree programmes;
- TVET and/or University 'interrupted learners', who were not able to complete their degree programmes and can be routed to digital skills
- Tertiary education graduates who have not been able to find employment.

Our view is that, of these, TVETs and Universities of Technology are supported as the most viable, based on criteria including the intended objectives of the intervention, theoretical soundness and proof-of-concept, and the intended timeline for intervention. A third model which leverages tighter integration between TVETs and private providers for more extended degree programmes is also presented.

A roadmap has been developed that draws on the research findings to outline a plan of action that will reliably and quickly create a cohort of youth with the digital skills needed by the labour market, improving the employability of these youth and, through their entry into the world of work, driving improved economic outcomes. The roadmap has been developed as a standalone document and includes suggestions for a new theory of change. The roadmap demonstrates a model that can be used to respond to skills misalignment between education and the world of work.

Perhaps most importantly, by capacitating the PSET system to appropriately train youth for critical IT roles, this model can significantly increase the number of youths shifted from unemployed to employed.



10. BACKGROUND AND PURPOSE OF ROADMAP IMPLEMENTATION

The roadmap outlines a plan of action that will reliably and quickly create a cohort of youth with the digital skills needed by the labour market, improving the employability of these youth and, through their entry into the world of work, drive improved economic outcomes by imagining a new type of partnership between public and private providers of education and training. Further, this roadmap demonstrates a model that can be used to respond to skills misalignment between education and the world of work.

Table 5 provides a research sample of private training providers in the ICT sector who are seeing success in programme completion and placement into the tech industry. The table demonstrates how some private training providers are able to run successful skilling programmes at larger scales.

Table 5: Sample of training providers and placement ratios

<i>Training Providers</i>	<i>Number of Students</i>	<i>No. of Industry Partners</i>	<i>Placement Ratio</i>
Okuhle Holdings	3	2	100%
Foster-Melliar	302	5	95%
WeThinkCode	792	60	92%
Umuzi	950	105	83%
JumpCo	40	0	75%
CodeX	165	5	70%

1. PUTTING THE FOCUS ON TVETS

As a result of the investigations and the application of the selection criteria, the model chosen for presentation in this roadmap focuses on PPPS in TVETs. The problem statement, change theory and plan of action outlined in this document therefore focus on TVETs.

The resultant model will (if successful), rapidly increase the availability of placements in TVET for digital skills training, thereby strengthening digital and IT training in the South African PSET system and improving graduation and industry placement rates for students.

2. PROBLEM STATEMENT

2.1. The ICT sector has the potential to significantly contribute to most facets of work and life in the 21st Century, as well as to all other sectors (for example, the use of ICT skills to develop programs and/or processes to increase productivity in agriculture, quality of care in health, etc.), and there is demand for the skills to enable these contributions (Schofield & Dwolatzky, 2022, 3). Changes in technology over the last few decades have had two substantive effects on the labour market internationally:

- 2.1.1. Technology-induced job skill requirements have outpaced the growth in education levels of the workforce, resulting in a skill-biased technological change, meaning that technology raises demand for educated workers, thus allowing them to command higher wages, which in turn increases wage inequality (*Schmitt, Shierholz & Mishel, 2013*).
- 2.1.2. Increased job displacement has led to routine tasks that are codifiable and repetitive being replaced by technology that can do these tasks more efficiently and effectively (*Chang, Tamers & Swanson, 2022*).

3. RESPONDING TO THE CHALLENGE: A NEW THEORY OF CHANGE




This model addresses the challenges by:

- Developing skills in the digital or technology sector by scaling up successful industry-recognised skills development initiatives with proven results that are accessible to youth from low- to middle-income communities;
- Bridging the gap between education and the world of work by providing both industry-recognised skills and strong placement outcomes
- Fostering and scaling collaborative partnerships for workplace and PSET institutions, specifically in TVET colleges.
- Assisting TVETs to offer a prime, easily accessible opportunity to create new PPPs and interventions, and to scale up existing initiatives;
- Capacitating TVET institutions and improving their offerings in the tech space, thereby enhancing TVET colleges' reputation and reach.

As a result of these efforts, a significant increase in the proportion of youth in employment, education, or training in digital or technology-related fields and a commensurate reduction in the level of unemployment is expected. In addition, improved skills in the sector will increase productivity and further grow the IT sector, contributing positively to the economic climate of South Africa.

The envisaged outcomes of the model are illustrated in the table below.

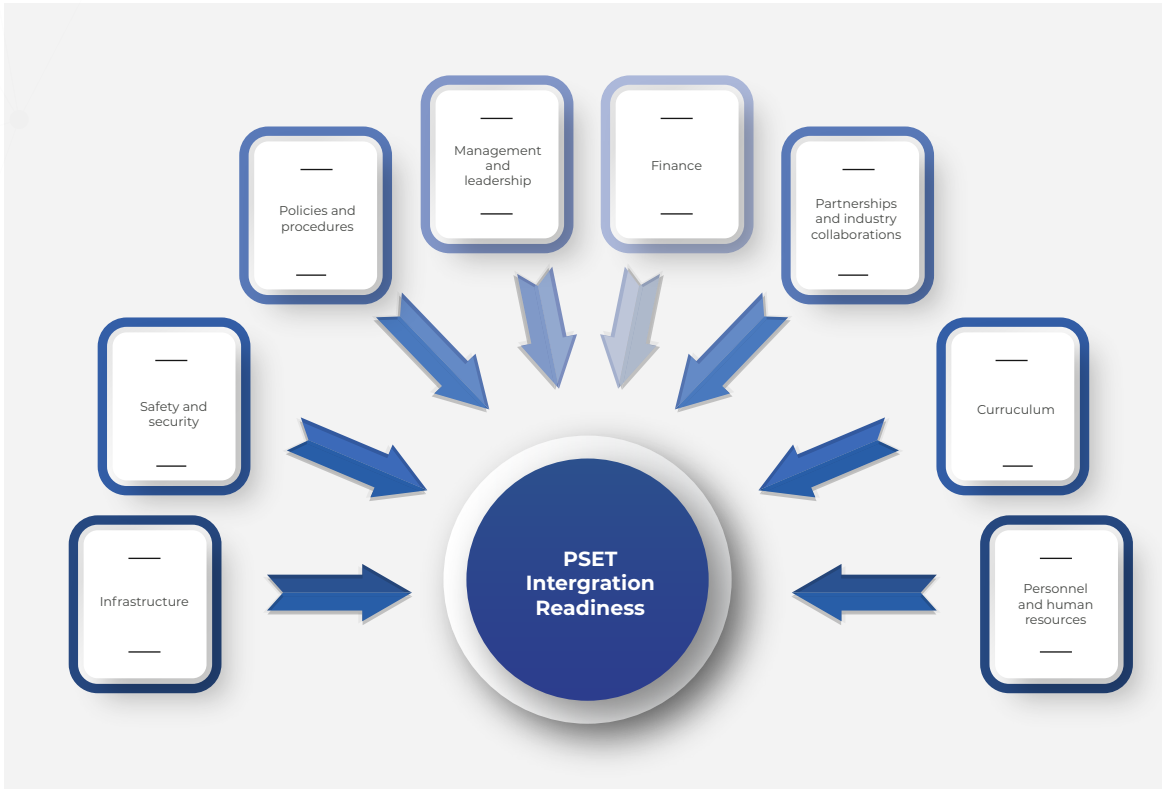
Table 6: Sample of training providers and placement ratios

	Learners	<p>More learners from disadvantaged backgrounds:</p> <ul style="list-style-type: none"> - Complete quality TVET training relevant to digital sector - Experience improved productivity and quality - Experience increased income from employment or entrepreneurship
	TVET institutions	<ul style="list-style-type: none"> • Access to industry-aligned programmes and curricula with proven success rates. • Improved performance of TVET institutions • Improved public perception of TVET institutions.
	Private Training Providers	<ul style="list-style-type: none"> • Scaled up programme that meet labour market requirements. • Higher probability of accessing SETA funding due to joint application by TVETs. • Access to TVET infrastructure and resources

Implementing the model

The PSET Integration Readiness Framework model highlights the fundamentals needed for successful partnerships between DHET, SETAs and TVET Colleges:

Figure 12: PSET integration readiness framework components



TVET colleges should apply for SETA Discretionary Grant funding during the open funding window

ROLES OF KEY PARTIES

STRENGTHENING DIGITAL & TECHNOLOGY TRAINING IN THE PSET SYSTEM (9 STEPS)

The model	Relevance	Outcome
The model calls for accredited private training providers with proven results. driven and industry-recognised IT courses to scale up in partnership with TVET Colleges and relevant SETAs, although initial funding for the model can be secured from industry, donors, and/or SETAs. The model operates within the current frameworks for PSET, including the National Qualifications Framework and minimum requirements for practicals and work-integrated learning (WIL)	A goal of the South African government as identified in the Digital Skills Strategy is to see a 20% increase in participation and graduation rates in ICT-related programmes. A public-private partnership with an 80% or higher graduation and placement rate will contribute to ensuring this goal is achieved	Skilled low-income youth are absorbed into the ICT sector (reducing youth unemployment) and meaningfully contribute to IT sector skills and the South African economic outlook



Industry

- Improved productivity and increased income achieved by industry partners (formal and informal).
- Effective implementation of policies by industry partners (formal and informal) for creating quality new jobs and placement of graduates in jobs with full protection of labour rights and ongoing learning opportunities.
- Access to a strong talent pipeline
- Better incorporation of intermediary feedback needed



SETAs

- Contribute to improved sector skills and thus fulfil mandates.
- Improved oversight and accountability measures for resources.
- Better implementation outcomes, with targets and contractual deliverables met.
- Improved collaboration within the sector leading to growth and youth employment.



Government

- Improved government accountability
- Productive employment, especially for youth from disadvantaged backgrounds.

1. A ROADMAP TO ACTION

A roadmap detailing the activities, outcomes, aims, assumptions and potential learning points has been developed (see Figure 2 below). Activities include the selection of partners and the development of public-private partnerships; the selection of learners and the implementation of quality, relevant, accredited ICT training programmes with work experience and practical training, and the ongoing monitoring of programmes.

These activities will result in the onboarding of appropriate partners – TVET institutions and private training providers who have the capacity, interest, resources and implementation record to successfully partner and deliver a high-quality programme with demonstrated labour market outcomes. The partnerships established will increase the capacity of the TVET sector, both in terms of what programmes it can deliver and the scale on which they can be delivered, supporting higher enrolment, improved access and ultimately better graduation rates among students. This in turn will contribute to reduced youth unemployment, improved ICT skills in the South African labour force, and an improved economic outlook.

The effectiveness of the programme can be monitored through indicators such as the number of partnerships formed, the number of students enrolled, measures of industry confidence in graduates and the training programmes, graduation rates (including on-time graduation rates) and work placement rates post-graduation.



Aim

Ultimate Aim

Skilled low-income youth are absorbed into the ICT sector (reducing youth unemployment) and meaningfully contribute to improved IT sector skills and the South African economic outlook

Assumptions

What we believe is needed to achieve outcomes and aims

Sufficient funds are available for scale

Government support and push for PPPs to support this initiative.

Enough PPPs are established to create this intended impact

Sufficient candidates with the required interest and STEM skills

Well-structured and managed PPP, with stakeholders aligned

Strategic outcome

Intended results of the activities

Effective PPPs enable PSET institutions (TVETs) to leverage effective industry-recognised and NQF-aligned programmes of private sector training providers

Increased TVET capacity to deliver quality programmes at the scale needed to influence sector skills and youth unemployment

Companies employ graduates of PPP interventions

Knowledge

Key learnings on what needs to be achieved to meet the strategic outcome

Which training programmes result in placement within 6 months after course completion.

How do community and sector perceptions of TVETs and TVET graduates change over time?

How is the digital divide mitigated to ensure access to low-income learners?

Evidence

Indicators that the work effectively contributes to the desired outcome

# SLAs with private sector training providers	# SLAs with identified TVETs	# MOUs with SETAs to access discretionary funding	# MOUs with participating employers	# of suitable students enrolled	Increased confidence of industry players	# of low-income youth that enter the relevant training programmes	# that receive effective WBL + mentoring	# that complete training and receive credentials
# partnerships with suitably qualified stakeholders established				# TVET offering relevant quality digital skills programmes		Increased # low-income students are serviced through PPPs		

Outcomes

The immediate effect of the activities

Appropriate partners are identified and onboarded

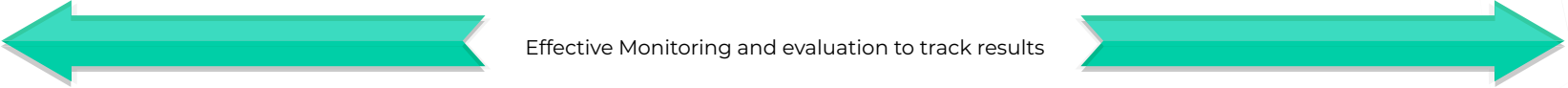
Increased TVET capacity to deliver quality digital skills programmes

Improved knowledge/skills and higher graduation numbers and rates of students




Activities

Indicators that the work effectively contributes to the desired outcome

Screen structure, appraise the PPP and mobilise mechanisms	Partner assessment matrix used to determine private and third-sector partners	Active participation by all stakeholders	TVET colleges leverage private-sector training partners	Low-income students are trained in IT through PPP	Ongoing monitoring and evaluation of delivery by SETAs, TVETs and providers
	Integration framework is used to identify TVET partners	Advocacy and mobilisation efforts, including the establishment of funding models and partners	Efficient but effective application and screening process for students	Students engage in workplace-based learning and practicals in IT	



	TVET COLLEGE	SETA	PRIVATE TRAINING PROVIDER
<p>Step 1</p>  <p>Mobilise the ecosystem</p> <p>Selection of high-potential TVETs using the readiness framework. Engage to ensure TVETs are ready to partner with private institutions</p>	<ol style="list-style-type: none"> 1 Actively engages with IYF, DHET, SETAs, private donors and other stakeholders (with interest in the partnership) 2 Participates in screening process using framework 3 Scopes and identifies potential private sector partners through the WIL/partnership office 	<ol style="list-style-type: none"> 1 Actively engages with high potential TVET colleges, IYF, DHET, private donors and other stakeholders (with interest in the partnership) 	<ol style="list-style-type: none"> 1 Responds to expressions of interest and give input into the model, training and costing 2 Participates in screening process using the partner assessment matrix
<p>Step 2</p>  <p>TVETs apply for Discretionary Funding from SETAs</p> <p>TVETs apply for SETA Discretionary Grant funding during the open funding window, generally February.</p>	<ol style="list-style-type: none"> 1 Actively engages with IYF, DHET, SETAs, private donors and other stakeholders (with interest in the partnership) 2 Participates in screening process using framework 3 Scopes and identifies potential private sector partners through the WIL/partnership office 	<ol style="list-style-type: none"> 1 Actively engages with high potential TVET colleges, IYF, DHET, private donors and other stakeholders (with interest in the partnership) 	<ol style="list-style-type: none"> 1 Responds to expressions of interest and give input into the model, training and costing 2 Participates in screening process using the partner assessment matrix
<p>Step 3</p>  <p>Set up TVET/SETA partnership agreements</p> <p>An MOU between the TVET and the SETA is signed to confirm the award, the budget, deliverables, targets, roles and responsibilities, and payment schedule. Disclose that training is outsourced.</p>	<ol style="list-style-type: none"> 1 Actively participates in contract negotiations (as required) to ensure mutual consent, consideration, capacity and legality 	<ol style="list-style-type: none"> 1 Generates contract with expected outcomes, deliverables, targets, timelines, capacity requirements, roles, and payment terms 2 Engages in contract negotiations to ensure mutual consent, consideration capacity and legality 	
<p>Step 4</p>  <p>Rigorous selection of training & placement providers</p> <p>An advert seeking training providers is placed, followed by an intensive assessment and screening process to identify the most suitable training and placements.</p>	<ol style="list-style-type: none"> 1 Recruits, assesses and screens interested training providers against qualifying criteria 2 Engages with training providers to determine fit, suitability, capacity, expertise, commitment and any other compliance criteria 		<ol style="list-style-type: none"> 1 Training providers interested in the partnership formally apply, providing all the necessary evidence to meet qualifying criteria
<p>Step 5</p>  <p>Sign SLAs with training providers</p> <p>Once identified, the College enters into a service level agreement with the training provider to fulfil the expected mandate from the SETA.</p>	<ol style="list-style-type: none"> 1 Generates a contract. outline expected outcomes, targets, deliverables, timelines, roles, capacity required, and payment terms 2 Contract negotiations to ensure mutual consent, capacity and legality 		<ol style="list-style-type: none"> 1 Actively participates in contract negotiation to ensure contract terms expected roles of all parties and expected outcomes, outputs/deliverables and targets are fully understood and can be met. 2 Ensures the necessary resources capacity, and expertise is in place
<p>Step 6</p>  <p>Rigorous candidate selection</p> <p>Recruitment of low income youth in identified regions, followed by rigorous candidate selection processes using criteria set by training providers.</p>	<ol style="list-style-type: none"> 1 Recruits the students, and screens students jointly with the training provider. 2 Uploads students' details on the MICT SETA system 	<ol style="list-style-type: none"> 1 Verifies placement of students, who must be registered on their system 	<ol style="list-style-type: none"> 1 Assists TVETs with recruitment of students 2 Assists TVETs to screen potential candidates using rigorous selection criteria

	TVET COLLEGE	SETA	PRIVATE TRAINING PROVIDER
<p>Step 7</p>  <p>Training and WIL</p> <p>The training provider rigorously selects learners (potentially in partnership with the TVET), delivers the training using their own and/or TVET resources, supports WIL and practicals. Certificates or other dual qualifications are awarded.</p>	<ol style="list-style-type: none"> 1 Quality assures the training from start to end 2 Supports training as may required 3 Moderates the assessments conducted. 	<ol style="list-style-type: none"> 1 Oversees and quality assures delivery 	<ol style="list-style-type: none"> 1 Offers a 12-month accredited programme, mentorship/coaching, and practicals 2 Assesses competency, submit marks on the SETA system. 3 Identifies, arranges and manages Internships/WIL 4 Issues certificates 5 Offers support for at least 3-6 months after the completion
<p>Step 8</p>  <p>Graduate Placement</p> <p>The training provider supports learners with work placements post-programme</p>	<ol style="list-style-type: none"> 1 Supports with access to employer networks as required 2 Verifies placement of learners within the workplace. 	<ol style="list-style-type: none"> 1 Oversees and quality assures delivery 	<ol style="list-style-type: none"> 1 Identifies, arranges and manages placements at employing companies
<p>Step 9</p>  <p>Monitor Results</p> <p>Ongoing monitoring of work is carried out to ensure quality standards are met and deliverables are achieved as planned. Each deliverable is attached to a tranche, so targets need to be met and outcomes demonstrated before a claim can be made</p>	<ol style="list-style-type: none"> 1 Manages and monitors delivery by the training provider, including regular check-ins with students to identify challenges and support needed. 2 Pays service provider as outcomes, targets and deliverables are met 	<ol style="list-style-type: none"> 1 Engages external provider to evaluate programme 2 Pays TVET College if outcomes, targets and deliverables met 	<ol style="list-style-type: none"> 1 Ensures the necessary data for monitoring (defined upfront) outcomes are gathered for own analysis and reporting 2 Shares data with external evaluators, TVETs and SETAs as required

Box 2: Accessing skills levy funding through SETAs: Key points

- There is a strong preference to fund public entities such as TVETs, funding of private sector entities will be on a lesser scale and funded public sector entities may sub-contract private or third-sector partners with no restrictions.
- SETA-funded programmes must align with the NQF.
- Organisations receiving funding directly must be registered with SAQA and the SETA.
- The preference of SETAs is to engage in split-funding arrangements, with industry providing matching funds with the SETA.
- Geographic limitations or preferences may apply to SETA funding.
- SETAs will generally only fund projects which have not commenced prior to the approval of the application for funding.
- SETAs will not fund training for learners who are already funded through other programmes.
- SETAs do not fund set-up, start-up, or infrastructure costs or existing operating costs.
- SETAs prefer funding outcomes-based contracts, and will not fund programmes without such outcome targets.
- Administrative costs are capped at 7.5%.

A critical success factor is to that learners are selected who are suited to the programmes in terms of both prior knowledge and interest. in the field.. Private providers tend to have lower technical requirements but a more in-depth selection process that looks at aptitude and potential. This can be leveraged to good effect in this model.

To attain the levels of scale required to result in improved labour market and economic outcomes, a range of programmes that support employability may be offered at varying levels of digital and mathematical skills requirements and along the spectrum of NQF qualification levels. To improve advanced digital skills such as computer animation, cybersecurity, artificial intelligence and the internet of things at scale, bridging courses that focus on mathematics may be necessary.

To support placement after graduation or completion of certificate programmes, trained learners should receive career counselling and post-training support services for up to a year in order to achieve better work placement rates and assist their transition into the labour force.

PRIVATE SECTOR TRAINING PROVIDER REQUIREMENTS

- NQF qualifications at an affordable cost;
- Networks of industry partners to support workplace training;
- Skilled trainers
- Mentors/supervisors that support learners and develop competency in skills relevant to the labour market; and
- Effective screening and selection processes
- Offices and individuals dedicated to proposals and sourcing funding for programmes;
- Willing and interested staff including institutional leadership and management;
- The basic resources, policy and institutional capacity to oversee programmes delivered by external providers;
- Collaborative partnerships with community, private sector training providers and industry (formal and informal) partners to recruit learners for training, co-design and deliver workplace learning, and to support graduates in post-training employment;
- Sound policies and strategies that integrate private sector provider digital courses into TVET service offerings; and
- Effective screening and selection processes implemented against clearly defined selection criteria.

To assist PSET institutions in developing the basics required to successfully implement a partnership model, a PSET Integration Framework (see Appendix E) has been developed. This framework can help select institutions which are at a minimum level of investment, infrastructure, and capacity to roll out a PPP intervention and assist those who are still on the journey to prioritise and focus their efforts.

Selection criteria should not favour urban or peri-urban institutions at the expense of more rural TVETs and criteria should not favour issues that can be addressed with a one-time funding investment (such as infrastructure).

CONCLUDING REMARKS

The proposed intervention model fits within the existing structures and mandates of the PSET system and can assist TVET institutions, SETAs and the DHET to deliver on their mandates to skill South Africans to respond to the needs of industry and society.

Government can further support the initiative by mobilising resources and implementing targeted public campaigns to advocate for policies and funding that support relevant, quality, and accessible training through PPPs to low-income and disadvantaged youth.

TVETs contribute to the model by initiating, through their partnership or funding offices, the provision of infrastructure, project management support, and quality of training taking place.

Students bring to the model their intellectual curiosity, natural abilities and aptitudes, drive and willingness to learn and contribute positively to their own futures, their communities and their workplaces.

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