



unesco

International Centre for
Technical and Vocational
Education and Training

New qualifications and competencies for future-oriented TVET

TVET delivery

Providing innovative solutions

Volume 3



New qualifications and competencies for future-oriented TVET

TVET delivery

Providing innovative solutions

Volume 3

UNESCO – a global leader in education

Education is UNESCO's top priority because it is a basic human right and the foundation for peace and sustainable development. UNESCO is the United Nations' specialized agency for education, providing global and regional leadership to drive progress, strengthening the resilience and capacity of national systems to serve all learners and responding to contemporary global challenges through transformative learning, with special focus on gender equality and Africa across all actions.



United Nations
Educational, Scientific
and Cultural Organization

The Global Education 2030 Agenda

UNESCO, as the United Nations' specialized agency for education, is entrusted to lead and coordinate the Education 2030 Agenda, which is part of a global movement to eradicate poverty through 17 Sustainable Development Goals by 2030. Education, essential to achieve all of these goals, has its own dedicated Goal 4, which aims to "ensure inclusive and equitable quality education and promote lifelong learning opportunities for all." The Education 2030 Framework for Action provides guidance for the implementation of this ambitious goal and commitments.



UNESCO-UNEVOC International Centre for Technical and Vocational Education and Training

UN Campus
Platz der Vereinten Nationen 1
53113 Bonn
Germany

© UNESCO 2021

This publication is available in Open Access under the Attribution-ShareAlike 3.0 IGO (CC-BY-SA 3.0 IGO) license (<http://creativecommons.org/licenses/by-sa/3.0/igo/>). By using the content of this publication, the users accept to be bound by the terms of use of the UNESCO Open Access Repository (<http://www.unesco.org/open-access/terms-use-ccbysa-en>).

The designations employed and the presentation of material throughout this document do not imply the expression of any opinion whatsoever on the part of UNESCO concerning the legal status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries.

The ideas and opinions expressed in this document are those of the authors; they are not necessarily those of UNESCO and do not commit the Organization.

Written by James Keevy, Kelly Shiohira, Raymond Matlala and Patrick Molokwane from JET Education Services, South Africa

Cover and design by Christiane Marwecki



Acknowledgements

This publication on new qualifications and competencies (NQCs) in TVET has been compiled as part of the Bridging Innovation and Learning in TVET (BILT) project. The BILT project is implemented by the UNESCO-UNEVOC International Centre for TVET, with support of the German Federal Institute for Vocational Education and Training (BIBB), sponsored by the German Federal Ministry of Education and Research (BMBF) and in collaboration with the UNEVOC Network.

UNESCO-UNEVOC would like to acknowledge the significant input of the expert groups that guided the work and provided many examples of how new qualifications and competencies are identified, integrated and implemented in policy and practice.

This volume was written by the Lead Experts **James Keevy** and **Kelly Shiohira**, with support of **Raymond Matlala** and **Patrick Molokwane** from JET Education Services, South Africa.

The senior expert responsible for the coordination of the work of the three expert groups was:

- **Mr Dieter Euler**
Emeritus Professor, St Gallen University, Switzerland

The expert group for this volume were:

- **Ms Edel Cassar**
Director Strategy Implementation, Malta College of Arts, Science and Technology (MCAST), Malta
- **Ms Kati Valtonen**
Service manager, International and Project activities, Omnia, Finland
- **Mr Paolo Nardi**
International Affairs and Research Coordinator, Cometa, Italy
- **Mr Thim Veng Lim**
Lead Specialist of Strategic and Quality Development Department, Temasek Polytechnic, Singapore
- **Mr Yongxue Wang**
Professor, Shenzhen Polytechnic, China
- **Mr John K Kikwai**
Registrar, Rift Valley Technical Training institute (RVTTI), Kenya
- **Mr Emmanuel C. Osinem**
TVET teacher educator, TVET Quality Assurance expert, Centre for TVET and Research, University of Nsukka, Nigeria

In addition, the broader BILT team provided expertise, support and assistance, including:

- **Mr Jens Liebe**
Former Team Leader for Innovation and the Future of TVET, UNESCO-UNEVOC, Germany
- **Mr Wilson Lima Junior**
Project Manager, UNESCO-UNEVOC International Centre for TVET, Germany
- **Ms Vera Hark**
Project Manager, BIBB, Germany
- **Mr Michael Schwarz**
Senior Technical Advisor, Federal Institute for Vocational Education and Training, BIBB, Germany
- **Mr Matt Zuvela**
Sustainable Development Editorial and Communications Consultant

The external validation team representing TVET experts from different systems across the globe:

- **Ms Annelie Dahlin-Jones**
Centre for Flexible Learning, Soderhamn, Halsingland Education Association (CFL), Sweden
- **Ms Renata Tomaszewska**
Kazimierz Wielki University in Bydgoszcz (UKW) Poland
- **Mr Gangqiang Zheng**
Zhejiang Technical Institute of Economics (ZJTIE), China

Table of contents

Acronyms and abbreviations	6
1. Introduction	7
2. The ‘three-i’ approach: identification, integration and implementation of new qualifications and competencies	8
What are NQCs?	8
How can TVET remain responsive to new developments in the economy and society?	10
Methodology and structure of this publication	10
3. Implementation of NQCs: a micro-level perspective	13
Frame conditions	13
Implementation challenges	13
Promising implementation practices	14
4. Identification of NQCs: a micro-level perspective	20
Frame conditions	20
Identification challenges	20
Promising identification practices	21
5. Integration of NQCs: a micro-level perspective	23
Frame conditions	23
Integration challenges	24
Promising integration practices	25
6. Conclusion	29
References	30

Acronyms and abbreviations

AT&T	American Telephone and Telegraph Company
BMO	Business Membership Organization
CBET	Competency-based Education and Training
CDIO	Conceive-Design-Implement-Operate
Certif-ID	Certificate Identification Number
CETVETAR	Centre for Technical Vocational Education, Training and Research, University of Nigeria
DHET	Department of Higher Education and Training (South Africa)
EADDI	E-Apprenticeship Alternate Delivery Design Initiative
ETF	European Training Foundation
GIZ	Deutsche Gesellschaft für internationale Zusammenarbeit GmbH (Germany)
ICT	International Information and Communication Technology
ILO	International Labour Organization
MCAST	Malta College of Arts, Science and Technology
NGO	Non-governmental Organizations
NQC	New Qualifications and Competencies
OECD	Organization for Economic Co-operation and Development
PLAR	Prior learning, assessment and recognition
RPL	Recognition of prior learning
RVA	Recognition, validation and accreditation
RVTTI	Rift Valley Technical Training Institute (Kenya)
SDG	Sustainable Development Goals
SMMEs	small, medium and micro enterprises
TP	Temasek Polytechnic (Singapore)
TVET	Technical and Vocational Education and Training
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNESCO-UNEVOC	UNESCO-UNEVOC International Centre for Technical and Vocational Education and Training
UTM	Universiti Teknologi Malaysia
WEF	World Economic Forum

1. Introduction

This publication – ‘TVET delivery: providing innovative solutions’ – is one of three volumes. Each focuses on the role of different stakeholder groups in efficient and rapid identification of NQCs, prioritizing and integrating NQCs into curricula and training regulations and the effective implementation of NQCs into learning environments.

This specific volume focuses on the micro-level stakeholders involved in the implementation of TVET skilling programmes and/or their components: It will suit lecturers, administrators and programme designers interested in understanding some of the challenges and opportunities of introducing new qualifications and competencies into TVET programmes.

The volume aims to address the role and contributions of TVET providers and companies in identifying, integrating and implementing new qualifications and competencies, drawing on contributions from literature as well as expert engagements and case studies.

The publication has been prepared as a collaborative effort between UNEVOC centres and experts from across the globe in early 2021 as the COVID-19 pandemic was having a significant impact on TVET institutions. This situation also created an opportunity for the authors and their collaborators to engage in a more future looking process, which is presented in the following pages. International UNEVOC centres and TVET practitioners, stakeholders and researchers are intended as the main audience. Robust engagement with this report is welcome, and readers are encouraged to explore the other two volumes for additional insights: ‘TVET advocacy: ensuring multi-stakeholder participation’ targets the meso level, and ‘TVET governance: steering collective action’ focuses on macro-level stakeholders.

2. The ‘three-i’ approach: identification, integration and implementation of new qualifications and competencies

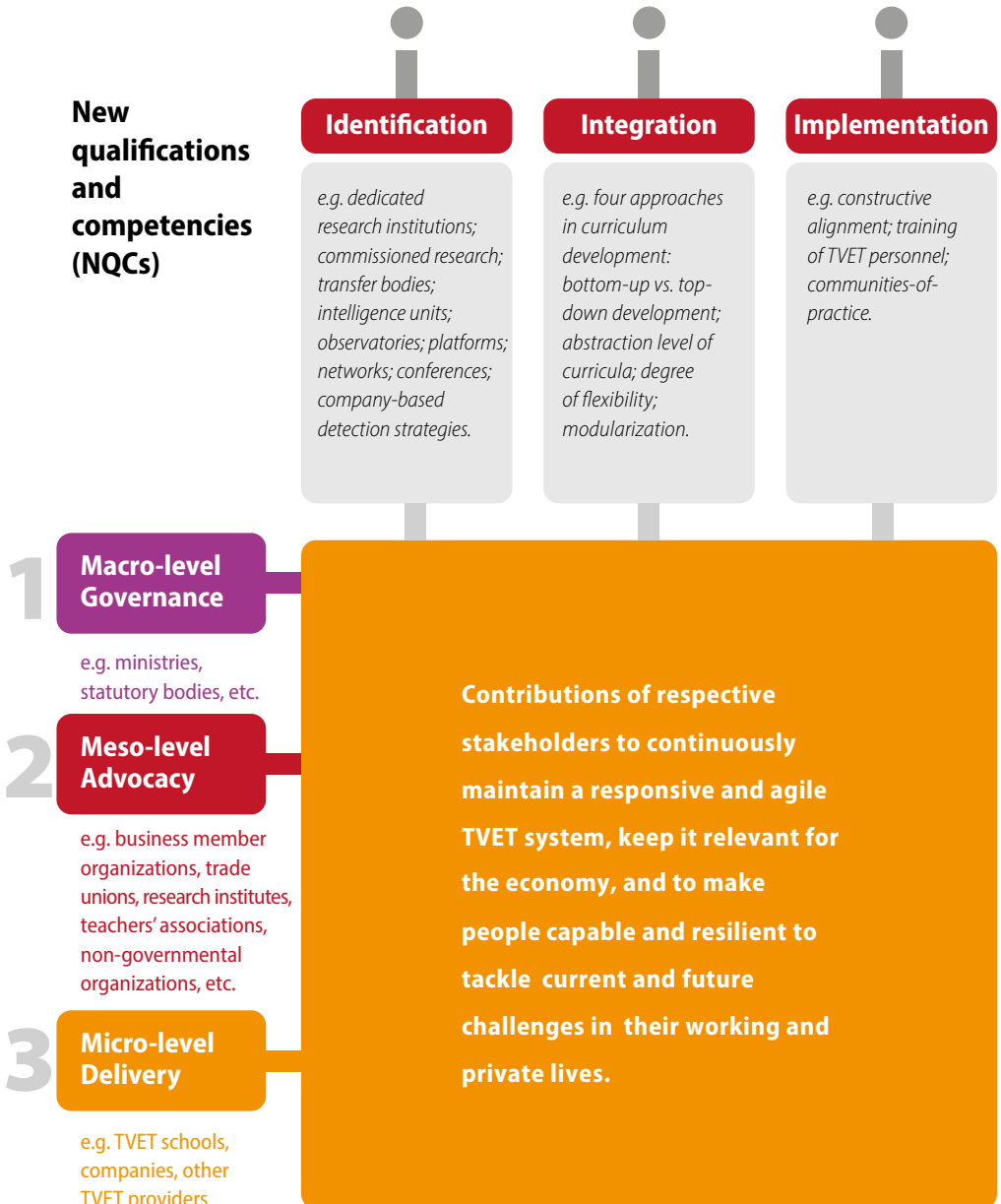
TVET plays a key role in any society when it comes to providing qualified labour for the economy and transitioning young people from ‘learning to earning’. TVET is the education sector closest to the labour market. As such, it is designed to tackle current and future challenges: first by making people capable and resilient in their lives, and second, to keep TVET relevant for the economy and society. These demands can only be met if TVET keeps up with the pace of change: accelerated innovation in digital technology, new demands in sustainability and environmental protection, and increased processes of migration are just a few areas where TVET systems must respond more rapidly than in the past to modernize its infrastructure, capacities and practices. We need to look no further than the COVID-19 pandemic for a convincing example of the need for education systems to prepare for unprecedented and unpredictable disruptions.

What is the best way to keep TVET responsive to economic and societal changes, with the agility to swiftly address new challenges? In other words, how should TVET approach NQCs? Our approach centres upon the best methods to identify NQCs, integrate them into curricula and training regulations and effectively implement them within adequate learning environments with trained personnel. Our conceptual framework draws on the way stakeholders at different levels of the TVET system identify, integrate and implement NQCs. Figure 1 (next page) shows the key components of the approach.

What are NQCs?

The interrelationships between the terms qualification, knowledge, skill and competency are important to note. We recognize that there exists limited common understanding in the international TVET community on terms such as qualification and competencies. In this volume, we have therefore deliberately decided against adopting a single prescriptive definition. Instead, we offer an interpretation that covers a prevalent understanding of many experts. Given the future perspective inherent to NQCs, there is a preference for a broader notion of competency that captures the potential of people embracing knowledge, skills and attitudes. They may be phrased in abstract terms (e. g. social competencies) or be put into more concrete terms (e. g. applying empathic attitudes in conflict resolution processes; analysing technology-enhanced work-processes; creating innovative concepts to set up a business). In this volume, qualification is understood as a formal proof of successfully completed learning according to an agreed standard. We also recognize that as learners in TVET are increasingly less novices but mature and experienced adult learners, formal qualifications face competition from micro-credentials and other short course awards – some of these may also be provided by non-traditional, private providers.

Figure 1 Key components of the ‘three-i’ approach



How can TVET remain responsive to new developments in the economy and society?

More than any other sector of the education system, TVET needs to arrange for provisions to keep it up to date and future ready. There are three stages to remaining relevant:

- Provisions for *identifying* relevant NQCs in a timely and accurate manner in view of ever-faster evolutions both in the private sector as well as in society and economy;
- Procedures for *integrating* NQCs into flexible and agile curricula, creating flexible learning pathways, allowing for greater convergence to the general education and providing intermediary exits to the labour market; and
- Ways for *implementing* NQCs in classrooms and workshops with the adoption of innovative teaching and learning practices, proper teacher and trainer training and adequate pedagogical environments.

This volume of the BILT publication focuses specifically on micro-level stakeholders, and by implication also emphasizes the delivery and implementation stages outlined above. We have interpreted micro-level stakeholders as the implementers of TVET programmes and/or their components, including TVET schools, colleges, companies and other providers. Micro-level stakeholders can also be considered the ‘front line’ of education delivery. It falls to these organizations to provide timely, relevant and quality training courses in line with the needs of society and the labour

market. Successful systems will enrich the lives of their students and trainees by providing the competencies needed for not only income generation but also active citizenship. These systems will improve their communities through contributions to local and national sustainable development goals. This volume provides insights from literature, a series of nine case studies and three workshops spanning three continents on the identification, integration and implementation of NQCs, across both developed and developing contexts. TVET lecturers, administrators and the UNEVOC network are invited to reflect on the challenges and solutions raised through this research and to use these lessons to further advance the TVET delivery within their own nations and contexts.

Methodology and structure of this publication

In reading this volume, micro-level TVET stakeholders are meant to gain a better understanding of their role in the greater TVET ecosystem; potential tools for identifying, integrating and implementing NQCs into a TVET system; and action items for closer collaboration with other stakeholders. Not all examples and insights provided will be applicable in every TVET context. However, prompts have been included (**indicated by coloured text**) to encourage reflection, which may help you place the cases cited and potential applications in your own context and consider their applicability. You may also find that reflection on your own TVET context provides insights into how your practices are similar or different to other systems around the world: our aim is to encourage mixing

and matching of innovative approaches and promising practices to provide all stakeholders with a better sense of the solutions that exist for using NQCs to overcome the challenge of keeping TVET systems modern and relevant.

The rapid pace of innovation and broad concerns over trends such as global warming and migration create demand for a constantly evolving set of skills in the labour market and communities. In such a context, the ability to forecast and rapidly respond to NQCs will be part of any successful strategy to keep the supply of qualified workers aligned to labour market needs. In most cases, structures, systems and even people that do not adapt to emerging requirements will not remain competitive against those with more current and relevant competencies (Stanwick & Stanwick, 2020), highlighting the need for lifelong learning in today's rapidly changing society. In this context, curricula and training regulations need ongoing modernization to be responsive and relevant for the economy and to ensure students are capable and resilient enough to tackle current and future challenges

in working and social life. Given this, our guiding research question is: *How can NQCs be identified timely, integrated into appealing and flexible curricula and training regulations and implemented effectively in adequate learning environments?*

In our attempt to answer this question, we conducted a literature review focused on new thinking on NQCs, compiled nine case studies of TVET institutions (reflected in Table 1) and held three discussions with case study authors to further interrogate the relevant topics and ensure that the micro level was reflected in an authentic manner. The case studies are listed on the next page in alphabetical order by country.

The case studies and related sources were analysed using the BILT NQC conceptual framework (see Figure 1). This volume follows the structure of the conceptual framework, covering aspects of implementation, identification and integration, but with a stronger emphasis on the first.

Table 1 *Case studies included in the micro-level analysis*

Case Study	Source	Country	Download site
Coupling of TVET Curriculum and Enterprise Certification: Cooperation between Shenzhen Polytechnic and Huawei in China	Shenzhen Polytechnic, (Yongxue, 2021)	China	Here
The case of Omnia in Finland	Omnia, (Valtonen, 2021)	Finland	Here
Cometa Formazione and the Minimaster for Migrants in Italy	Cometa Formazione, (Nardi, 2021a)	Italy	Here
Cometa Formazione and the School-Enterprise Model in Italy	Cometa Formazione, (Nardi, 2021b)	Italy	Here
Greening in TVET: A case study of the Rift Valley Technical Training Institute in Kenya	Rift Valley Technical Training Institute (RVTTI), (Kikwai, 2021)	Kenya	Here
Malta College of Arts, Science and Technology Entrepreneurship Case Study	Malta College of Arts, Science and Technology (MCAST), (Cassar, 2021)	Malta	Here
Entrepreneurship Development in TVET: the case study of Centre for Technical Vocational Education, Training and Research in Nigeria	Centre for Technical Vocational Education, Training and Research, University of Nigeria, (Osinem, 2021)	Nigeria	Here
Innovation and Entrepreneurship Initiatives in Temasek Polytechnic in Singapore	Temasek Polytechnic, (Veng and Loong, 2021)	Singapore	Here
Project-Based Teaching and Learning for Electrical and Plumbing In-Service TVET Lecturers in South Africa	Deutsche Gesellschaft für Internationale Zusammenarbeit GmbH (GIZ) and Department of Higher Education and Training, (Magnus, Setusha and Rudolph, 2021)	South Africa	Here

3. Implementation of NQCs: a micro-level perspective

Frame conditions

Trends in TVET such as digitalization, greening, the increasing need for entrepreneurial mindsets and migration contribute to demand for new qualifications and competencies. The transition to a low-carbon economy is increasingly generating green occupations such as solar-panel installers, wind-turbine technicians and agricultural meteorologists (UNESCO-UNEVOC, 2020a). Significant internal and international migration has further led to demand for context-specific skilling programmes, such as language and cultural communication courses, as well as calls for credential transparency and recognition across contexts (Certif-ID, 2019; UNESCO, 2020b). Meanwhile, a high demand for digital capacity, which is required in up to 82% of middle-skill jobs (Burning Glass Technologies, 2017), has transformed the skills requirements for most professions, even as technological innovations drive changes in the skills needs of sectors ranging from energy to manufacturing to telecommunications and of course technology. Finally, in recognition that creativity and new ideas are important factors in tackling the challenges of the 21st century, the relevance and demand for entrepreneurial mindsets are on the rise.

Local, national and regional contexts can vary in the extent to which these trends are embraced at any given time, and therefore lead to distinct labour market demands in

the communities served by individual TVET institutions. For example, countries have varying degrees of public and private sector investment in digital infrastructure (WEF, 2014), which can affect the extent of service delivery in areas served by TVET institutions and lead to challenges relating to unequal access to emerging technologies.

Implementation challenges

Capturing lifelong learning

While TVET is perhaps most commonly linked with youth, there is a current and increasing need for lifelong learning even among the working population (Auger et al, 2020; UNESCO-UNEVOC, 2020a). Although lifelong learning is included in the United Nations Sustainable Development Goals (SDGs) (Boeren, 2019), in many contexts TVET institutions struggle to embed lifelong learning in practice.

Challenges in implementing lifelong learning are related to the inflexibility of institutional processes (Popov & Fedorenko, 2019) and weak practical ties between training and the world of work (Maina et al, 2017). Kanwar, Balasubramanian and Carr (2019) observe that **in order for lifelong learning to be truly effective, it must encompass all learning – formal or not – beginning at birth and continuing for a person's entire life.** With

trends such as migration increasing, and evidence of non-linear education pathways in which youth (particularly in developing countries) often transition between education and work several times (Gewer & Pereira, 2018), timely and effective systems are needed to recognize and integrate formal and informal learning.

Educators and trainers keeping up with dynamic and emerging industries

Procuring staff and lecturers with the required knowledge and technical capabilities can prove a significant challenge in cases where there is high industry demand for a limited talent pool (Khan, 2018). Skills gaps among both lecturers and students have been noted for various technical abilities relating to big data, the Internet of Things and AI (Ismail & Hassan, 2019). Part of the mismatch issue relates to the tools and methodologies used by industry, which are constantly being updated or revised. This leads to a challenge for institutions to ensure updated infrastructure and procure or develop the related instructor capacity to pass new developments on to students.

Issues of lecturer identity and motivation were also identified as challenges by the TVET experts who engaged in this research (Blom et al, 2021). **Experts noted that lecturers were challenged by new skills requirements and new administrative tasks and changes. TVET was identified as a demanding space that is unlike other teaching professions.** It requires dedication, ingenuity and increased capacity to accommodate additional tasks such as engaging with industry. Lecturer motivation and engagement are affected when this work is not recognized and when TVET on the whole is regarded as 'second-class' education.

The cost of adapting infrastructure

While these challenges are not limited to the realm of digital infrastructure, the COVID-19 pandemic challenged TVET and other learning institutions to improve connectivity and equipment while introducing staff and students/trainees to new learning platforms and virtual learning methods. Though there were many successes in this process, lessons learned included that **the ability of TVET institutions to adapt to new working methods and tools can be impeded by organizational structures and processes, insufficient technical access and expertise and personal characteristics of lecturers and other staff.** The practical nature of TVET itself can be challenging to translate into remote contexts for some competencies.

Insufficient infrastructure has been shown to be one determining factor affecting perception of TVET colleges, student choice and the ability of institutions to deliver responsive and quality competency training (Omar, Rauf, Ismail, Rashid, Puad and Zakaria, 2020; Sassetta, 2019). This is often related to the high cost of infrastructure and can lead to limited offerings: one example is coursework based on specific industry products rather than the generically applicable skills necessary in a broader sector (ILO, 2020).

Promising implementation practices

Methods for recognizing learning in all contexts

Establishing robust practices for the recognition of prior learning (RPL) – also referred to as recognition, validation and accreditation (RVA),

or prior learning, assessment and recognition (PLAR) – can **ensure system efficiencies and reduce individual expenditure by integrating non-formal learning (taking place in communities, homes and workplaces) with formal learning pathways**. RPL can further accommodate challenges related to migration such as the current lack of credential mobility. An additional or modular approach enables course delivery or other initiatives that complement initial degrees, provide continuing education and training and allow TVET providers to deliver a quick response to new developments. There are further benefits in contexts that include flexible learning pathways or stacked credentials, which enable incremental learning to aggregate into formal qualifications. An example is the Future Skills Portal in India¹, which provides targeted skills development support for individuals interested in identifying 'future industries' through the recognition of prior learning, mapping required skills development pathways and links to related education and training providers.

Solutions for the recognition of informal and non-formal learning are also being explored. As older learners are increasingly seeking additional upskilling and are likely to have experience outside of formal education, Omnia – a Finnish TVET institution – also allows for the recognition of informal and non-formal learning (Valtonen, 2021). Lecturers are responsible for RPL and assisting students in creating individual study plans based on the student's goals, prior experience and course opportunities. Another proposed system would allow students to aggregate skills gained both

formally and informally through various digital platforms into a personal curriculum (Popov & Fedorenko, 2019). Digital badges are a related development, used in some contexts to represent skills and knowledge attained in non-formal education settings. For example, the US-based company AT&T includes both a system for monitoring company-sponsored engagements as well as badges as part of its internal skilling records, and the Badges Work for Vets programme helps US army veterans 'leverage their military training and unique skill sets' through badges that reflect their military training and other skills acquired during their service (Crafford & Matthee, 2016, para. 14).

Investment in lecturer capacity

As professionals who must bridge education and the world of work, TVET lecturers require a specialized set of competencies. In response to this need, some institutions offer programmes of development and support. South Africa developed a policy on professional standards for lecturers in 2013, which has been implemented in universities since 2017 (Magnus, Setusha and Rudolph, 2021). In Malta, MCAST offers its own degree programmes for TVET lecturers, a Bachelor's in Vocational Education and Training and a Master's in Vocational Education Applied Research (Cassar, 2021). In some cases, such as Nigeria, national frameworks for professional development have been produced but not fully implemented, leaving lecturer development at the discretion of each institution (Osinem, 2021).

TVET institutions also offer in-company and externally provided training opportunities for teachers based on need. One example from Omnia is an independent study learning module on sustainability for teachers.

¹ <https://futureskills.nasscom.in/>

At Cometa in Italy, staff development aligned to NQC implementation needs is undertaken by industry partners or academic researchers (Nardi, 2021b).

Peer support networks are also important avenues of developmental support for lecturers. At Omnia, (Valtonen, 2021), teachers engage in peer networks and pedagogical coaching that address areas such as instruction, digital skills and working life cooperation. The human resource department of the institution uses a team mapping approach that reflects the current skills of the team and the anticipation of future needs on both individual and team levels. This is a useful tool that helps managers make relevant suggestions for their members' professional development. In Malta, professional development for lecturers is also reflected in different engagement tracks that include curriculum drafting, implementation and review; teaching, learning and assessment;

education leadership and individual agency; and ethos and the creation of a learning community (Cassar, 2021).

Effective stakeholder collaboration is essential to improve the relevance of TVET and development of TVET staff, and one model of upskilling includes lecturers or other staff attending training or upskilling programmes at industry sites. Often, this is done in combination with the development of training packages that directly involve industry stakeholders (Balasooriya & Kulathunga, 2020; Hamdan, Yunos & Sern, 2019; UNESCO-UNEVOC, 2020b). For example, at RVTTI in Kenya, staff gain experiential knowledge of new trends in industry through month-long attachments during school holidays (Kikwai, 2021). Other approaches include joint appointment models in which industry experts engage in a limited or supplementary teaching load or work closely with TVET staff in the implementation of programmes.

Lecture development is a critical priority in South Africa, with emphasis placed on the skills and competencies required to facilitate industry-relevant and work-situated learning. The Project-Based Teaching and Learning Programme is an innovative capacity-building project for in-service TVET lecturers in the fields of Electrics and Plumbing. Throughout an 11-week pilot in 2020, upskilling for lecturers focused on: project-based teaching and learning methods, the latest digital technologies and industry/workplace-based teaching and learning, and improving technical competency and cross-sectoral competencies (such as flexibility, adaptability, problem-solving, teamwork, leadership and creativity). Real-life client projects were initially presented through a 3D virtual setup and later translated into practical on-site installation. The training offered interfaces between the two professions that required collaboration and interdisciplinary

discussions such as hot water preparation, rainwater harvesting and installations for the use of renewable energy, while the reference to practical problems increased motivation and the learning effect. As the programme was rolled out during the COVID-19 pandemic, lecturer development on digital technologies was accelerated even beyond the initial programme plan, including virtual viewing and design software, conferencing tools, learning management systems and online collaborative tools. Lecturers gained experiential knowledge of the effects and benefits of new technologies and project-based pedagogical approaches (Magnus, Setusha and Rudolph, 2021).

Further information: Project-Based Teaching and Learning for Electrical and Plumbing In-Service TVET Lecturers in South Africa

New spaces and concepts for learning and instruction

In order to respond to the changes in qualifications and skills needed by the workforce, infrastructure can form a significant but necessary outlay for TVET institutions, even those that invest heavily in workplace-based learning. Programmes such as the Centres of Specialisation in South Africa focus on TVET education programmes with three components: theoretical knowledge, simulated practical learning and workplace-based learning. Simulated learning could refer to modalities such as computer simulations or virtual design spaces and take place in learning labs. For example, Temasek Polytechnic houses a Makerspace+ facility where students can practice hands-on skills using equipment for 3-D printing, woodwork, metalwork, electronics and fabric (Veng and Loong, 2021). Coaches in the facility offer consultancy and support to students, which is leveraged both during compulsory courses and for student-initiated projects outside of scheduled class time. A cautionary note is also important here regarding the potentially prohibitive

costs of new and emerging technologies. In this regard, **more international and regional collaborations to develop common and open platforms and tools can go a long way to reduce costs and reduce dependency of TVET institutions on external support.**

Focus on cross-cutting competencies to develop 21st century skills

Creativity, problem-solving, learning to learn and entrepreneurial mindsets are examples of competencies increasingly seen as essential for the future world of work. A study conducted at MCAST in Malta found that **alumni considered transversal skills – such as teamwork, communication, time management and basic digital skills – to be the most useful ones they had learned** (Cassar, 2021). Cross-cutting competencies such as these finding their way into TVET frameworks and offerings in a variety of contexts.

For example, an international consortium of universities developed a 'Conceive-Design-Implement-Operate' (CDIO) method in Malaysia to reform the contemporary engineering

education curriculum (Olanrewaju, Ojo and Peter, 2020, p. 239). This encompasses inter and intra-departmental collaboration that enables two or more courses to feed into a single project or assessment, which can facilitate cross-disciplinary learning and skills development (Kamarudin and Teh, 2017, p. 5). In their survey of students at Universiti Teknologi Malaysia (UTM), Jambari et al (2018) found that students rated the CDIO model positively as it enables acquisition of personal, interpersonal and system building knowledge and skills as competencies for the future world of work. The method has been taken up by other international institutions, including a number of TVETs (see Jambari, Razali, Taman, Noh, Osman, Ahmad & Rameli, 2018).

Experiential learning opportunities and work-integrated learning

There are a number of promising approaches that have been applied to improve the alignment of skilling programmes and industry needs. Many are derived from the German dual system of apprenticeship, in which education and training is delivered by both TVETs and companies (Gessler, 2017; Thelen & Busemeyer, 2012). While attempts to transfer this model have had limited success at the macro level (Maurer & Gonon, 2014), there are many instances of successful transformations at the micro level. One example is 'expansive apprenticeship', in which the student aligns their learning to skills that suit their individual

At Temasek Polytechnic in Singapore, Design Thinking is integrated into core coursework undertaken by all students studying at the institution through a project-based learning approach. Students apply the principles of Design Thinking to carefully curated real-life problem statements presented by industry, global and local communities, such as those arising from the COVID-19 pandemic. Students from different schools within the institution may also collaborate in cross-disciplinary teams, and teaching faculty showcase past final-year student industrial projects from different schools to illustrate the applications of various principles and, more importantly, how companies from their respective industries value innovation. Interested students are then able to pursue a study track that introduces entrepreneurship, with opportunities to create a Minimum Viable Product. Students are supported with training in skills such as the product development process, user experience, product pitching, market validation and business development, with the goal of supporting students to start and run a viable and sustainable business. The first implementation cycle of this training concluded in 2020 and resulted in three businesses obtaining a national grant for start-up founders (Veng and Loong, 2021).

Further information: Innovation and Entrepreneurship Initiatives in Temasek Polytechnic in Singapore

goals rather than a predetermined set. The approach delivers a highly flexible learning opportunity but is also 'time consuming, expensive and requires a great deal of coordination between employers, institutions, and the learners' (Kanwar et al, 2019: 58).

Other models include the e-Apprentice model in the Canadian TVET system, which involves an 80-20% split respectively between workplace training and the education or training provider; and the E-Apprenticeship Alternate Delivery Design Initiative (EADDI) piloted at Red River College in Manitoba, in which students were oriented on campus and then engaged in community-based workplace training supplemented by short online training sessions twice per week.

At Cometa, a 'mini-masters' programme embeds migrant students within the local service industry concurrent to their training at the college, with temporary placements at workplaces guaranteed for graduates (Nardi, 2021b).

However, collective skills development as designed by the German dual model is not feasible in all contexts. It can be constrained by a number of factors, including the local availability of industry and the willingness of industry partners to engage in training (Maurer

& Gonon, 2014). The live enterprise model run by the Business Development Centre at the University of Nigeria (Osinem, 2021) and the School-Enterprise Model (*Modello Scuola-Impresa*) at the Cometa Formazione Oliver Twist School in Italy (Nardi, 2021b) demonstrate variations in which businesses are embedded within and run by TVET institutions, a variation of the dual model philosophy that attempts to provide experiential learning despite external mitigating factors.

In Nigeria live enterprises span sectors including construction, agriculture, textiles, sales, automobile maintenance and information technology (Osinem, 2021), while in Italy, entrepreneurial activities in hospitality, textiles and carpentry are integrated into the school environment and connected to daily TVET provision (Nardi, 2021a). **These models give students unique learning experiences that straddle the line between the traditional classroom environment and a more modern work-based setting: classrooms become workshops, trainers and teachers become managers and evaluation becomes a concrete output delivered to real customers.** Along the way, students learn professional, entrepreneurial and technical competencies as well as general administration, promotion and transversal skills such as communication and teamwork.

4. Identification of NQCs: a micro-level perspective

Frame conditions

The extent to which TVET institutions engage in the identification of NQCs is affected by a number of contextual factors. Prominent considerations include policy frameworks, the adoption timeline of prominent international trends and the degree of autonomy or decentralization of curriculum decisions within the institution's national and regional context.

The degree of involvement of micro-level stakeholders in the identification of NQCs is largely shaped by the prevailing national or regional frameworks: more flexible systems are more receptive to 'bottom-up' input, while rigid top-down systems often lack processes to take micro-level feedback on board. Another contributing factor to the visibility of micro-level stakeholders in the NQC identification process is their degree of autonomy in the wider TVET system in a given context.

Identification challenges

Stakeholder inclusion

Micro-level institutions that are integrally involved in the daily delivery of TVET are well-placed to reflect on the demands of students, their industry partners and the communities in which they are located. This puts them in a good position to provide meaningful insights into local, national and international

identification of NQCs. Despite this, in highly centralized or top-down systems, the identification of NQCs is often seen as primarily a responsibility of central governments and their agencies. On the most extreme end of this scale, the role of TVETs may be completely confined to the implementation of centrally-developed curricula based on nationally-identified needs.

Research also shows that while industry is regularly consulted regarding its requirements for skills, engagements with the third sector and experts are often absent from the identification process (UNESCO-UNEVOC, 2020a). **The exclusion of community-based organizations in particular ignores a potential channel to encourage wider participation in the TVET sector** (Volmink and van der Elst, 2017).

Further, the inclusivity of the term 'industry' can be questionable, with small, medium and micro enterprises (SMME) at times excluded from these processes. The informal economy is nearly always excluded, though internationally more than 60% of the world's employed population works in the informal sector – this is as high as 85% in some countries (ILO, 2018). This supports in some ways a decentralized and even more demand-driven approach to identification, one which focuses on bringing together local industry, worker representation and education institutions to collaboratively identify, develop, integrate and deliver locally-relevant TVET training (Kraak, 2015).

Mismatched expectations among employers, students/trainees and industry

The heart of the TVET curriculum is collaboration in delivery between training providers and workplaces, yet some countries have been found to have low degrees of linkage between TVET systems and employment (Caves, Ghisletta, Renold & Kemper, 2019). Skills gaps are not limited to technical capability: some research shows that new graduates from TVET institutions lack the appropriate behavioural skills for the world of work (Fasih, 2014). This extends to transversal skills such as the ability to learn and competencies such as professionalism, collaboration and problem-solving. **Varying expectations among students or trainees, those in a position to hire them and the industry as a whole further contribute to technical and non-technical skills gaps** (Husain, Che-Ani, Affandi, Nasri and Musid, 2020). Micro-level stakeholders have a role in addressing this through more timely and effective methods of NQC identification.

Data lag and rigid systems

Identification of NQCs can be undertaken or initiated by a number of stakeholders, including government, technical sectoral committees, industry, TVET administrators, staff and students. The process through which NQCs are identified is of paramount importance to ensure timely and responsive skills development within institutions. Labour market scans and sector skills plans contribute to decision-making processes at the national and ministerial levels of governance, which are arguably the front line of ensuring the match between skills supply and demand in many countries.

However, typical methods of evaluating labour market and social needs can take years to implement, resulting in delayed reporting and slow identification of NQCs.

This may be exacerbated in rigid systems with high degrees of centralization. Systems with insufficient data or poor evaluation processes may further be unable to identify the full range of required NQCs in their communities.

Promising identification practices

Collecting data at the source and utilizing available flexibility

One of the most crucial links in the development of responsive qualifications and other skilling programmes is the availability of data. A number of countries, including Australia, Tunisia and Estonia, have developed and implemented systems that use job placement scanning software to monitor the labour market and enable skills anticipation (Loo, 2020). At the moment, these initiatives are managed at the governance level, but some of the data regarding labour markets is made available through government publications or [websites](#) and can be used by education and training institutions as part of their own skills and curriculum alignment processes.

Easy access to data and analysis can help identify current and potential skills supply and demand gaps. It can also contribute to decision-making on future direction for individual students, education and training institutions, industry partners and governing bodies (Rajab et al., 2020). For TVETs, the availability of such data to institutions, particularly in more decentralized or flexible systems, is another tool that can allow institutions to respond to industry and

social needs in a more accurate and timely manner. The availability of this data can also enable individual citizens to make informed choices about careers and further professional development based on both opportunities and trends.

The ability of institutions to identify NQCs rests partly upon the flexibility of national processes. A degree of local or institutional autonomy can contribute to quicker identification of emerging community and industry needs.

Targeted inclusion of on-the-ground stakeholders

Whether NQC identification is led by macro-level institutions and governance structures, or through bottom-up approaches initiated or coordinated by TVET institutions, **good systems and structures for identification involve multiple stakeholders engaged in partnerships to ensure the various needs of a TVET institution's community and market are met.** These partners include the private sector, communities, industry and labour market experts, civil service organizations and students.

Some contexts enable flexible identification by multiple stakeholders. In South Africa, stakeholders including industry players, TVET providers and professional associations can apply to national governance structures for new or revised qualifications (Magnus, Setusha and Rudolph, 2021). In Malta, the identification of NQCs can be set in motion by TVET staff, management, the Board of Governors or external parties. A proposed new concept

is considered by the senior management team and taken to the Board of Governors, which includes industry, employee and staff representatives, for approval (Cassar, 2021). This approach enables individuals working within industry, TVET staff or experts to identify emerging NQCs, and can essentially provide a theory-based counter to the strongly data-driven approach of labour market scans. While literature by labour and development economists largely trends towards more industry-driven or 'demand driven' education, **an alternative approach is important, particularly with regards to social development: it allows individuals or groups to envisage a society they do not yet inhabit but would like to develop and to pursue an appropriate course of action.**

Institutions engaging in the identification of NQCs also leverage efforts such as the monitoring of enrolment patterns and data collected through student and/or market surveys. Temasek Polytechnic in Singapore, for example, regularly collects feedback from students, alumni, faculty, an advisory committee and industry partners (Veng and Loong, 2021). In Italy at the Cometa Formazione Oliver Twist School, an annual five-week training programme is undertaken by all staff to analyse the results and outcomes of the past school year, industry feedback and evidence of new trends in the market. This culminates in the identification of NQCs and new didactic methods and machineries to be added or integrated into programmes (Koenig and Nardi, 2019).

5. Integration of NQCs: a micro-level perspective

Frame conditions

Government frameworks and policies affect curriculum, institutional mandates and the type of programmes and delivery that can be offered at different levels and types of TVET institutions. TVET can be implemented at secondary, post-secondary and tertiary levels by a variety of public, private and third sector providers. For example, the importance of workplace-based learning in TVET cannot be understated, but when TVET systems engage through secondary schools, industry-based models of work-integrated learning may be in violation of the Rights of the Child (United Nations, 1989) or national child labour laws. TVET systems may also be affected by policies towards migrants if these regulate or restrict employment for temporary residents. This demonstrates the need to balance the intended learning outcomes with humanistic considerations, and the complexity of the sector.

Literature shows that there has been a shift and, in some countries, significant reform in the governance of the TVET sector (UNESCO, 2020a; UNESCO; European Training Foundation, 2019; British Council 2018; Caves & Baumann, European Training Foundation, 2013). For example, research has found movement towards increased institutional autonomy and more inclusive and participatory methods and models in Europe (British Council, 2018; European Training Foundation, 2019).

Cuenco (2018) conducted research on TVET governance in eight countries and found that half assign policy responsibility to the national government, while others assign responsibility to local government or use a shared system of responsibility across different layers of government. However, just as the systems governing TVET institutions differ based on factors such as the strength of the central government and the stage of a country's development (British Council, 2016), not all TVET institutions will be placed to take advantage of increased autonomy in policy and decision-making.

TVETs are also concretely influenced by the types of certificates and degrees they can offer, and the extent to which degrees, diplomas and other awards are recognized. **Within national qualification frameworks, TVET systems can articulate into higher education; they can form a cumbersome parallel system in which TVET credentials are not recognized as suitable to satisfy entrance requirements for higher degrees of study; or they can operate at some measure between these extremes.** Within the labour market, TVET institutions are affected if there is limited acceptance or trust in their degrees or certificates on the part of employers and citizens.

Integration challenges

Anticipating future skills needs and aligning or adjusting curricular programmes

In the best circumstances, translating identified new qualifications and competencies into curriculum requirements benefits from broad participation from a wider range of stakeholders. Unfortunately, research indicates that **TVET institutions struggle to update existing courses, let alone introduce NQCs relevant for future skills needs** (Maira et al, 2019; Kadiria et al, 2020). Many institutions lack the processes, policies, capacity or mandate to meaningfully engage in the work of curriculum design and development.

For example, research on post-school courses in Italy's construction sector found gaps in the curriculum, including a lack of project management courses and a failure to introduce collaborative work tools and methods. Effectively, there was insufficient alignment with national policies (Balzani, Raco and Zaffagnini, 2017). Additionally, a review of five lower- and middle-income countries (Bhutan, Fiji, Malaysia, Nepal and Pakistan) found that only two (Malaysia and Pakistan) had TVET-specific policies for addressing the needs of Industry 4.0 (Rajput, 2013).

Even with close participation from a range of stakeholders, there is a related issue: accessing relevant expertise and the difficulty of 'perfect timing' in credential development. The Malta College of Arts, Science and Technology provides a telling example: drafting a new qualification for electric cars took eight to twelve months because the internal and external expertise available was limited (Cassar, 2021). In this case, NQCs were identified that

pre-empted the market to the extent that the expertise needed to develop the curriculum was not available in the country.

Introducing flexibility into learning programmes and pathways

As the skills needs of various sectors shift, emphasis is increasingly placed on the process of student autonomy, individual learning and the creation of transversal skills. At times these are reflected in the promotion of new pedagogies or tools, but the conversation in some countries has extended to the promotion of flexible learning pathways which leverage an individual student's prior learning and individual goals.

For example, Popov & Fedorenko (2019) propose the use of systems for 'monitoring the digital footprint of students' to determine individual or personalized development paths (p. 3). **As systems shift to become more student-centred and to accommodate flexible learning pathways, students are increasingly choosing fields and programs with less rigid timeframes that suit their goals – a development that can potentially improve relevance and diversification in TVET systems.**

However, these new modalities also present institutions with new challenges to address. Flexible learning pathways disrupt traditional cohort dynamics and time-bound learning programmes, requiring new institutional principles and types of lecturer-student engagements. These can place a burden on not only lecturers but also school resources. For example, when courses have a small number of registered students, further subdividing the group impacts timetabling, room allocation and staff allocation (Valtonen, 2021).

Promising integration practices

Leverage micro-stakeholder influence within framework conditions

Even in systems with more centralized governance, TVET institutions can still influence the integration of NQCs into curricula through consultations. Though curricular development is led by the national government in Kenya, Rift Valley Technical Training Institute (RVTTI) participates in the development of curricula for Competency Based Education and Training (CBET) courses designed for TVET institutions in consultation with industry stakeholders (Kikwai,

2021). In South Africa, extensive consultation processes with stakeholders including industry players, TVET providers and professional associations determine the alignment of proposed NQCs to the needs of industry and broader society (Magnus, Setusha and Rudolph, 2021). **However, the onus may fall to an institution to actively exert this influence; they may not be asked otherwise in certain national contexts.**

On the other end of the scale, institutions with more autonomy such as MCAST in Malta can undertake a broader range of curriculum design and development processes.

MCAST is regarded as the go-to education institution for the dynamic development and review of programmes to reflect the needs of the market in Malta. Existing programmes at MCAST are reviewed at the end of their first cycle and every three years thereafter in a regular review period, enabling the integration of NQCs into coursework. Reviews are undertaken in a consultative process involving students, student bodies, industry and third sector stakeholders, college staff (such as coordinators and lecturers), institute directors, internal and external academic reviews and data input (such as student results, retention rates and formal complaints).

In addition, MCAST undertakes the development of new employment-oriented programmes and qualifications within its institutes, with the participation of internal and external stakeholders from the world of work, students, and relevant administration and governance departments within the institution. New courses include the Advanced Diploma in Robotics, Drone Technology, Automation and Artificial Intelligence and courses in aircraft maintenance, finance and insurance, and transport and logistics management. MCAST is currently focused on increasing the portfolio of part-time course offerings for lifelong learning and the introduction of new programmes at the master's and PhD levels. MCAST identifies **key principles for the design of an accredited programme** (Cassar, 2021), stating that such a programme should:

- identify the expected student workload in terms of learning credits;
- indicate the target audience and the minimum eligibility and selection criteria, where applicable;
- be learning outcome-based and distinguish between knowledge, skills and competencies;
- identify appropriate learning dynamics and a measure of tutor-learner interaction appropriate for the course level and content;
- identify appropriate resources and forms of assessment;
- identify the minimum requirements in terms of qualifications and competencies for teaching staff;
- be designed so that programmes enable smooth student progression; and
- align with the National Quality Assurance Framework accreditation rules.

Further information: Malta College of Arts, Science and Technology Entrepreneurship Case Study

Collaboration in design and development

TVET institutions with the flexibility to develop curricula often work closely with industry and other partners to do so. **Curriculum design can be consultative even in more centralized models.**

Industry plays a direct role in both institutional governance and in the development of curricula and associated standards. In Italy at the Cometa Formazione Oliver Twist School, hospitality industry partners set the competency requirements for a hospitality certificate for migrants that addresses the needs of the industry, the migrants and the community (Koenig and Nardi, 2019). Shenzhen Polytechnic in China works closely with a specific industry partner, Huawei, to develop programmes and courses that deliver both an academic credential and an industry

certificate for ICT programmes (Yongxue, 2021). Following a series of general education courses at Shenzhen Polytechnic, students specialize in areas such as data communication, cloud computing and artificial intelligence as they pursue one of three levels of industry certification. Shenzhen Polytechnic works closely with its industry partner to regularly review and redesign the courses to fit both the needs of the local ICT industry and broader society.

Integration partnerships can also include donors or sponsors. Examples include the dual apprenticeship model in Benin (Caves et al, 2019) or the donor-funded live enterprise models pursued in locally-relevant industries at the Centre for Technical Vocational Education, Training and Research at the University of Nigeria (Osinem, 2021).

Creating local training content

In some systems, **increasing student autonomy provides institutions the flexibility needed to design responsive, localized content**. For example, in France, the Trades and Qualifications Campus model links TVET institutions, governments and businesses within a given locality, creating a model for accreditation which is inclusive and addresses challenges in a particular region (Shiohira and Keevy, 2020).

At Temasek Polytechnic in Singapore, an extensive review of local and international sources on future trends and competencies undertaken in 2017 resulted in the introduction of a suite of core subjects focused on communication, digital literacy, problem-solving, entrepreneurship and resilience (Veng and Loong, 2021).

RVTTI in Kenya (Kikwai, 2021) and Omnia in Finland (Valtonen, 2021) offer examples of integration through local demand. In Kenya, student demand drove the establishment of a qualification in petroleum geoscience at RTTVI when oil was discovered locally (Kikwai, 2021). In Finland, VET providers can set up vocational units in response to the competency needs of local working life (Valtonen, 2021). Examples include units created for e-commerce, sustainability in the hospitality sector and artificial intelligence.

Putting students in the driver's seat

In countries such as Finland and Malta, there is movement towards more student-centred and flexible learning pathways that mitigate challenges in resourcing and allocations raised by highly individualized learning programmes. For example, Omnia offers students personalized learning pathways that include both compulsory and optional study modules drawn from units and divisions across the institution. Students can also follow thematic learning pathways such as entrepreneurship or international studies (Valtonen, 2021). MCAST has recently introduced concepts such as optional courses and electives to allow students to specialize (Cassar, 2021).

Another approach to flexible learning is demonstrated by Temasek Polytechnic, where two 'Flex Weeks' are embedded within each semester. During these weeks there are no scheduled lessons, and students take time to learn and explore subject matter outside of their disciplines (Veng and Loong, 2021). **Flexible learning pathways work together with the promotion of innovative pedagogies within a curriculum to create student-centred learning environments**. Examples include the integration of Design Thinking into the curriculum at Temasek Polytechnic (Veng and Loong, 2021) and the promotion of project-based learning at the Centre for Technical Vocational Education, Training and Research in Nigeria (Osinem, 2021) and in South Africa (Magnus, Setusha and Rudolph, 2021). At Cometa in Italy, student-centred approaches include the design of curricula and courses for migrants with culture and language courses as well as counselling and support tailored for each individual student (Nardi, 2021b).

Collaborating beyond traditional offerings

TVET institutions can leverage closer collaboration with higher education to create strong pathways for students with multiple exit points. For example, a collaboration between Siemens Ltd and the Swineburne University of Technology in Australia has created a two-step learning pathway in Applied Technologies. Students first receive a Diploma of Applied Technologies, linked to the VET system. At this point they can enter the workforce as an Engineering Technician, or they can continue their learning journey to receive an Associate Degree of Applied Technologies, qualifying them for work as an Associate Engineer (Shiohira, 2021).

TVET institutions are also expanding their offerings in multiple directions. Experts consulted for this paper noted the addition of Bachelors, Masters or PhD-level offerings as one strategy to improve the perception of the TVET sector within their countries. TVET institutions were also seen as well-positioned to provide short skilling courses for general citizens during public emergencies such as the COVID-19 pandemic, as well as to respond to changes in industry standards or equipment for various sectors.

For many decades, the development of qualifications frameworks has attempted to fill the need for more articulated learning pathways and approaches (Coles et al, 2014), but **we are increasingly seeing new forms of qualifications systems emerging (Keevy et al, 2021) that are more flexible, digital, and certainly more able to recognize different forms of learning.**

Even the notion of RPL, which has long been touted as a way to enable competencies in shorter and more agile manners (OECD, 2010; OECD, 2020), seems to gradually be making place for digital solutions (Swedish Council for Higher Education, 2021). Micro-credentials are one such example. **Micro-credentials offer opportunities in non-formal learning that enable students, workers and others in some contexts to make their own determinations about marketable skills and pursue appropriate action, while combinations of distance and modular approaches accommodate broader engagements with communities to develop new and useful skills.** These can be related to employment or broader social needs.

However, some caution must be taken with micro-credentials to avoid situations such as the 'stacking' of components of learning that do not logically fit together, or the undue fragmentation of learning that may occur if the credentials are not well designed (Wheelahan, 2021).

6. Conclusion

This volume set out to provide lecturers, administrators and programme designers with insights into the challenges and opportunities of introducing NQCs into TVET programmes. By drawing on the most recent literature and the nine case studies, we have found that this is an incredibly fast-moving area. We will also be the first to acknowledge that we could not cover all aspects related to the implementation of NQCs within the constraints of this volume, but we trust that we have provided a foundation for many more debates and developments in future years.

We have found that there is much hype about the use of technology in TVET, such as digital platforms and micro-credentials. At the same time, there are many cautions being raised – these are often linked to long-standing and largely intractable issues in TVET, such as the status of the sector, and the need for competent and professional practitioners.

TVET institutions clearly need to stay integrally involved in the new developments but should not discard the progress they have made in the more traditional areas over many years.

NQCs are important to identify and integrate in TVET, and their implementation must be done in a measured and scientific manner. This is the challenge to TVET institutions going forward: be agile and responsive, and also build on the insights gained over many years. Some TVET institutions may be more inclined and able to work on newer and more technologically-enabled qualifications and competencies, while others may not be able to. TVET networks, such as UNEVOC, provide important vehicles through which TVET institutions can share learnings across this new frontier.

References

- Allen Consulting Group, Deloitte Touche Tohmatsu and National Centre for Vocational Education Research. 2003. *The Cost of VET in Schools: An Analysis of the Costs of Delivering VET in Schools Including an Analysis of Cost Efficiencies*. Canberra: DEST.
- Arndt, C., Arent, D., Hartley, F., Merven, B., and Mondal, A. 2019. Faster than you Think: Renewable Energy and Developing Countries. *Annual Review of Resource Economics* 11(1). 149 - 168
- Askitas, N., & Martins, P. S. 2018. Labour Market Data Sources Towards Digital TVET. https://paris21.org/sites/default/files/2018-08/Labour-Market-Data-Sources-TVET_WEB_0.pdf
- Auger, Irwin, Desetti, Bender and Craney. 2020. *The Future of Lifelong Learning: Designing for a Learning-Integrated Life*. D2L White Paper. <https://www.d2l.com/resources/assets/the-future-of-lifelong-learning/>
- Australian Skills Quality Authority (ASQA). 2014. Users' guide: standards for registered training organisations (RTOs) 2015. <http://hdl.voced.edu.au/10707/390791>
- Balasoorya, B. M. C. N., & Kulathunga, I. D. J. 2020. A Study to Identify Ways of Enhancing Industry Partnership Towards Technical Education-The Sri Lankan Context. <https://pub.cpsctech.org/steps04/pdf.pdf#page=41>
- Balzani, M., Raco, F., & Zaffagnini, T. 2017. Learning for Placement. Fostering innovation in the construction sector through public-private partnership in the Emilia-Romagna Region. In: *INTE 2017-International Conference on New Horizons in Education* (Vol. 2, pp. 480-485). Sakarya University.
- Bassier, I., Budlender, J. & Zizzamia, R. 2021. The labour market impacts of COVID-19 in South Africa: An update with NIDS-CRAM Wave 3. <https://cramsurvey.org/wp-content/uploads/2021/02/2.-Bassier-I.-Budlender-J.-Zizzamia-R.-2021-The-labour-market-impact-of-COVID-19-.pdf>
- Batholmeus, P., & Pop, C. 2018. The integration of work-integrated learning in teacher education. In: *Refereed Proceedings of the 3rd International Research Symposium on Cooperative and Work-Integrated Education, Stuttgart, Germany*. http://www.waceinc.org/DHBW2018/WACE_IRS_2018_Refereed_Conference_Proceedings.pdf#page=19
- Belfus, L. 2015. Online and MOOC Content Can Strengthen, But Not Replace, Traditional Education. <https://evollution.com/opinions/online-mooc-content-strengthen-replace-traditional-education/>

- Bettinger, E., & Loeb, S. 2017. Promises and pitfalls of online education. *Evidence Speaks Reports*, 2(15), 1-4. http://www.k12accountability.org/resources/Online-Education/Promises_and_Pitfalls_of_Online_Ed.pdf
- Blom, R., Keevy, J., Green, W., Mathey, M., Magnus, G. & Sethusha, S. 2021. Positioning TVET Lecturer Identities at the Centre of TVET Lecturer Education and Training in a Post-COVID-19 Context. Forthcoming: UNEVOC & GIZ.
- Boeren, E. 2019. Understanding Sustainable Development Goal (SDG) 4 on “quality education” from micro, meso and macro perspectives. *International Review of Education*, 65(2), 277-294. <https://link.springer.com/article/10.1007/s11159-019-09772-7>
- Burning Glass Technologies. 2017. *The Digital Edge: Middle skill workers and careers*. Boston: USA https://www.burning-glass.com/wp-content/uploads/Digital_Edge_report_2017_final.pdf
- British Council. 2018. TVET Governance: The Role of Institutional Leaders. [tv et_governance_document_12_april.pdf](https://www.britishcouncil.org/tvet-governance-document-12-april.pdf) (britishcouncil.org).
- Cassar, E. 2021. Malta College of Arts, Science and Technology Entrepreneurship Case Study. Micro-level case study. Unpublished.
- Caves, K., & Baumann, B. 2018. *Getting there from here: A literature review of VET reform implementation, KOF Working Papers*, No. 441. Zurich: Swiss Economic Institute. <http://dx.doi.org/10.3929/ethz-b-000257741>
- Caves, K., Ghisletta, A., Renold, U., & Kemper, J. 2019. Meeting in the middle: TVET programs' education-employment linkage in developing contexts (No. 460). *KOF Working Papers*. <https://www.econstor.eu/handle/10419/204796>
- Cedefop. 2020. *Strengthening skills anticipation and matching in Estonia: capitalising on OSKA's potential to realise national ambitions*. Luxembourg: Publications Office of the European Union. <http://data.europa.eu/doi/10.2801/12542>
- Crafford, R., & Matthee, M. 2016. Implementing open badges for recognition of learning achievements in South African organisations. In: *Proceedings of the Annual Conference of the South African Institute of Computer Scientists and Information Technologists*. <https://doi.org/10.1145/2987491.2987503>
- Coles, M., Keevy, J., Bateman, A. & Keating, J. 2014. 'Flying blind: Policy rationales for national qualifications frameworks and how they tend to evolve'. *International Journal of Continuing Education and Lifelong Learning*, Vol. 7, No. 1, pp. 17–45. https://www.researchgate.net/publication/274715606_Flying_blind_Policy_rationales_for_national_qualifications_frameworks_and_how_they_tend_to_evolve
- Cuenco, G. C. 2018. Decentralizing TVET in a Federal Philippines. Master's thesis, Faculty of Graduate Studies. <http://dx.doi.org/10.11575/PRISM/34938>

- European Commission. 2020. DigComp 2.1. The Digital Competence Framework for Citizens. <https://ec.europa.eu/jrc/en/publication/eur-scientific-and-technical-research-reports/digcomp-21-digital-competence-framework-citizens-eight-proficiency-levels-and-examples-use>
- European Training Foundation. 2013. Good Multilevel Governance for Vocational Education And Training. 5C0302B17E20986CC1257C0B0049E331_Multilevel governance x VET.pdf (europa.eu).
- European Training Foundation. 2019. *Governance arrangements for vocational education and training in ETF partner countries Analytical overview 2012–17*. VET governance in ETF partner countries 2012-17.pdf (europa.eu)
- European Training Foundation. 2021. *The Future of Skills. A case study of the agri-food sector in Morocco*. Turin: ETF. https://www.etf.europa.eu/sites/default/files/2021-04/future_of_skills_agri-food_sector_in_morocco.pdf
- Fahrner, M., & Schüttoff, U. 2020. Analysing the context-specific relevance of competencies–sport management alumni perspectives. *European Sport Management Quarterly*, 20(3), 344-363. <https://doi.org/10.1080/16184742.2019.1607522>
- Fasih, T. 2014. Raising Botswana's human resource profile to facilitate economic diversification and growth. <http://hdl.voced.edu.au/10707/372504>
- Gessler, M. 2017. Educational Transfer as Transformation: A Case Study about the Emergence and Implementation of Dual Apprenticeship Structures in a German Automotive Transplant in the United States. *Vocations and Learning* 10, 71–99. <https://doi.org/10.1007/s12186-016-9161-8>
- Gewer, A. & Pereira, C. 2018. New Skills for Youth Initiative. Report prepared for the PM Morgan Chase & Company. Unpublished.
- Hamdan, N. H., Yunos, J. M., & Sern, L. C. 2019. Criteria for sustainable curriculum of TVET teacher education programme in Malaysia. *Journal of Technical Education and Training*, 11(3). <https://publisher.uthm.edu.my/ojs/index.php/JTET/article/view/3111>
- Husain, S. H., Che-Ani, A. I., Affandi, H. M., Nasri, N. M., & Musid, N. A. 2020. Mismatch in Supply and Demand of Building Surveying Graduates' Skills: A Triangulation Perspective. *Journal of Technical Education and Training*, 12(4), 70-80. <https://publisher.uthm.edu.my/ojs/index.php/JTET/article/view/3966>
- International Labour Organization (ILO). 2018. *Women and Men in the Informal Economy: A Statistical Picture*. Geneva: ILO. https://www.ilo.org/wcmsp5/groups/public/---dgreports/---dcomm/documents/publication/wcms_626831.pdf
- International Labour Organization (ILO). 2020. *The Digitization of TVET and Skills Systems*. Geneva: ILO. https://www.ilo.org/wcmsp5/groups/public/---ed_emp/---emp_ent/documents/publication/wcms_752213.pdf

- International Telecommunication Union. 2020. Measuring digital development: Facts and figures 2020. ITU Publications. <https://www.itu.int/en/ITU-D/Statistics/Documents/facts/FactsFigures2020.pdf>
- Ismail, A. A., & Hassan, R. 2019. Technical competencies in digital technology towards industrial revolution 4.0. *Journal of Technical Education and Training*, 11(3). <https://publisher.uthm.edu.my/ojs/index.php/JTET/article/view/3208>
- Jambari, H., Razali, N. A., Taman, I., Noh, N. H., Osman, S., Ahmad, J. & Rameli, M. R. M. 2018. Conceive-design-implement-operate (CDIO) approach for an innovative capstone project. *Journal of Technical Education and Training*, 10(2). <https://publisher.uthm.edu.my/ojs/index.php/JTET/article/view/3122>
- Kadira, R. B. A., Saidb, T. A., & Thangaveluc, L. 2020. IR 4.0 Knowledge and Readiness of Lecturers at the Teachers Education Institute, Technical Education Campus, Malaysia. *International Journal of Innovation, Creativity and Change*, 11(11), 1-29.
- Kamarudin, N. & Teh, H. 2017. Enhancing TVET Graduates' 21st Century Skills Through an Integrated Curriculum-the Malaysian Polytechnics' Experience. In: *International Conference on Skills for the Future World of Work and For Global Competitiveness. Dhaka, Bangladesh: Institution of Diploma Engineers Bangladesh (IDEB)*. https://www.researchgate.net/profile/Noreen-Kamarudin/publication/320708547_Enhancing_TVET_Graduates%27_21st_Century_Skills_Through_An_Integrated_Curriculum-the_Malaysian_Polytechnics%27_Experience/links/59f6c524458515547c2320e6/Enhancing-TVET-Graduates-21st-Century-Skills-Through-An-Integrated-Curriculum-the-Malaysian-Polytechnics-Experience.pdf
- Kanwar, A., Balasubramanian, K., & Carr, A. 2019. Changing the TVET paradigm: New models for lifelong learning. *International Journal of Training Research*, 17(sup1), 54-68. <https://doi.org/10.1080/14480220.2019.1629722>
- Keevy, J., Castel-Branco, E., Bateman, A., Vally, Z., Overeem, M., Mavimbela, L., Adotevi, J., Sutherland, L., Matlala, R., Kyari, U.F. & Sibiya, T. 2021. *Towards the African Continental Qualifications Framework – Mapping report*. Turin/Addis Ababa: European Training Foundation and Deutsche Gesellschaft für Internationale Zusammenarbeit.
- Kikwai, J.K. 2021. Greening in TVET: A case study of the Rift Valley Technical Training Institute, Eldoret, Kenya. Micro-level case study. Unpublished.
- Koobonye, S. 2020. TVET in Botswana: a case study on its ability to develop demand-driven and competence-based skills for the labour market (Doctoral dissertation, Bundesinstitut für Berufsbildung). <https://d-nb.info/1209514117/34>
- Koh, J. H. L., Chai, C. S., Benjamin, W., & Hong, H. Y. 2015. Technological pedagogical content knowledge (TPACK) and Design Thinking: A framework to support ICT lesson design for 21st century learning. *The Asia-Pacific Education Researcher*, 24(3), 535-543.

- Kraak, A. 2015. *Sector Skills Councils in International Perspective: In Search of Best Practice*. Research Report commissioned by the Technical Task Team of the Human Resources Development Council (HRDC). Pretoria: the Presidency of South Africa.
- Langthaler, M., & Bazafkan, H. 2020. *Digitalization, education and skills development in the Global South: an assessment of the debate with a focus on Sub-Saharan Africa*. Austrian Foundation for Development Research-ÖFSE. https://www.researchgate.net/profile/Margarita-Langthaler/publication/346252877_Digitalization_education_and_skills_development_in_the_Global_South_an_assessment_of_the_debate_with_a_focus_on_Sub-Saharan_Africa_28/links/5fbd163fa6fdcc6cc6610537/Digitalization-education-and-skills-development-in-the-Global-South-an-assessment-of-the-debate-with-a-focus-on-Sub-Saharan-Africa-28.pdf
- Loo, J. V. 2020. *Strengthening skills anticipation and matching in Estonia: capitalising on OSKA's potential to realise national ambitions*. Luxembourg: Publications Office of the European Union. <https://www.cedefop.europa.eu/en/publications-and-resources/publications/4183>
- Maina, T. M., Kahando, D. M., & Maina, C. M. 2017. Curriculum Content Relevancy in Integration of ICTs in Kenya TVET Institutions in Readiness to Industry Needs. <http://article.sciencepublishinggroup.com/html/10.11648.j.ijssedu.20160406.11.html>
- Maurer, M. & Gonon, P. 2014. The challenges in policy transfer in vocational skills development – An introduction. *Studies in Vocational and Continuing Education*, Volume 12. Bern: International Academic Publishers
- Mtshali, T. I., & Ramaligela, S. M. 2020. Contemporary Employability Skills Needed for Learners to Succeed in the Civil Technology Field in the 4IR Era. *Journal of Technical Education and Training*, 12(3), 29-40. <https://publisher.uthm.edu.my/ojs/index.php/JTET/article/view/6325>
- Nardi, P. 2021a. Cometa Formazione and the Minimaster for Migrants Case Study. Micro-level case study. Unpublished.
- Nardi, P. 2021b. Cometa Formazione and the School-Enterprise Model Case Study. Micro-level case study. Unpublished.
- OECD. 2010. *Recognition of Non-Formal and Informal Learning: Country Practices*. Paris: OECD. <http://www.oecd.org/education/skills-beyondschool/44600408.pdf>
- OECD. 2020. *OECD Future of Education and Skills 2030. Conceptual learning framework*. Paris: OECD.
- Olanrewaju, F. J., Ojo, O. J., & Peter, O. I. 2020. Adopting the Conceive-Design-Implement-Operate (CDIO) Approach in the National Curriculum for Improving Technical Vocational Education and Training (TVET) programmes. *Vocational and Technical Education Journal*, 2(2). <https://acjool.org/index.php/votej/article/view/810>
- Oliver, B. 2019. *Making micro-credentials work for learners, employers and providers*. Australia: Deakin University. <http://hdl.voced.edu.au/10707/515939>

- Omar, M., Rauf, A., Ismail, N., Rashid, A., Puad, M., & Zakaria, A. 2020. Factors On Deciding TVET For First Choice Educational Journey Among Pre-Secondary School Student. *European Journal of Molecular & Clinical Medicine* 7(3). 609 – 627. https://ejmcm.com/article_1543_6e7c9d3dc85294169807627600857ca3.pdf
- Osinem, E.C. 2021. Entrepreneurship Development in TVET: the case study of Centre for Technical Vocational Education, Training and Research, University of Nigeria, Nsukka. Micro-level case study. Unpublished.
- Oswald, F., Behrend, T.S. & Foster, L.L. 2019. *Workforce Readiness and the Future of Work*. New York: Routledge.
- Otero, J. P. G. D., Cole, T., & Lima J, W. 2020. Trends in new qualifications and competencies for TVET: perspectives of the European UNEVOC Network. <http://hdl.voced.edu.au/10707/558822>
- Oxfam India. 2018. NGOs Strengthening the Education System in India. <https://www.oxfamindia.org/blog/ngos-strengthening-education-system-india>
- Paterson, A., Keevy, J. & Boka, K. 2017. *Exploring a Work-Based Values Approach in South African Colleges to Improve Employability of Youth: Literature review*. Johannesburg: JET Education Services.
- Pilz, M., Wiemann, K. 2021. Does Dual Training Make the World Go Round? Training Models in German Companies in China, India and Mexico. *Vocations and Learning* 14, 95–114. <https://doi.org/10.1007/s12186-020-09255-z>
- Popov, A. I., & Fedorenko, R. V. 2019. Individualization of Training Using the Resources of International Digital Platforms. In: *SHS Web of Conferences (Vol. 71, p. 05001)*. EDP Sciences. <https://doi.org/10.1051/shsconf/20197105001>
- Pruvot, E. B., & Estermann, T. 2017. University autonomy in Europe III. The Scorecard. https://www.uni-med.net/wp-content/uploads/2019/07/University-autonomy-in-Europe_2017.pdf
- Rajab, R., Nomvete, S., Manda, M. & Keevy, J. 2020. *Unlocking the power of data. A review of the state of readiness of the post-school education and training sector in South Africa for enhanced data interoperability*. Johannesburg: JET Education Services and merSETA. <https://www.jet.org.za/resources/unlocking-the-power-of-data-final-web-nov2020.pdf/download>
- Rajput, A. G. 2013. Status of TVET in Relation to Industrial Revolution 4.0 in CPSC Member Countries. Scholarly Technical Education Publication Series, Volume 4, 2020, pp.93-104.
- Ramasamy, D., & Reddy, L. S. 2018. A study on the lack of job creation in the Indian IT industry. *Indore Management Journal*, 10(1). https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3494152
- Magnus, G., Setusha, S. & Rudolph, C. 2021. Project-Based Teaching and Learning for Electrical and Plumbing in-service TVET Lecturers: An innovative, interdisciplinary Lecturer Capacity Building programme for the 21st century. Micro-level case study. Unpublished.

- Sasseta. 2019. *Inspiring and Enabling Innovation within TVET Colleges*. <https://www.sasseta.org.za/download/92/tvet-colleges-study-final-report-revised/7476/tvet-colleges-study-final-report-revised.pdf>
- Shiohira, K., & Keevy, J. 2020. *Virtual Conference on Artificial Intelligence in Education and Training: Virtual Conference Report. UNESCO-UNEVOG TVET Forum, 11 to 15 November 2019. UNESCO-UNEVOG International Centre for Technical and Vocational Education and Training*. Bonn: UNEVOG.
- Stanwick, P. A., & Stanwick, S. D. 2020. The Rise and Fall of Eastman Kodak: Looking Through Kodachrome Colored Glasses. <https://www.ajhssr.com/wp-content/uploads/2020/12/ZB20412219224.pdf>
- Swedish Council for Higher Education. 2021. Recognition of Prior Learning in Practice. Putting policies to work – experiences from two years of peer learning. UHR's report series 2021:4. https://www.uhr.se/globalassets/_uhr.se/publikationer/2021/uhr-recognition-of-prior-learning-in-practice.pdf
- Tan, C. 2017. Lifelong learning through the Skills Future movement in Singapore: Challenges and prospects. *International Journal of Lifelong Education*, 36(3), 278-291. <https://doi.org/10.1080/02601370.2016.1241833>
- Thelen, K. and Busemeyer, M. 2012. Institutional Change in German Vocational Training: From Collectivism toward Segmentalism. In M. Busemeyer and C. Trampusch (Eds), *The Political Economy of Collective Skill Formation*. Oxford Scholarship Online DOI: 10.1093/acprof:oso/9780199599431.001.0001
- UNESCO. 2020a. Reforming TVET in Iraq. TVET Governance (unesco.org)
- UNESCO. 2020b. Policy brief: using digital credentials to keep the promises of TVET. <https://unesdoc.unesco.org/ark:/48223/pf0000374389>.
- UNESCO-UNEVOG International Centre. 2020a. Trends in New Qualifications and Competencies for TVET Perspectives of the European UNEVOG Network. UNESCO-UNEVOG. https://unevoc.unesco.org/pub/bilt_trends_mapping_study.pdf
- UNESCO-UNEVOG International Centre. 2020b. *Future of TVET teaching*. UNESCO-UNEVOG.
- United Nations. 1989. *Convention on the Rights of the Child*. United Nations, Human Rights Office of the Commissioner. <https://www.ohchr.org/en/professionalinterest/pages/crc.aspx>
- Valtonen, K. 2021. BILT Micro-level Entrepreneurship Case Study: OMNIA. Micro-level case study. Unpublished.
- Veng, L.T. & Loong, L.T. 2021. Case Study on the Polytechnic-wide Innovation & Entrepreneurship Initiatives in Temasek Polytechnic, Republic of Singapore. Micro-level case study. Unpublished.

- Volmink, J., & van der Elst, L. 2017. The evolving role of 21st Century Education NGOs in South Africa: Challenges and Opportunities. National Education Collaboration Trust. <https://www.mietafrica.com/wp-content/uploads/2017/04/The-evolving-role-of-21st-Century-Education-NGOs-in-South-Africa.pdf>
- Yongxue, W. 2021. Coupling of TVET Curriculum and Enterprise Certification: A Case Study of Cooperation between Shenzhen Polytechnic and Huawei. Micro-level case study. Unpublished.
- Wheelahan, L. 2021. Rethinking Pathways: Why a New Approach is Needed, A Report from Australia. Published online: https://www.academia.edu/6798110/Rethinking_Pathways_why_a_new_approach_is_needed_a_report_from_Australia
- World Bank Group. 2020. TVET Systems' response to COVID-19: Challenges and Opportunities. <http://documents1.worldbank.org/curated/en/930861589486276271/pdf/TVET-Systems-response-to-COVID-19-Challenges-and-Opportunities.pdf>
- World Economic Forum. 2014. Delivering Digital Infrastructure: Advancing the Internet Economy. http://www3.weforum.org/docs/WEF_TC_DeliveringDigitalInfrastructure_InternetEconomy_Report_2014.pdf



unesco

International Centre for
Technical and Vocational
Education and Training

New qualifications and competencies

for future-oriented TVET systems

This document is organized in three volumes and aims to cater to the diverse needs of TVET-related institutions. From their unique perspectives, the document explores and examines the three I's process: the timely and accurate identification of NQCs, their integration into appealing and flexible curricula, and their effective implementation through new teaching and learning methods as well as relevant teacher and trainer training. Illustrated with case studies and practical examples, the document proposes solutions to specific challenges, and offers a database of experiences and lessons from across the world.

Stay in touch



unevoc.bilt@unesco.org



<https://unevoc.unesco.org/bilt>



@unevoc



[unesco.unevoc.international](https://twitter.com/unesco.unevoc.international)

The BILT project is implemented with support of



and sponsored by the



Federal Ministry
of Education
and Research

