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

New qualifications and competencies for future-oriented TVET

TVET governance

Steering collective action

Volume 1

Education 2030

New qualifications and competencies for future-oriented TVET

TVET governance

Steering collective action

Volume 1

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.

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
United Nations
Educational, Scientific
and Cultural Organization

Education 2030

UNESCO-UNEVOC International Centre for Technical and Vocational Education and Training
UN Campus
Platz der Vereinten Nationen 1
53113 Bonn
Germany

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 Phil Loveder
from the National Centre for Vocational Education Research, Australia

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 Expert **Phil Loveder** from the National Centre for Vocational Education Research (NCVER), Australia.

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:

- **Mr Iñigo Araiztegui**
  Director of Internationalization, Basque Centre of Research and Applied Innovation in Vocational Education and Training (TKNIKA), Basque Country, Spain
- **Mr Jens Bjornavold**
  Senior Expert, European Centre for the Development of Vocational Training (Cedefop), Belgium
- **Ms Christina Hong**
  President, Technological and Higher Education Institute of Hong Kong (THEi), China
- **Mr Joseph Kikomeko**
  Assistant Commissioner, Teacher and Instructor Education and Training (TIET), Ministry of Education and Sports, Department of Business, Technical, Vocational Education and Training (BTVET), Uganda
- **Mr Gabriel Konayuma**
  Senior VET Officer and Curriculum Development Specialist, Ministry of Higher Education, Zambia

- **Mr Rikardo LaMadrid**
  Director of Technology and Advanced Learning of the VET Vice Ministry, Department of Education, Basque Government, Basque Vice-Ministry of VET, Spain

- **Ms Inga Schad-Dankwart**
  Senior Researcher, Federal Institute for Vocational Education and Training (BIBB), Germany

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, Germany

- **Ms Vera Hark**
  Project Manager, BIBB, Germany

- **Mr Michael Schwarz**
  Senior Technical Advisor, BIBB, Germany

- **Mr Matt Zuvela**
  Sustainable Development Editorial and Communications Consultant; and

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

- **Mr Reinhard Noebauer**
  Austrian Federal Ministry for Education, Science and Research (BMBWF TVET), Austria

- **Mr Matthews Phiri**
  Human Resource Development Council (HRDC), Botswana

- **Ms Deepti Saxena**
  National Skill Development Corporation (NSDC), India

Table of contents

Acronyms and abbreviations

AI	Artificial Intelligence
AISC	Australian Industry and Skills Committee
AMS	Austrian Labour Market
ASQA	Australian Skills Quality Authority
BIBB	Federal Institute for Vocational Education and Training (Germany)
BMBF	Federal Ministry of Education and Research (Germany)
BMO	Business Membership Organization
BTVET	Ministry of Education and Sports, Department of Business, Technical, Vocational Education and Training (Uganda)
Cedefop	European Centre for the Development of Vocational Training
CEGEPS	Collège d'enseignement général et professionnel (Québec, Canada)
CET	Continuing Education and Training
DigComp-Edu	European Framework for the Digital Competence of Educators
E3M3	Energy, Environment, Economy
EDUFI	Finnish National Agency for Education
EMBOs	Employer and Business Membership Organizations
ESCO	European Skills, Competences, Qualifications and Occupations
ETF	European Training Foundation
	Eurostat - Statistical office of the European Union
ILO	International Labour Organization
ICT	Information and Communication Technology
IVAC-EEI	Instituto Vasco del Conocimiento de la Formación Profesional (Basque Country, Spain)
JEDI	Jobs and Education Data Integration
LMIP	Labour Market Information Portal
LMIS	Labour Market Information Systems
MELS	Ministère de l'Éducation, du Loisir et du Sport (Canada)
MOOCs	Massive Open Online Courses
NQC	New Qualifications and Competencies
NSDC	National Skill Development Corporation (India)
OECD	Organization for Economic Co-operation and Development
O*Net	US Department of Labour Occupational Information Network
OVATE	Online Vacancy Analysis Tool for Europe
PMRVY	Pradhan Mantri Kaushal Vikas Yojana (India)
SENAI	National Service of Industrial Training (Brazil)
SMEs	Small and medium-sized enterprises
Thei	Technological and Higher Education Institute of Hong Kong (China)
Tiet	Teacher and Instructor Education and Training
TK-gune	Innovation and Technology Transfer Network (Spain)
TKNIKA	Basque Centre of Research and Applied Innovation in Vocational Education and Training (Spain)
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
VTC	Vocational Training Council (Hong Kong, China)

1. Introduction

A total of three volumes on new qualifications and competencies (NQCs) in TVET focus on the role of different stakeholder groups, which are categorized into macro, meso and micro levels. These stakeholders are principally responsible for the following processes: efficient and rapid identification of NQCs, prioritization and integration of NQCs into curricula and training regulations, and effective implementation of NQCs into learning environments.

This volume – 'TVET Governance: steering collective action' – is written with the macro-level or system-level stakeholder in mind.

Macro level stakeholders can be any number of bodies with a mandate for collective action in TVET. This primarily covers ministries and statutory bodies with legally assigned duties in the governance of TVET. Policy and operational managers interested in understanding some of the challenges and opportunities of introducing NQCs into TVET systems are most likely to benefit from the findings in this volume, but readers are encouraged to explore the other two volumes for additional insights: 'TVET advocacy: ensuring multi-stakeholder participation' targets meso-level stakeholders, while 'TVET delivery: providing innovative solutions' focuses on micro-level stakeholders.

Macro-level stakeholders, including governments, national ministries and other 'meta organizations', play important roles in all three aspects of NQCs. However, it is in their identification and integration where they exercise the most influence; stakeholders at the macro level often contribute to NQC implementation through a range of 'enabling' or supportive activities.

While micro-level stakeholders such as TVET institutions tend to be most directly responsible for effective implementation of NQCs, their success depends on a commitment from macro stakeholders to providing a suitable environment for NQCs to thrive and take hold. Macro-level stakeholders can create such an environment through funding mechanisms, positive policy changes, conducive regulatory and governance environments and curricular development. Different frame conditions within a country will determine which approaches will work best, but a commitment from macro stakeholders to supporting the effective implementation of NQCs will ensure their relevance and durability in the longer term.

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 arguably 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, by being part of a complex set of solutions to the world's growing challenges.

These demands can only be met if TVET keeps up with the pace of change: all societies are confronted with accelerated innovation in digital technology, new demands in sustainability and environmental protection, the need for entrepreneurial mindsets and increased processes of migration. These are just a few areas where TVET systems must respond more rapidly than in the past to modernize infrastructure, capacities and practices. We need to look no further than the COVID-19 pandemic for a convincing example that demonstrates the need for education systems to prepare for unprecedented and unpredictable disruptions.

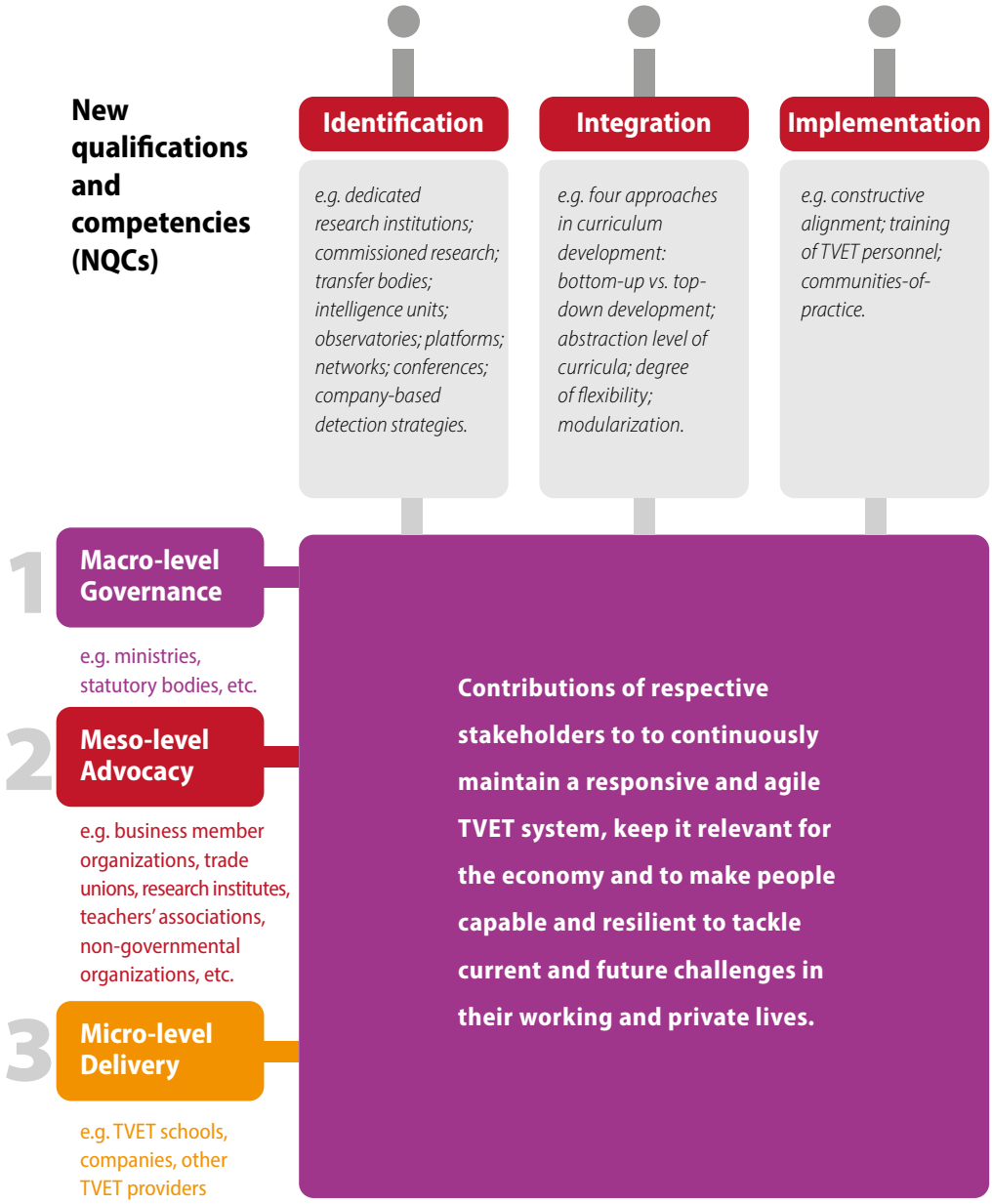
What is the best way to keep TVET responsive to economic and societal changes, with the agility to swiftly address new challenges? In other words, how should TVET approach NQCs? Our approach centres upon the best methods to identify NQCs, integrate them into curricula and training regulations and effectively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

What are NQCs?

We recognize that there is limited common understanding in the international TVET community on terms such as 'qualification' and 'competencies'. In this publication, we have 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 to be understood as a non-observable disposition and inner potential of people. As such, it covers knowledge, skills and attitudes (knowing – doing – wanting). At a certain point in the design of curricula and training regulations and for assessment purposes, competencies need to be put into observable and measurable form.

In this publication, 'qualification' is understood as a formal proof of successfully completed learning according to an agreed standard.

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 find ways to remain up to date and future ready in three broad stages:

- Provisions for identifying relevant NQCs in a timely and accurate manner that reflect ever-faster evolution in the private sector, society and economies.
- Procedures for integrating NQCs into flexible and agile curricula, creating different learning pathways, allowing for greater convergence with general education and providing intermediary exits to the labour market.
- Ways for implementing NQCs in classrooms and workshops, which include adopting innovative teaching and learning practices and introducing proper training for teachers and trainers and adequate pedagogical environments.

This volume of the publication focuses on how macro stakeholders can utilize available models and methods to identify and justify the need for NQCs, how to integrate these into formal governance and policy structures and finally to support their successful implementation. It discusses the impact of the different 'frame conditions' that exist on the three stages of the NQC process, examines challenges and opportunities and explores what 'influence' macro stakeholders can have on meso and micro level organizations who are very often partners in the journey.

The three volumes of the publication are unique in their context-specific scope: recognizing that stakeholders at each level face different but related challenges, the insights contained in these documents are aimed at creating complimentary approaches to governance, advocacy and delivery of NQCs in TVET.

Methodology and structure of this publication

Each of the following sections is devoted to one part of the three-i approach. The sections are broken down into frame conditions that might apply for macro stakeholders tasked with identifying, integrating and implementing NQCs; key challenges; and existing innovation and learning practices that could inform potential first or next steps.

In addition, case examples show how existing innovation and learning practices used in different TVET settings could inspire replication and/or adaptation within other contexts.

Not all the 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 upon 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.

3. How are NQCs identified and prioritized by stakeholders at the macro level?

Frame conditions

While macro-level stakeholders are generally defined here as institutions with a legislative mandate to identify new qualifications and competencies, this falls to different bodies in different contexts, with cases where both national and regional level approaches are used. In the Basque Country, Spain, for example, the entire NQC process is handled at the 'sub national' level and involves the full range of industry, union and social partners. In fact, there is emerging evidence that in some country contexts, national 'primacy' in setting the agenda for NQCs is being challenged by a move to greater regional autonomy. At the other end of the scale, major global players in industry are also assuming more influence in identifying NQCs.

Regardless of what body has the mandate to identify NQCs or where the lines are drawn between top-down and bottom-up approaches, there are current gaps in our knowledge and understanding of the relationship between demand and supply side factors: when and how labour markets and societies articulate their expectations, for example, or how to future-proof a TVET system to capture NQCs and ensure their renewal.

Given the range of 'disruptive forces' increasingly being observed in digitalization, sustainable development, migration and the need for entrepreneurial mindsets, it comes as no surprise that gaps in effective information sharing between labour market stakeholders (especially industry) and those dedicated to supply (especially TVET providers) occur in many national contexts. This creates a general disconnect in the identification, integration and implementation of NQCs.

Key challenges

Data availability and quality

A significant challenge for many macro stakeholders is having the available data and richness of information to identify and understand the need for NQCs. By their very nature, NQCs often involve very new or emerging skills and competencies, or ones that have not yet been routinely integrated into mainstream curricula or training regulations.

Current systems of defining occupations are sometimes based on out-dated national occupational classifications that do not reflect new job titles or contain job titles that are effectively obsolete. This can make it a challenge to understand what competencies are required for 'new jobs', as the jobs themselves are not yet fully understood. Making matters worse, standard industry classifications often fail to adequately encompass 'niche sectors', which are precisely the sectors often found at the forefront of innovation and technology and therefore

in demand. Skills data (for example) on these sectors is often either unavailable or aggregated at a level that inhibits granular understanding of unique competency needs.

Additionally, many of the demands for NQCs are being created in very new or digital-intensive industries, such as in specialist manufacturing and ICT. A solid understanding of these emerging industries has yet to be established (UNESCO, 2020).

Cultivating new stakeholder relationships

Another challenge is ensuring 'buy-in' from important stakeholders to the process of identification. Not all countries have a history (for example) of institutionalized consultation processes between macro stakeholders (such as government) and meso level stakeholders (such as industry peak bodies or unions). In addition, a culture of public-private partnership may not exist in many countries where stakeholders maintain the position that developing competency in the workforce is a 'government responsibility'.

There are two challenges around effective consultation. The first is reconciling the interests of the different types of enterprises involved. For example: how do small, emerging or micro industries have their voices heard? The second challenge is creating a mindset shift among employers that gets them thinking beyond short-term reskilling or up-skilling requirements and instead focusing on long-term implementation of NQCs. In all of this, understanding who is ultimately responsible for identifying NQCs and feeding these down to the meso and micro levels (the 'implementers') is necessary. At the same time, macro-level stakeholders need to be receptive to input on identifying NQCs from stakeholders on other levels.

Experience also shows that many industries are moving to adopt technological advancements arising from Industry 4.0 (and increasingly Industry 5.0[1]) in a simultaneous way, especially when it involves significant capital investment or technological 'know-how'. In these instances, TVET needs transition strategies for identifying, understanding and accounting for rapidly changing industry and market requirements.

Existing and promising practices

Taking the lead on stakeholder consultation

Consultation with important stakeholders about the needs of their workforces and what NQCs are required is a common and tested way of understanding which competencies are in-demand by employers and societies. This often takes the form of national stakeholder engagement efforts by peak governmental and employer groups, such as industry skills boards or Employer and Business Membership Organisations (EMBOs) (ILO, 2020).

1 Industry 5.0 provides a vison of industry that aims beyond efficiency and productivity as the sole goals and reinforces the role and the contribution of industry to society. It places the wellbeing of the worker at the centre of the production process and uses new technologies to provide prosperity beyond jobs and growth while respecting the production limits of the planet (EU, 2021).

In Germany and many other European countries, the goal is to reach common ground (where possible) on priorities with multiple stakeholders through consultation that includes representatives from different contexts (big and small companies for example). However, this model is not easily replicable in certain country contexts, especially where the tradition of industry and government working closely in the TVET system has not been established.

Even where this practice is established, an essential question remains: how do we bring the different stakeholders together and reconcile the differing perspectives, and who has the final say? In Germany it is primarily government, in Switzerland it is employers, and in other systems there are other de facto players who are influential. In Brazil, it is sectoral technical committees who are responsible for identifying and defining professional standards and profiles.

Spain – Framework for understanding and defining NQCs

The Basque Country in Spain has implemented a range of innovations focused on NQCs that extend across all elements of their identification, integration and implementation. Their comprehensive framework includes three different elements of 'identification': research, prospective activities and collaboration.

Research involves understanding what qualifications and competencies are required in important regulated professions or those that require specific accreditation for professional performance. NQC proposals with wide industry, employer and broader community support are submitted to the government for consideration (IVAC-EEI, 2021).

The prospective activities have focused on introducing growth 'hubs' in prospective industries like biosciences, advanced manufacturing, digital connected factories and advanced manufacturing to inform the development of highly relevant NQCs in these industries and address important technology and environmental concerns. This has additionally been supported through the Basque Industry 4.0 plan designed to incorporate 'intelligent systems' into the production processes of employers.

Collaboration involves the coordinated involvement and participation of business peak bodies, scientific and technology organizations, training institutions and sector promotional agencies in the areas of research and development, competitive development of SMEs and tailored training for high priority sectors (such as automation, energy, high technology manufacturing and creative industries). This is facilitated through the Innovation and Technology Transfer Network (TK-gune) and professional training centres.

Further information: Instituto Vasco del Conocimiento de la Formación Profesional - IVAC-EEI - Presentación

Industry often plays an important role in driving the need for change in NQCs. In many countries, these decisions are based on demand or changing labour market needs, identified through skills and competency anticipation exercises or sectoral reviews (Wibrow and Waugh, 2021).

Advantages to the stakeholder survey approach

The use of stakeholder surveys is another common method for gathering information on the demand for specific competencies and qualifications to inform future policy decisions and strategies. Sector-based skills surveys or 'intelligence gathering' efforts often focus on:

- the demand for new qualifications (including skills requirement of new entrants or existing workers, also known as the 'reserve workforce')
- the extent of skills deepening, which reflects overall change in qualification profiles from one period to the next
- general pathways information about occupations or jobs (Training and Skills Commission, 2018).

Many countries have also implemented employer satisfaction or reflection surveys for assessing TVET systems. In addition to gaining a sense of how satisfied employers are with the quality of training provided through TVET, these surveys also focus on the skills and competencies that graduates possess and the extent to which they align with current and emerging trends in industry. These surveys typically provide quantitative and/or qualitative information about the labour market outcomes: destination, employment status and occupation and/or satisfaction levels of both VET learners and employers.

Leveraging job and careers databases

A range of databases have been established across the world that contain standardized and occupation-specific descriptors for jobs. These are organized into 'taxonomies' that can be analysed to provide insights into the types of skills required for various occupations or job families. One of the earliest examples is the US Department of Labour Occupational Information Network (O*Net) database, which catalogues information on the personal requirements and characteristics needed to perform certain jobs. The database also includes information on licensing, credentials and experience and the outlook for jobs in the economy.

Existing databases on jobs and competencies are a good place to start if an equivalent system does not exist in your national or regional context. Some NQCs are universal to a degree, and context specific modification can always follow as a next step.

The European Commission has developed an alternative to O*Net to better reflect the European labour market. It is increasingly used as a reference point for big data analysis, such as the European Centre for the Development of Vocational Training (Cedefop) OVATE project that aims to develop big data analysis of European job vacancies (Cedefop, 2021). The classification of European Skills, Competences, Qualifications and Occupations (ESCO) is a multilingual platform containing an assembly of skills information using web tagging technology (Siekmann & Fowler,

Austria – Austrian Labour Market (AMS) Standing Committee on New Skills

The Public Employment Service Austria, in cooperation with Austrian social partners, set up an 'AMS Standing Committee on New Skills' in 2009 to support companies, employees and jobseekers in preparing for new trends in the world of work as early as possible and in a targeted manner (Cedefop, 2021).

Within the framework of the standing committee, groups of specialists are set up every year, in which experts from various professional areas ('clusters') identify short to medium-term qualification requirements.

In collaboration with experts from companies, the committee continually initiates projects/workshops/lectures that aim to identify the needs for updating existing qualifications and the creation of new ones. Based on these projects, the committee develops continuing education and training (CET) programmes to make it easier for jobseekers to re-enter the world of work.

Working groups including business representatives are created for specific sectors (such as construction and building, business administration or health). These groups then formulate a list of current and future sector-specific requirements for the employees and jobseekers in the respective trades. The outcomes are used by the Austrian Labour Market Service for the design of training measures for the unemployed and can also be used to guide (further) training in companies and in specific occupations.

Further information: AMS Standing Committee on New Skills | CEDEFOP (europa.eu)

2017). Similarly, Australia has modified aspects of O*Net in its search engine – the Jobs and Education Data Integration (JEDI) platform – to suit local customization.

The OECD skills for jobs database provides a ranking of occupations that are considered hard to fill (or conversely easy to fill) for firms based on four areas of growth (wages, employment, hours worked and under-qualification – the proportion of workers with qualifications below what is required for their job) and the unemployment rate.

Scanning the internet: job vacancy analysis

Data on internet job postings sourced from job advertisements (and their descriptions) posted on various websites is a relatively new way of identifying new and emerging competencies as well as the underlying knowledge and personal attributes required for jobs and industries. These data are collected and coded to provide information on the numbers and types of jobs available as well as the various attributes of these jobs, including the competencies required or considered desirable

by employers. This information is not always readily available through traditional sources of labour market information (Korbel, 2018).

The approach involves scanning relevant websites where job postings are listed. These include trade jobs boards, corporate websites and internet jobs-posting and recruitment websites. Tools such as Burning Glass Technologies use artificial intelligence (AI) technology to analyse millions of job postings, resumes and social profiles to provide insights into labour market patterns. Other search engines with similar abilities include ADZUNA, which currently operates across 16 countries and takes data directly from job portals (Stanwick and Hall, 2021).

In addition, there are emerging platforms such as the NESTA Innovation Agency, and various proprietary platforms such as Qualski and FAETHM which are established to predict the effect of new and emerging technology on human capital management and new skills – especially arising from Industry 5.0.

Forecasting methods for skills anticipation

Eurostat (2016), Braham and Tobin (2020) and Kosorukova et al (2016), describe approaches to the measurement of competencies in terms of skills supply, skills demand, skills mismatch (the match between the qualifications and skills people have in a job as opposed to what the job requires) and skills development (initial, continuing and work-based). These make use of selected economic, education, demographic and labour market indicators that can be used to predict the need for NQCs. The International Labour Organization (ILO, 2018) describe four important considerations in establishing indicators-based skills forecasting or anticipation systems:

- Identify clear objectives for skills assessment and anticipation systems – Determine the final use of the information to be collected (for example: policy formulation, strategic planning or career guidance) and ensure all relevant stakeholders are involved in setting objectives.

- Set up information systems that support these objectives – Develop exercises that maximize the use of extant qualitative and quantitative data, and include sectoral and sub-national dimensions, particularly in countries with decentralized decision-making in key areas where NQC information is used.

- Involve relevant stakeholders and ensure cross-ministerial cooperation, the involvement of social partners and other sub-national and sectoral entities.

- Align the exercise outputs to policy needs – This may include geographical level and coverage, occupational disaggregation and skills measurement. Establish effective dissemination of the results of these exercises in an accessible and informative way.

Many examples of these approaches exist in countries across Europe, Asia and the Americas. One of the most enduring is the Cedefop pan-European forecasts of skills supply and demand E3M3 (Energy, Environment, Economy) macroeconomic model available for the EU as a whole and each Member State (ILO, 2018).

Labour market information systems and skills observatories

Labour market information systems (LMIS) are an important tool for advising employment and labour policies. Broadly described, LMIS are the institutional arrangements and procedures that coordinate the collection, processing, storage, retrieval and dissemination of labour market information (ETF, 2017). They inform the design, implementation, monitoring and evaluation of policies that are more focused and targeted while enabling better decision-making and policy planning in the areas of employment, education, and migration policies (ILO, 2021). The European Training Federation (ETF) has identified five typical levels of operation for LMIS; the following questions may be helpful in adapting these levels in different contexts:

- At which level should the analysis be performed (national, regional, sectoral) and in what time frame (short, medium, long)? What aspects should be considered (employment, education, economy or industry)?
- What data sources are the most useful for monitoring and anticipating skills supply and demand? Which are available? Where are the gaps?
- What infrastructure is required for the collection, analysis, and dissemination of data? This includes trained and experienced analysts who can work with the data.
- What are relevant methods, research questions, data analyses/interpretations and validation exercises for the results?
- What are the best ways to provide labour market stakeholders with information they can use for decisions to solve mismatch problems or meet NQC demands (ETF, 2017)?

Examples of current observatories include the European labour market observatory (European Commission, 2021), the ILO and OECD Labour Market Information System (LMIS), the Labour Market Information Portal (LMIP) in Australia (Australian Government, 2021) and the National Service of Industrial Training (SENAI) for prospective technological and occupational trends within specific occupational sectors for work in Brazil (Vocational Training Institutions' Network, 2013). In fact, the relevance of skills and competencies is very much a product of timely labour market information, data or market and technology 'signals'.

Cross-sectoral projects focusing on new competencies

Cross-sectoral projects aimed at addressing common competency needs shared across multiple or new and emerging industries is a developing method for macro-level stakeholders to work together and identify NQCs. This involves adopting a coordinated response between government, industry, and skills sector representative organizations with an interest in developing training products for new or emerging skills and competencies. Additionally, such initiatives can draw on the collective interest and expertise of a range of meso-level stakeholders and promote greater cooperation between the two levels.

One example comes from Australia, where the government and the Australian Industry and Skills Committee (AISC) – an industry-led body

that provides advice on the implementation of national TVET policies – have established a range of cross-industry sector 'projects' focused on automation, digital skills, supply chains, big data and cybersecurity, environmental sustainability and teamwork and communication. Each project examines the skills profiles of existing roles, and the digital competency-related requirements of emerging roles in Australia's developing digital economy (AISC, 2021).

Other countries take a cluster approach to TVET qualifications. In Finland, for example, sectors agree on a set of 'general competencies' to be applied universally (Finnish National Agency for Education 2019).

Additional insights

Given the wide variety of competencies that can be taught and learned, a multi-layered approach ensures TVET systems cover what is needed. Consideration must be given to transversal versus technical competencies; multiple literacies (such as visual literacy, textual literacy, digital literacy and technological literacy) and the ability to prepare for the unknown. Given its role in permanent record keeping, the use of block chain distributed registers of learning also provide opportunities in learner identity verification. It also increases innovation by providing a platform for collaboration between business and education institutions (Cognizant, 2019).

Investigating the new or emerging training markets offered through Massive Open Online Courses (MOOCs), training providers such as the US-based 'UDEMY' or more formal training through CISCO networking academies, can provide insights into the types of skills training and competencies being sought in the new economy. In addition, examining qualification and competency demands of start-up companies is also useful, as these businesses are often seeking competencies associated with new technologies or innovations being brought to market.

Early detection projects (or 'fast-track' projects), such as examples provided from Germany (Windelband and Spottl, 2003; Hackel et al. 2015; Schad-Dankwart case study below) seek to establish a range of 'indicators' that help quickly identify changes in work processes and the resulting changes in qualification requirements. In addition, the indicators consider changes, interactions and repercussions of the business environment; define the characteristics to be surveyed; and infer phenomena and trends.

While Windelband and Spöttel (2003) examine the mechanical engineering and circular economy sectors, Hackel et al. (2015) define indicators that play a role in the introduction of new technologies. Even though these indicators are sector-specific or focused on one trend, it can be assumed they can be transferred to other occupational areas or trends. Continuous monitoring of such indicators, according to the assumption in the BIBB research project for the early detection of NQCs (Schad-Dankwart case study below), will enable changes that may lead to earlier identification of needed NQCs.

Germany – Identification of NQCs through systematic monitoring of VET-relevant indicators

Most projects carried out in Germany that deal with the early identification of new qualifications and competencies differ a lot in their scope: they can focus on a specific industry, occupation, region, or trend and may also differ in terms of depth of analysis or scientific approach. Each project or study offers relevant and meaningful results on its own, but there is no systematic way to derive generalizable statements across all initiatives for early detection across occupational fields.

In response, the German Federal Institute for VET (BIBB) is working on systematic monitoring of occupations, which utilizes and facilitates systematic early detection. The main idea of this new approach is to identify cross-professional indicators of change that may require new competencies or qualification and curricular adaptation.

Occupations that have seen changes to training regulations in the last 10 years have been analysed for the project. The initiative also looks at why new qualifications (for emerging occupations such as e-commerce clerk) have been created and what has caused other qualifications to become less important.

Overall, this analysis is intended to find out the driving forces behind the need to adapt occupations, the related influencing factors and the changes that eventually emerge. This retrospective case analysis seeks to derive indicators for recognizing change at a very early stage that points to the need for new competence and qualification. (Schad-Dankwart, BIBB, 2021)

Futher information: Federal Institute for Vocational Education and Training (BIBB) - Germany

In the future, macro-level stakeholders may be best served by maintaining a 'toolbox' of methodologies on how supply-side stakeholders can respond to signals from demand-side stakeholders. A key finding from the research is that multiple approaches to understanding the supply and demand equation utilized in tandem appear to work best.

4. How are NQCs integrated by stakeholders at the macro level?

Frame conditions

Once new qualifications and competencies have been identified as relevant for a TVET system, the next challenge is translating these identified competencies into curricula, qualifications and training regulations.

TVET systems worldwide have a great deal of variation in how they formulate curricula and training regulations. In some systems, teachers, trainers and schools decide how they want to implement NQCs in practice. This allows for a greater degree of customization to local circumstances. In other systems, curricula must be formulated in a precise, operational way, with tight specification for teachers or trainers on what they should teach.

However, according to Misko (2015), countries now are almost universally aiming to ensure that the qualifications and competencies gained in TVET are indeed new, emerging and valued in the labour market by employers and learners. This is done in part by aligning national qualifications and training standards with comprehensive labour market analyses, and then applying outcomes-based quality assurance and/or assessment frameworks to them. Additionally, bringing these NQCs into formal frameworks (such as in national or supra-national qualifications frameworks) is often a priority.

Nonetheless, curriculum development and regulatory or approval processes must operate in the context of each country's TVET governance framework. As examples, the government takes the lead on such processes in Finland and Singapore, while New Zealand, the United Kingdom and South Africa have more stakeholder-led development and integration processes. In between lie hybrid models, which are in place in countries such as Australia (Wibrow and Waugh, 2021). In Germany and some other European countries, institutionalized consultation processes take place with stakeholders seeking to reach a consensus during the integration of NQCs into curricula.

Key challenges

Establishing responsibility and ownership

Understanding how NQCs are translated into curricula and transitioned into operational TVET is an integral step, with an important distinction between the broader specifications of labour market need and the narrower qualifications, learning outcomes or competencies.

However, integrating NQCs is not a straightforward task for macro-level stakeholders. One challenge, especially in federated states where the responsibility for TVET is shared across national and provincial governments, is reaching consensus on how

to proceed in a consistent and harmonized manner. Localized and provincial labour market conditions, differing jurisdictional licencing arrangements in industry and other governance factors can complicate national decision making and NQC recognition.

Assigning the last word

Reconciling the different 'power relationships' that exist in countries and the representativeness of TVET system 'owners' in decision making is another challenge. Not all countries have well-established structures with joint ownership and responsibility from governments, industry and unions when it comes to the integration of NQCs. Some more traditional models see greater primacy for government stakeholders, which can affect the nature of dialogue and decision making around NQCs. Others have more 'tripartite' and cooperative arrangements that include the full range of social partners including industry and employer associations, government, and unions (Bjornavold, 2021).

Existing innovation and learning practices

The BILT project identified four types of integration strategies in their Trends Mapping Study of 2020 (UNESCO, 2020). These include:

- Cross-cutting approaches – competencies are implemented in all curricula or training regulations reflecting their importance for all learners
- Sectoral approaches – competencies are relevant for different curricula and training regulations affiliated to the same sector
- Occupational approaches – competencies are related to occupation-specific curricula and training regulations; and
- Additional modular approaches – additional complementary modules are developed to support core, compulsory TVET within initial or continuing training.

Cross-cutting approaches

An important part of ensuring the successful uptake of NQCs is ensuring the governance environment is right for success. Cross-cutting approaches involve the integration of 'transversal' competencies that are relevant to learners into all curricula and training regulations.

The Singapore Skills Framework (SkillsFuture Singapore, 2020) provides an interesting example of how qualifications at all six levels of their National Qualifications Framework (NQF) must include statements on learning outcomes describing how learners should function in the related job role against five key requirements:

- Knowledge and analysis
- Application and adaptation
- Innovation and value creation
- Social intelligence and ethics
- Learning to learn

Many TVET systems feature broad stakeholder involvement in the development of cross-cutting qualifications, especially those undergoing reforms related to qualifications and those systems promoting movement through different education sectors and qualification types. Such consultations and activities are generally driven by macro-level stakeholders, such as government ministries,

and involve a range of regulatory agencies, industry bodies, trade unions (including students), professional associations, public and private TVET providers, schools, higher education sectors (including practitioners), experts in the field and research agencies (Misko, 2015). Macro-level stakeholders are often tasked with deciding on who has the final say or ultimate decision-making responsibility after reflecting upon input from the stakeholders listed above.

Hong Kong, China – Key competencies integration into TVET curricula

The Vocational Training Council (VTC) in Hong Kong, China has adopted a competence-oriented vocational education model in response to the rapid speed of change occurring in society, technology and the world of work. Important 'lifelong' learning key competencies (such as design thinking, competencies for Industry 4.0, green skills and sustainability, digital skills and language abilities) are being incorporated into curriculum as embedded, inter-disciplinary and mandatory aspects of learning for TVET students (VTC, 2020). To support this, multi-disciplinary programmes in public relations and digital communications are being introduced to further bolster the global workforce skills of people in Hong Kong.

Further information: VTC

Macro stakeholders have an important role to play in quality control, development, delivery, assessment, recognition and accreditation of NQCs, especially with the recent advent of micro-credentials and the related decisions about whether micro-credentials can be expanded to full qualifications. The same stakeholders also play a valuable role in integration activities, such as engaging meso-level stakeholders, monitoring processes and validating or authorizing results (Kato et al, 2020).

Sectoral approaches

Sectoral approaches ordinarily focus on integrating competencies into single industries or sectors. This can either be achieved by integrating competencies into all curricula or regulations related to an industry sector, or by creating curricula or regulations for a specific sector (UNESCO, 2020). The added value to this approach is the ability to effectively link new developments – such as changes to environmental regulations or consumer preferences for more sustainable practices – to TVET training practices of a whole sector. Examples include 'green' or sustainable plumbing (as an occupational example), or energy efficiency in transport and logistics (an industry example). The Indian Sector Skills Councils are now including greening of jobs and skills for sustainability in their National Occupational Standards as one very relevant case (NSDC, 2021).

Some countries are adopting a 'growth industry approach'. This provides a forum for individual industries to come together to discuss opportunities provided by new

technologies, and how this can lead to new competencies within individual sectors or a cluster of related sectors. In Australia, 'industry growth centres' have been established to focus on how to enhance management and workforce skills across single or linked industry sectors. The centres also identify opportunities for regulatory reform (DISER, 2021). The Basque Ministry of Education and TKNIKA, a regional TVET innovation centre, have similarly established growth 'hubs' focused on prospective industries such as biosciences, advanced manufacturing, digitally-connected factories and advanced manufacturing to inform the development of highly relevant NQCs in emerging industries, all of which address important technology and environmental concerns (Araitztegui, 2021).

Occupational approaches

Occupational approaches involve the integration of competencies relevant to specific occupations into either curricula or training regulations. This tends to be the most common of the four approaches listed in this section. Occupational approaches are often tightly aligned to occupational settings, with corresponding NQCs tied to changing needs in the workforce or industry.

Many countries (notably in Europe and in Australia) have developed occupational approaches that rely on 'holistic modularization' (or unitization). Entire qualifications are broken down into sub-units or modules that can, in some circumstances, be assessed independently.

Finland – occupational clustering

The Finnish vocational education and training system has undergone significant reforms in recent years to reduce the number of TVET qualifications available (thereby removing potential overlap), and to more closely connect education to new and emerging competency needs in industry and society. In addition, they have adopted a broader system of qualifications grouped around 'occupational clustering' to ensure competencies that have relevance across a wider range of industry contexts.

The Finnish National Agency for Education (EDUFI) is responsible for overseeing development and renewal of qualifications. It has introduced a process of NQC development whereby 'projects' are established and experts (including employees and the self-employed, employers and enterprises, and teachers in the particular industry setting) are invited to actively participate in the process. In addition, important meso-level stakeholders such as unions, industry peak organizations, companies and VET providers are offered the opportunity to provide feedback (Wibrow and Waugh, 2021, Finnish National Agency for Education, 2019).

Further information: Finnish National Agency for Education (oph.fi)

This approach is beneficial because it allows TVET systems to rapidly respond to changes in work brought on by technological developments with appropriate NQCs by modifying specific sub-units or modules (Cedefop, 2015).

Additional modular approaches

Another 'fast-response' possibility for reacting to emerging skills needs is the use of additional or 'optional' modules for NQCs. Wibrow and Waugh (2020) provide an example from the Netherlands where modules have been jointly developed by industries or enterprises along with education institutions to respond quickly to local or regional employment needs. Success depends on an environment (created by the national ministry and other macro stakeholders) that is conducive to customization and flexibility in TVET.

Despite its modular way of structuring qualifications, the Finnish national system has a high degree of built-in flexibility, which allows for broader-based qualifications and competencies and fewer hurdles for introducing and updating NQCs. This is indicative of Finland's broad labour market and the importance of promoting mobility across sectors (Wibrow and Waugh, 2021).

International technology standards are increasingly important for some qualifications and occupations. Digital skills are of relevance, which is reflected in the growing trend of multi-national technology companies such as CISCO or Microsoft that are offering an alternative to the primacy of single stakeholders (such as governments) setting qualification standards in areas such as ICT.

Alternative approaches

New forms of certification – such as skills sets and micro-credentials, digital badges and industry-recognized certificates – are also emerging as useful practices (Kato et al, 2020). Cedefop's Europe-wide survey on micro-credentials and new ways of credentialing/qualification is designed to provide greater flexibility in addressing the needs of industry.

'Higher apprenticeships' are another development worth considering for macro-level stakeholders. This takes the concept of an apprenticeship and extends it to higher-level qualifications, such as associate degrees, as a way to meet the needs of Industry 4.0 (Loveder 2017). In the United Kingdom, this approach focuses on higher TVET or degree apprenticeships in areas such as advanced technology, construction, and digital media, with opportunities intended to attract students who will not attend university. The entry standards for a higher apprenticeship are more stringent than traditional apprenticeships, with off-the-job training blending both vocational and university courses.

5. How are NQCs implemented by stakeholders at the macro level?

Frame conditions

When it comes to moving from the macro setting to the micro context for implementing new qualifications and competencies in practice, current research emphasizes the importance of achieving alignment at the national, regional and local levels. Achieving 'buy-in' from stakeholders at all levels is a major objective that helps ensure successful implementation of NQCs. In practice, there is a great degree of variance in terms of who leads the charge: a centrally steered implementation process versus one that is led by local stakeholders.

Macro-level stakeholders usually get involved in the implementation of NQCs by establishing policy, governance or financial arrangements and structures intended to serve as de facto development or support impulses.

However, in such an arrangement, what autonomy is given to teachers and trainers to customize instruction, and what change processes would help ensure success? Evidence from many countries also shows that ensuring the efficiency of the development process impacts implementation. NQCs that are poorly implemented or difficult to update can lead to problems with acceptance and use (Wibrow and Waugh, 2021).

Nonetheless, introducing 21st century skills and NQCs is challenging and often requires stakeholders to embrace behavioural changes and to participate in rapid paradigm shifts. This is especially true in teaching, learning and assessment. Therefore, the micro-level stakeholders tasked with the on-the-ground work of facilitating these shifts need to be supported by macro-level stakeholders.

Key challenges

Defining the parameters of on-the-ground support

Training providers in TVET are on the front line of implementing NQCs. However, as reported by Maxwell and Gallagher (2020), schools, community colleges, institutes and their respective teaching workforces cannot address the dynamics of new 'credentialling' alone. Rather, this requires a coordinated approach across different stakeholder levels, including governments, employers and community partners.

Macro-level stakeholders clearly have an important role to play in facilitating this collaboration and ensuring its success. It is these macro-level stakeholders who are best positioned to understand the 'dynamics' of the interactions between the three stakeholder levels (macro, meso and micro) involved in NQC implementation and ensuring each level understand its unique roles in guiding and influencing NQC acceptance.

Funding and other forms of institutional backing

Funding mechanisms – set by government policy – also play an important role in stimulating the uptake of NQCs. For TVET systems that have developed a competitive training market, some incentive to implement these changes is often necessary. These often require specific investment through pilot programmes with selected schools and training providers and the (ongoing) support for resources such as digital media.

Transparency of the development processes and providing convincing arguments for implementing NQCs may impact take-up. For example: employers that do not consider identified NQCs as reflecting their needs are unlikely to value them, especially if their role as employer stakeholders in contributing to or deciding on the focus of NQCs is not clear or not considered. Similarly, excluding the practical curriculum development and teaching and assessment aspects of NQCs can make implementation harder for TVET teachers. Macro stakeholders are usually best placed to reconcile these considerations.

The research (especially UNESCO, 2020), indicates that NQCs should be delivered through innovative teaching, learning and assessment practices that utilize new technologies – all requiring investment by governments and other macro stakeholders. This includes investments in effective drivers of change such as continuing education for teachers, train-the-trainer courses and skill renewal or professional development. Too often, when it comes to bringing about a big change, the importance of a change plan, 'champions of change' and engendering stakeholder ownership is neglected or inadequately considered.

The 'further education' of teachers, train-the-trainer courses, renewal of skills, and professional development can all be used to drive effective change, and to that end, the continuing training and development of TVET teachers and trainers is paramount.

Existing innovation and learning practices

Establishing trust and quality in NQCs

Macro-level stakeholders can influence the effective implementation of NQCs by adopting quality control measures. Implementation of NQCs becomes more challenging if there is a lack of trust among TVET practitioners – such as instructors, learners and employers – in the quality of the training. Ensuring quality promotes acceptance and a willingness to invest resources into implementing NQCs. There are examples of organizations that are either government or industry-controlled which oversee quality in the system, such as the Australian Skills Quality Authority (ASQA).

In countries like Scotland, New Zealand and Canada, macro-level stakeholders have designated a greater role for educators in developing, reviewing and implementing NQCs. This improves the overall 'visibility' of the TVET professional's role in the effective implementation of NQCs.

Clear indications of structural support

Many countries contain examples of macro-level stakeholders providing practitioners, training providers and other stakeholders with

Québec, Canada – A comprehensive NQC process at provincial level

The Ministère de l'Éducation, du Loisir et du Sport (MELS) in Quebec, Canada has introduced a comprehensive process of NQC identification, prioritization, implementation and continuous improvement. It involves the following steps:

- Planning (sector-based surveys, skills monitoring, priority-setting between sectors)
- Programme development (job analysis, design and validation of draft plans)
- Impact analysis (organizational guides, publishing funding rules, distribution of programme offerings)
- Approval (institutional endorsements)
- Implementation of training
- Evaluation of the system (programmes, performance, job entry, employer satisfaction) (Wibrow and Waugh, 2021).

Partnerships with schools, training providers (CEGEPS), other government ministries, industry, labour analysis organizations and sector workforce committees is an essential component (Gouvernement du Québec 2019).

Further information: Ministère de l'Éducation et Ministère de l'Enseignement supérieur (gouv.qc.ca)

digital access to processes (such as standards development) to promote accessibility and buy-in during the development, implementation and review of NQCs. One example comes from the Canadian province of Ontario, which has enabled a range of online opportunities for stakeholder input in its apprenticeship development process (Ontario Ministry of Colleges and Universities, 2017).

Investments in professional capacity development and upskilling TVET practitioners is another way that macro-level stakeholders can influence NQCs implementation. The European Framework for the Digital Competence of Educators (DigCompEdu) provides a good example. DigCompEdu seeks to incorporate digital competencies into TVET delivery by upskilling TVET educators so they can use and apply digital resources in their teaching and assessment. Upskilling digital competencies also helps educators develop new formats and pedagogical methods for instruction (Wibrow et al, 2020).

In India, schemes such as the Pradhan Mantri Kaushal Vikas Youjana (PMKVY) are seeing the introduction of mandatory modules such as digital literacy, financial literacy and employability skills (among several) into TVET courses which are financed through government (NSDC, 2021).

6. The outlook for NQCs: ensuring TVET systems are 'future ready'

Given their broad perspective on the TVET landscape in each context, macro-level stakeholders can draw upon a wide range of approaches, strategies and tools to support the identification, integration and implementation of NQCs in TVET.

Ensuring TVET systems are 'future ready' involves continual evaluation of labour market data and improving the evidence base for the identification of NQCs. Ideally, this should cascade from the national to the local level and include a range of stakeholders from all levels, even if it is centrally coordinated from the macro level. Some countries are tasking new agencies (such as the National Skills Commission in Australia) to provide intelligence on future education, skills and competencies and jobs. This drives long-term improvements across the competency system to identify NQCs. Other countries are utilizing skills observatories, 'big data' analysis and consultative processes to gain a sense of NQCs priorities and relevance. Organizing and disseminating this information and data to assist in the curriculum development process is essential – a role that the macro-level stakeholder is often best placed to play.

Integrating NQCs into TVET involves a range of approaches (or models) focused on either specific occupations or industries. Alternatively, a 'cross-cutting' approach with relevance across the whole workforce or broader society can also be effective. Macro stakeholders play an important role in establishing the framework and governance environment for integrating NQCs and assuring the quality of and confidence in their use.

It is important to recognize that there are likely a range of 'common denominators' or TVET-specific actions that can be applied across the different types of models. For example, macro-level stakeholders can ensure that qualifications and curricula are continually updated, renewed and informed by good research and data. They can also ensure that when feasible, certifications made by individual companies from the private sector are aligned to national standards and regulatory requirements.

The key to measuring the success of NQCs is ultimately in their implementation and impact on the ground and ensuring their sustainability going forward. Macro stakeholders influence this by providing a supportive environment for implementation to happen through funding mechanisms, the introduction of 'enabling' or supportive structures or by providing opportunities for professional development or renewal of TVET instructors.

A distinction must also be made between ongoing adaptation and 'renewal' of existing competencies and curricula, and the introduction of new qualifications brought about by disruptive technologies and the emergence of new professions due to changes in society.

A final key message is the need to ensure that the governance and responsibility structures in TVET systems are optimized for the identification, integration and implementation of NQCs. By their nature, these structures are often complex and require a commitment from the full range of stakeholders and social partners to adapt to the changing need for new skills and competencies. It is the macro-level organizations who are usually in the best position to ensure these conditions are favourable and to establish and sustain effective lines of dialogue across the stakeholder groups.

References

Araitztegui, I. 2021. The Basque country Country approach to implementing NQCs. Example provided to the BILT Macro Experts group meeting, January 2021.

Australian Government. 2021. Labour Market Information Portal (LMIP). https://lmip.gov.au/ (Accessed February 12, 2021.)

Australian Industry and Skills Committee. 2021. Cross Sector Projects. https://www.aisc.net.au/irc/cross-sector-projects (Accessed February 12, 2021.)

Braham, E. & Braham, S. 2020. Solving the skills puzzle: The missing piece is good information. *Public Policy Forum*. https://ppforum.ca/publications/solving-the-skills-puzzle/ (Accessed February 10, 2021.)

Bjornavold, J. 2021. Integrating NQCs from different country perspectives. Example provided to the BILT Macro Experts group meeting, March.

Cedefop. 2015. The role of modularisation and Unitisation in vocational education and training. Working Paper No. 26. https://www.cedefop.europa.eu/files/6126_en.pdf (Accessed February 24, 2021.)

Cedefop. 2021. Exploring the feed-back-loop between qualifications and labour market requirements. Unpublished report.

Cognizant. 2019. Blockchain goes to school. *Cognizant 20-20 Insights Report*. https://www.cognizant.com/us/en/whitepapers/documents/blockchain-goes-to-school-codex3775.pdf (Accessed March 9, 2021.)

Department of Industry, Science, Energy and Resources. 2017. Industry Growth Centres. https://www.industry.gov.au/policies-and-initiatives/industry-growth-centres (Accessed February 15, 2021.)

European Commission. 2021. European Employment Policy Observatory (EEPO) - Employment, Social Affairs & Inclusion. https://ec.europa.eu/social/main.jsp?catId=1086&langId=en (Accessed February 16, 2021.)

European Union. 2021. Industry 5.0. https://ec.europa.eu/info/research-and-innovation/research-area/industrial-research-and-innovation/industry-50_en (Accessed July 21, 2021.)

European Training Federation. 2017. Labour market information systems: Collecting information and data on labour market trends. https://www.etf.europa.eu/sites/default/files/m/466C7A2340B3DAE0C12580E60049FC1D_LMIS.pdf (Accessed July 14, 2021.)

Eurostat. 2016. Statistical approaches to the measurement of skills. https://ec.europa.eu/eurostat/documents/3888793/7753369/KS-TC-16-023-EN-N.pdf/438b69b5-2fcb-4923-b9e2-fa7b59906438 (Accessed February 10, 2021.)

Finnish National Agency for Education and Ministry of Education and Culture. 2019. Vocational Qualifications in Finland 2019. Helsinki. https://www.oph.fi/en/statistics-and-publications/publications/vocational-qualifications-finland-2019 (Accessed April 8, 2021.)

Hackel, M., Blötz, U. & Reymers, M. 2015. Diffusion neuer Technologien: Veränderungen von Arbeitsaufgaben und Qualifikationsanforderungen im produzierenden Gewerbe: eine deskriptive Analyse zur Technologiedauerbeobachtung. *W. Bertelsmann Verlag GmbH & Company KG*.

Hong, C. 2021. The Hong Kong Industry NQCs process. Example provided to the BILT Macro Experts group meeting, January 2021.

Insituto Vasco del Conocimiento de la Formacion professional. 2021. Instituto Vasco del Conocimiento de la Formación Profesional - Ivac-eei - Presentación. https://ivac-eei.eus/es/quienes-somos.html (Accessed March 31, 2021.)

International Labour Organization. 2018. Approaches to anticipating skills for the future of work: Report prepared by the ILO and OECD for the G20 Employment Working Group. https://www.ilo.org/wcmsp5/groups/public/---dgreports/---inst/documents/publication/wcms_646143.pdf (Accessed July 14, 2021.)

International Labour Organization. 2021. Decent work for sustainable development. https://www.ilo.org/global/topics/dw4sd/themes/lm-info-systems/lang--en/index.htm (Accessed February 15, 2021.)

International Labour Office, Skills and Employability Branch. 2020. The role of employers in skills development systems. https://www.ilo.org/wcmsp5/groups/public/---ed_emp/---emp_ent/documents/publication/wcms_762728.pdf (Accessed February 4, 2021.)

Kato, S., Galán-Muros, V. & Weko, T. 2020. The emergence of alternative credentials. *OECD Education working papers no. 2016*. https://www.oecd-ilibrary.org/education/the-emergence-of-alternative-credentials_b741f39e-en (Accessed August 2020.)

Korbel, P. 2018. Internet job postings: Preliminary skills analysis. National Centre for Vocational Education Research. Adelaide. https://www.ncver.edu.au/research-and-statistics/publications/all-publications/internet-job-postings-preliminary-skills-analysis (Accessed March 9, 2021.)

Kosorukova, O. et al. 2016. Methods of Establishing Occupational Skill Structure of Admissions in the System of Vocational Education. *International Journal of Environmental & Science Education*, 11(10). https://files.eric.ed.gov/fulltext/EJ1114680.pdf (Accessed February 24, 2021.)

Loveder, P. 2017. Australian apprenticeships: trends, challenges, and future opportunities for dealing with Industry 4.0. NCVER. Adelaide. https://www.ncver.edu.au/__data/assets/pdf_file/0029/1481456/Australian-apprenticeships.pdf (Accessed February 24, 2021.)

Maxwell, N.L. & Gallagher, S.R. 2020. *Credentials for a new era of work and learning*, San Francisco: Jossey-Bass.

Milligan, S. & Kennedy, G. 1970. To what degree? alternative micro-credentialing in a Digital age. *Find an Expert - The University of Melbourne.* https://findanexpert.unimelb.edu.au/scholarlywork/1202762-to-what-degree%3F-alternative-micro-credentialing-in-a-digital-age (Accessed February 15, 2021.)

Misko, J. 2015. Developing, approving, and maintaining qualifications: Selected international approaches. *National Centre for Vocational Education Research*. https://www.ncver.edu.au/research-and-statistics/publications/all-publications/developing,-approving-and-maintaining-qualifications-selected-international-approaches (Accessed February 7, 2021.)

National Skill Development Corporation. 2021. Sector skill councils. https://nsdcindia.org/sector-skill-councils (Accessed July 12, 2021.)

National Skills Development Corporation. 2021. Pradhan Mantri Kaushal Vikas Yojana (PMKVY). http://www.pmkvyofficial.org/ExploreSectorSkillCouncils.php (Accessed July 12, 2021.)

Ontario Ministry of Colleges and Universities. 2017. Published college program standards. http://www.tcu.gov.on.ca/pepg/audiences/colleges/progstan/index.html (Accessed February 23, 2021.)

Schad-Dankwart, I. 2021. Early bird systems for the early recognition of qualifications. Example provided to the BILT Macro Experts group meeting, January 2021.

Siekmann, G. & Fowler, C. 2017. Identifying work skills: International approaches. *National Centre for Vocational Education Research*. https://www.ncver.edu.au/research-and-statistics/publications/all-publications/identifying-work-skills-international-approaches (Accessed February 19, 2021.)

SkillsFuture Singapore. 2020. Overview of Technical Skills and Competencies. https://www.skillsfuture.gov.sg/-/media/SkillsFuture/Initiatives/Files/SF-for-Human-Resource/iv-TSCGSC/03-Workforce-Development/Career_Coaching_20180524_final_v02.pdf (Accessed February 19, 2021.)

Stanwick, J. & Hall, M. 2021. The stock of qualifications in Australia: What data is needed? *National Centre for Vocational Education Research*. https://www.ncver.edu.au/research-and-statistics/publications/all-publications/the-stock-of-qualifications-in-australia (Accessed July 15, 2021.)

Training and Skills Commission. 2018. Economic Outlook and Industry Demand for Qualifications: Skills for Future Jobs Series. TASC. Adelaide. https://www.tasc.sa.gov.au/DesktopModules/Bring2mind/DMX/Download.aspx?Command=Core_Download&EntryId=811&PortalId=5&TabId=1047 (Accessed February 7, 2021.)

UNESCO. 2020. Trends in New Qualifications and Competencies for TVET: perspectives of the European UNEVOC Network. UNESCO-UNEVOC International Centre for TVET, Bonn. https://unevoc.unesco.org/pub/bilt_trends_mapping_study.pdf (Accessed February 7, 2021.)

Waugh, J. & Stanwick, J. 2020. An Australian VET micro-credential definition. NCVER. Adelaide. Unpublished report.

Wibrow, B. & Waugh, J. 2021. International models to rationalise VET qualifications, including occupational clusters: case studies – support document. *National Centre for Vocational Education Research*. https://www.ncver.edu.au/research-and-statistics/publications/all-publications/rationalising-vet-qualifications-selected-international-approaches (Accessed February 7, 2021.)

Wibrow, B. & Waugh, J. 2011. Vocational qualification development: lessons from overseas. National Centre for Vocational Education Research. https://www.ncver.edu.au/research-and-statistics/publications/all-publications/vocational-qualification-development-lessons-from-overseas (Accessed March 9, 2021.)

Wibrow, B., Circelli, M. & Korbel, P. 2020. VET's response to Industry 4.0 and the digital economy: what works – support document.
https://www.ncver.edu.au/__data/assets/pdf_file/0034/9660436/VETs-response-to-Industry-4.0.pdf (Accessed April 19, 2021.)

Windelband, L. & Spöttl, G. 2003. *Research Handbook - Instruments for early recognitions of Qualification Need*, Flensburg: Biat.

Vocational Training Council (Hong Kong, China). 2020. Skilling for the future. https://www.vtc.edu.hk/ero/Skilling_for_the_Future_2020_Update (Accessed March 26, 2021.)

Vocational Training Institutions' Network. 2013. Skills Anticipation: The Transfer of the SENAI Prospective Model. Montevideo: ILO/Cinterfor. https://www.oitcinterfor.org/sites/default/files/file_publicacion/Prospectiva_ingles.pdf (Accessed March 9, 2021.)

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

The BILT project is implemented with support of

bibb Federal Institute for Vocational Education and Traing

and sponsored by the

Federal Ministry of Education and Research

4 QUALITY EDUCATION

Sustainable Development Goals