# Digital Transformation of TVET and Skills Development Systems in Africa

## Guidelines for countries to undertake a situational analysis

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The ideas and opinions expressed in this publication are those of the author; they are not necessarily those of the Pan African Initiative's secretariat and its partners.

If you have any comments, suggestions or ideas about how we can improve the guidelines, please contact info@digitalafrica.org

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# Acronyms

| | |
|---|---|
| **AI** | artificial intelligence |
| **AR** | augmented reality |
| **AU** | African Union |
| **CPD** | continuous professional development |
| **DLT** | distributed ledger technology |
| **ECTS** | European Credit Transfer System |
| **ECVET** | European Credit System for Vocational Education and Training |
| **EU** | European Union |
| **HE** | higher education |
| **FDI** | foreign direct investment |
| **ICT** | information and communications technology |
| **IT** | information technology |
| **ITCILO** | International Training Centre of the International Labour Organization |
| **ILO** | International Labour Organization |
| **IoT** | Internet of Things |
| **LMI** | labour market information |
| **MOOC** | massively open online course |
| **MR** | mixed reality |
| **NQF** | national qualifications framework |
| **OBI** | open badge infrastructure |
| **ODL** | open and distance learning |
| **ODFL** | open and distance flexible learning |
| **OER** | open education resource |
| **QA** | quality assurance |
| **RoI** | return on investment |
| **RPL** | recognition of prior learning |
| **SaaS** | software as a service |
| **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 |
| **VR** | virtual reality |
| **WBL** | work-based learning |

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# 1. Introduction

**"Digitisation is now mainstream. The pandemic experience of 2020–21 has led to the wide-ranging reassessment of many societal systems. In training and education, the shock of adjusting to the remote delivery of programmes has ensured that digitalisation is at the centre of all ongoing change strategies in education and training."**

**(ILO, 2021, p.24)**

**The Pan African Initiative for the Digital Transformation of TVET and Skills Development Systems in Africa** ('the initiative') was launched on 9 March 2021[1]. The initiative's **overall objective** is to create an **ecosystem** that will enable and accelerate the digital transformation of TVET and skills development systems in Africa.

The initiative's overall ecosystem target is to:

- Achieve a minimum of **10 targets** for the African continent; and
- Adopt the targets in **50%** of African countries by 2030.

The initiative uses **five key strategies** to achieve its objective and targets:

1. **Capability building:** Delivering a Pan African training programme;
2. **Communication:** Establishing a national network for digital transformation;
3. **Promotion:** Establishing 'ICTs and digitalisation in a TVET day' in African countries;
4. **New resourcing:** Establishing a national centre of excellence for the digital transformation of TVET in African countries; and
5. **Data sharing:** Providing a sharing and monitoring mechanism for the initiative, including a platform providing continental and national reports.

[1]The UNESCO Multisectoral Regional Office for West Africa in Dakar has partnered with the African Union, the African Institute for Economic Development and Planning (IDEP) of the United Nations Economic Commission for Africa, the Institut de la Francophonie pour l'éducation et la formation (IFEF), the African Development Bank (AfDB), the African Union Development Agency of the New Partnership for African Development (AUDA-NEPAD), and the Skills Initiative for Africa (SIFA), with a long-term vision to create an ecosystem that will enable and accelerate the digital transformation of TVET and skills development systems in Africa. It builds on two existing continent-wide strategies, the Education 2030 Agenda and the Continental Education Strategy for Africa (CESA), with a focus on the capability of technologies to reach marginalised and disadvantaged groups.

## 1.1 Key concepts for guidelines

Several of the concepts underpinning these guidelines need to be unpacked. The TVETipedia glossary[2] has a comprehensive set of definitions which are pertinent.

### 1.1.1 Ecosystem

'Ecosystem' is a nuanced term, meant to describe a community network of interactions between organisms and their environment. In the case of TVET and skills development systems, it refers to the transfer of information and resources in order to transform ideas into reality: to the production and distribution of knowledge-intensive digital products and services. A well-functioning TVET ecosystem for digitalisation is supported by an enabling government, flexible local support systems, and digital technologies that foster inclusion and innovation.

The initiative is dependent on the establishment of an ecosystem in participating countries that will allow more innovators to develop and implement solutions to digitally transform TVET and skills development in Africa, ideally optimising the collective benefit and multiplier effects[3]. Ultimately, the initiative aims to contribute to the African Union's Vision 2063: 'A prosperous Africa based on inclusive growth and sustainable development'.

The initiative consists of three components:

- **Component 1:** Support in setting up national networks to accelerate the digital transformation of TVET and skills development systems – under this component, online and face-to-face trainings will be offered to leaders and practitioners in the field.
- **Component 2:** Support for the national network in formulating an action plan – under this component, countries will produce three main outputs: 1) a situational analysis, 2) a strategic plan, and 3) an action plan.
- **Component 3:** Support for the national network in implementing the action plan – this component focuses on mutualisation and on knowledge and experience sharing.

[2]Available at: https://unevoc.unesco.org/go.php?q=TVETipedia+Glossary+A-Z

[3]The initiative's ecosystem is planned to be created through five key components: the Pan African training programme; a national network for digital transformation; ICTs and digitalisation in a TVET day being established in African countries; a regional centre of excellence on digital transformation in each of the regional economic communities (RECs); a knowledge-sharing and monitoring mechanism for the state of advancement of the digital transformation of TVET in Africa (platform, continental report, national reports). See https://pefop.iiep.unesco.org/en/activities/pan-african-initiative-digital-transformation-technical-and-vocational-education-and

#### 1.1.1.1 Overall ecosystem targets

The initiative has identified a minimum of ten targets that need to be achieved at a continental level to demonstrate that a viable ecosystem is in place in Africa.

Acknowledging that each country has a unique political, economic, social and technological context, it is expected that the implementation of each national policy/strategy by the ministry in charge of TVET will contribute to achieving the results below, which are commonly found in countries that have engaged in the digital transformation of their TVET and skills development systems.

By 2030, these targets would need to have been adopted by 50% of nation states on the continent.

| Target | Description |
|---|---|
| **T1** | Set up a fully functional **national network** (comprising leaders, managers and practitioners of the ecosystem), with members working in synergy as ambassadors to support and promote the digital transformation of the national TVET and skills development system |
| **T2** | Designate and establish a **national committee** or a department/institution of the ministry in charge of TVET to coordinate the national agenda on digital transformation of the national TVET and skills development system |
| **T3** | Produce a **national report on the state of digital transformation of TVET and the skills development system,** and set up a mechanism to ensure its regular update |
| **T4** | Develop an **ICT and digital policy for TVET** setting the national agenda on digital transformation of the TVET and skills development system, and set up a mechanism to ensure its regular update |
| **T5** | Create a **national generic guideline** on how to introduce/reinforce ICT and digitalisation in a TVET programme, and set up a mechanism to ensure: (i) its regular update and (ii) that all the official accredited TVET programmes follow the guidelines |
| **T6** | Set up a roster of **national experts/trainer of trainers** in the main issues of digital transformation of TVET and the skills development system as well as a mechanism to ensure its regular update |
| **T7** | Equip a **critical mass of young people and adults** (including those who have completed school and adults in the informal sector) with **basic digital skills** relevant to the labour market or **specialised skills in the field of digitalisation and ICT** |
| **T8** | Train a **critical mass of teachers, instructors and practitioners** of the ecosystem in mainstreaming digital and ICT skills necessary for their day-to-day work |
| **T9** | Celebrate an **ICT and digital day in TVET** and develop a mechanism to ensure its annual celebration |
| **T10** | Institutionalise and/or accredit a **national centre of excellence for the digital transformation** of TVET and skills development system |

In practice, an ecosystem for the digital transformation of TVET and skills development systems in Africa is the sum of many parts, some of which are particularly nuanced: the country's unique socio-economic and cultural context, which in turn contributes to the role of stakeholders; the importance attributed to the building blocks of TVET, skills development and digital transformation; and industry 4.0. Although these terms are defined in literature, the definitions are restated in this section.

## 1.1.2 Stakeholders in the ecosystem

Ecosystems are run by people and human networks. There are a number of stakeholder groups that have a legitimate interest in the digitalisation of the TVET sector. As corroborated by literature and evidence in many different parts of the world, **Figure 1** illustrates the typical stakeholders in a TVET and skills development ecosystem.

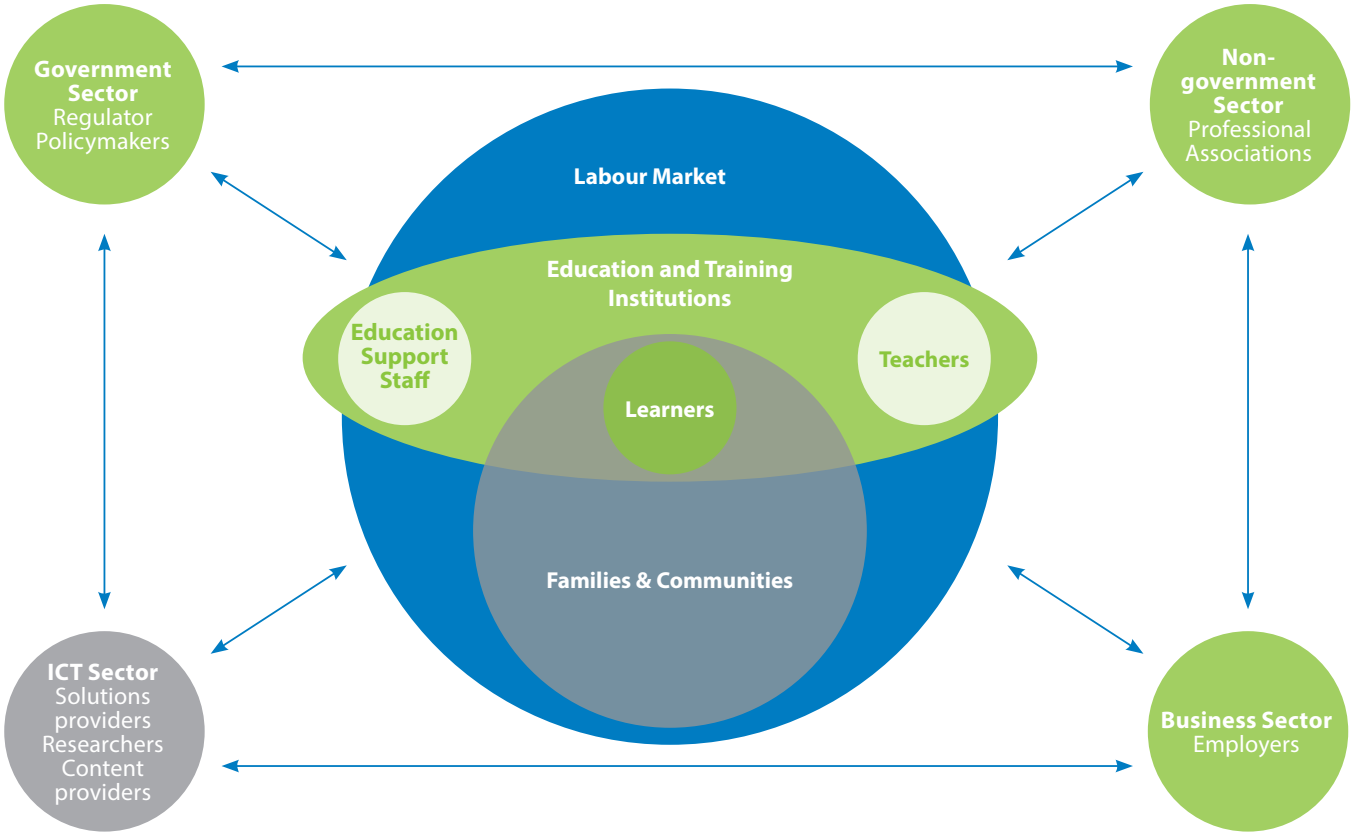


Figure 1: Stakeholders in TVET and skills development ecosystem
Source: Adapted from Keevy and Rajab (2019)

### 1.1.3 TVET

TVET is understood as comprising education, training and skills development relating to a wide range of occupational fields, production areas, services and livelihoods. As a component of lifelong learning, TVET can take place at secondary, post-secondary and tertiary levels. It includes work-based learning and continuing training and professional development which may lead to qualifications. TVET also includes a wide range of skills development opportunities attuned to national and local contexts. Learning to learn, the development of literacy and numeracy skills, transversal skills and citizenship skills are integral components of TVET. TVET is associated with training in public and private educational establishments or other forms of formal or informal instruction aimed at granting access to lifelong learning resources to all segments of society.

TVET increasingly focuses on preparing knowledge workers to meet the challenges presented by the transition from the Industrial Age to the Information Age, with its concomitant post-industrial human resource requirements and the changing world of work.

In many countries, distinct systems of TVET and academically oriented education operate side by side, often with different rules for quality assurance, funding, staffing, credits and qualifications. At the programme level, it is often harder to distinguish between TVET and academic education, as they both employ similar approaches to teaching with the same generic aims and methods. Thus, ISCED recognises that the traditional definitions used for 'vocational' and 'general' education at EQF levels 1–5 may have limitations. ISCED therefore suggests that at tertiary levels of education, a move towards the terms 'professionally oriented' and 'vocationally oriented' may be preferable. Nevertheless, ISCED does not currently provide definitions for these terms, explicitly leaving them open to future definition.

For example, a professional programme can be located within an academically oriented institution and vice versa. In fact, programmes such as medicine, which are developed in close collaboration with the profession and involve long and involved internships, include significant numbers of external lecturers, where much research feeds directly into industry (such as the pharma industry). It is hard to argue that these programmes are not 'professionally oriented', despite their having been located within universities for centuries.

Within TVET, strategic collaboration between institutions, students and enterprises is considered the core identity of the educational mode. Such collaboration is operationalised in the form of technical training for students, scientists' secondment to companies, joint courses, research chairs and consultations. Other activities can include contract research and development (R&D) and commercialisation activities such as licensing and incubation activities, investment in start-up companies, knowledge and technology transfers, and taking R&D outputs to market. All are legitimate activities relating to partnerships.

### 1.1.4 Skills development

Recent definitions of what constitutes 'skills' have moved from basic assertions about the 'ability to perform tasks and solve problems[4]' to sophisticated frameworks, such as those emerging from the OECD, that conflate skills with knowledge, attitudes and values. Skills development is not just limited to technical knowledge and aptitude but increasingly includes the development of 'softer' skills – communication, digital and media literacies, critical thinking, negotiation and teamwork.

[4]Cedefop (2008). Terminology of European Education and Training Policy

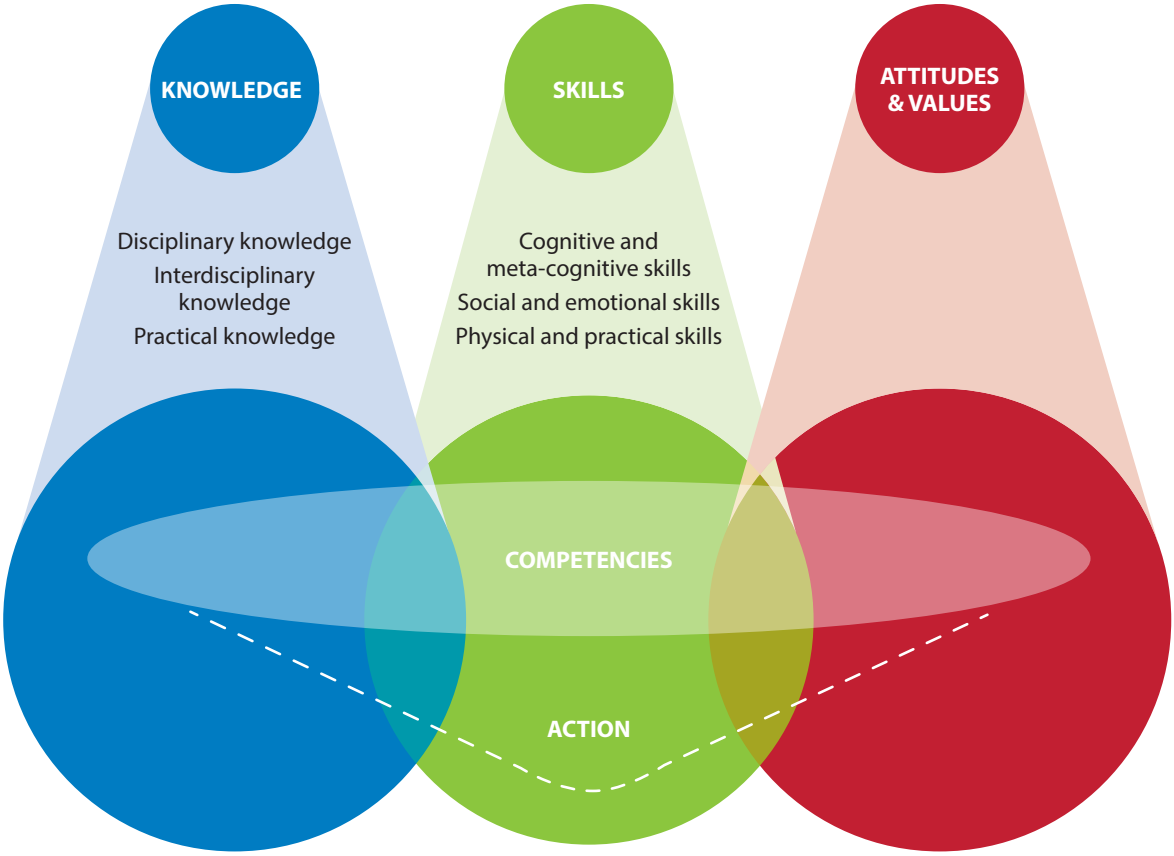


Figure 2: Adaptation of OECD education 2030 skills development framework

According to the ILO (2021), a national skills system can be understood to describe the specific arrangements in a country to:

1. identify the current and future skill needs of industry, business and the community;
2. provide the necessary education and training products and services to respond to the demand and develop the skills required;
3. enhance the possibilities for individuals regarding access to decent work, sustained livelihoods and wider social participation; and
4. enable innovation, structural economic change and strategic business restructuring.

### 1.1.5 Digitalisation and digital transformation

Digitisation or digitalisation[5] is frequently attributed to transformation – from the micro-transformation of processes to the transformation of nation state agendas. It is increasingly associated with progressive societies and modernisation. Digital transformation is about a series of deep and coordinated culture, workforce and technology shifts that enable new educational and operating models and transform an institution's operations, strategic directions and value proposition (ILO, 2021, p.6).

[5] 'Digitisation' and 'digitalisation' tend to be used interchangeably. In practice, digitisation is the process of converting information from a physical format into a digital one. Digitalisation is the process of leveraging digitisation to improve business processes.

## *These guidelines also lever on a conceptual framework that considers how elements of TVET (UNESCO, 2015) interface with three concepts of digital transformation, as proposed in the ILO and UNESCO report of 2020:*

| **Digital transformation** →<br>Elements of TVET ↓ | **Digital innovation** | **Digital adaptation and acceleration** |
|---|---|---|
| **Policies and governance**<br>(Policy-development, governance, social dialogue, finance, equity) | | |
| **Quality and relevance**<br>(Learning processes, staff, qualification systems, learning pathways, quality assurance, information and guidance) | | |

Table 1: Conceptual framework for the digitalisation of TVET and skills development systems
Source: ILO (2020)

- **Digital innovation** describes how new digital technologies enable new forms of teaching and learning (including new pedagogies) and create new capabilities for the workplace and societies in general.
- **Digital acceleration** considers how existing policies or trends, including massification, inclusion/exclusion or (un) employability, may be accelerated through digital innovation.
- **Digital adaptation** examines how digital innovation requires persons to secure new skills to adapt to the changing needs of society and the labour market.

Regulation creates a supportive environment for the development of new technology and the promotion of skills education.

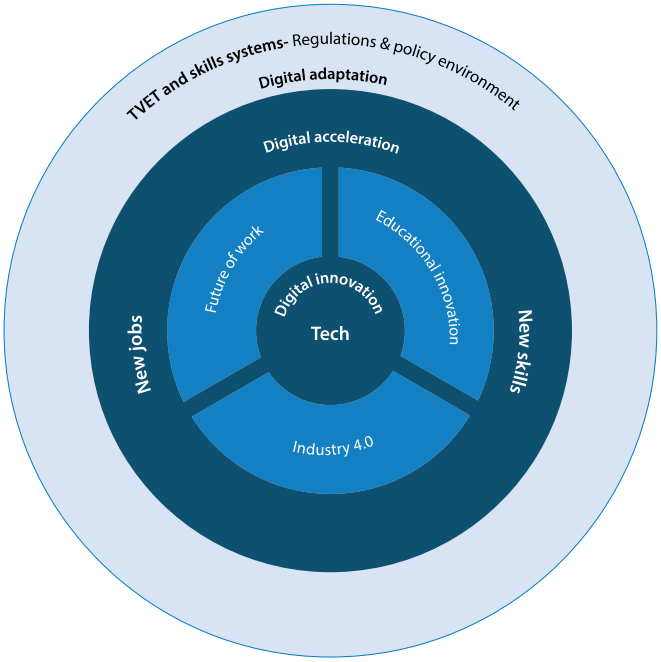


Figure 3: Digital transformation concepts in TVET and skills development systems ecosystem
Source: ILO (2020)

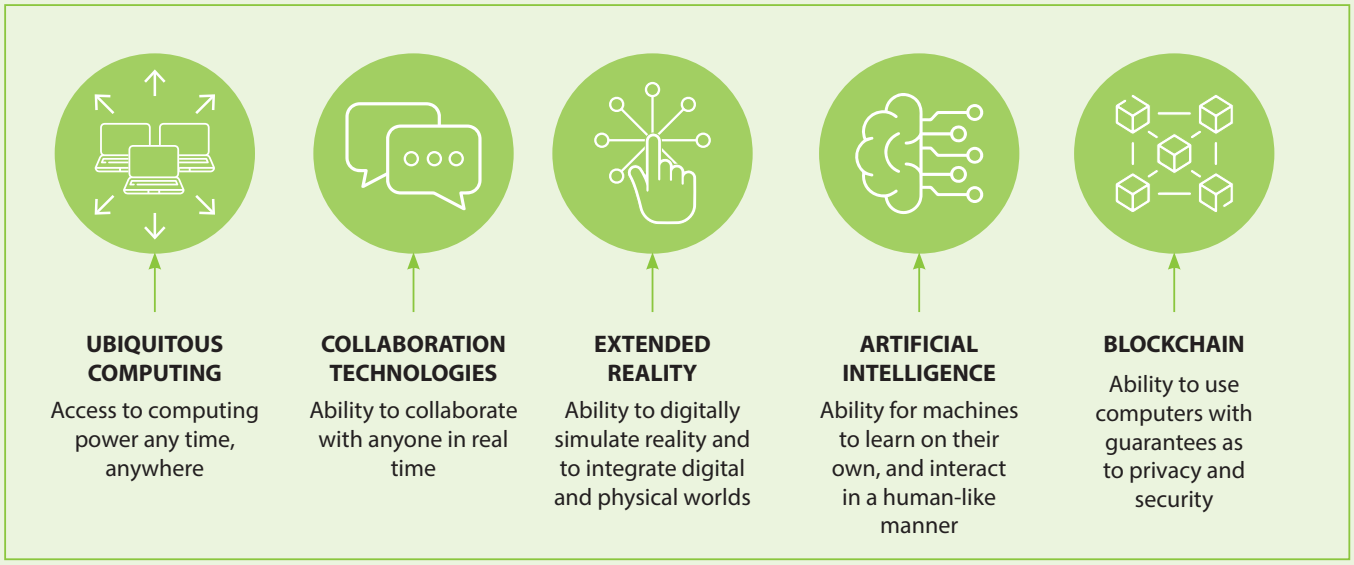


Figure 4: Technologies driving digital transformation in TVET systems
Source: ILO (2020)

## 1.1.6 Industry 4.0

The First Industrial Revolution started with the advent of steam and water power, enabling the mechanisation of production processes, while the Second Industrial Revolution was driven by electric power and mass manufacturing techniques. Information technology (IT) and automation brought the Third Industrial Revolution (also known as the digital revolution), which is defined by electronics and IT, automated production and advanced globalisation. The Third Industrial Revolution has changed human interactions, commerce and entire communities. The Fourth Industrial Revolution is emerging through a range of technologies that are blurring the distinction between physical, digital and biological spaces. Industry 4.0 is transforming how products are designed, fabricated, used and operated as well as how they are maintained and serviced. As a construct, 'Industry 4.0' is an overarching transformation that covers every aspect of industrial and economic activities and every aspect of living – it is a total transformation of all sectors into new systems and/or ways of life. The convergence of the physical, digital and biological worlds has much to do with technological advances which are viewed as 'disruptive technologies', including nanotechnology, AI, robotics, bionics, genetics and 3D printing. Under Industry 4.0, the distinction between industry and services is becoming less relevant as digital technologies are connected with industrial products and services and transformed into hybrid products that are neither goods nor services, exclusively. Indeed, the terms 'Internet of Things' (IoT) and 'Internet of Services' are both considered to be elements of Industry 4.0.

The main features of Industry 4.0 are:

1 **Interoperability:** Cyberphysical systems allow humans and smart factories to connect and communicate with each other. Interoperability can also be defined as the ability of independent systems and processes (technical and non-technical) to exchange data and information and communicate using common standards to enhance efficiency and service delivery. Interoperation thus occurs whenever independent or heterogeneous information systems or their components, controlled by different jurisdictions/administrations or by external partners, smoothly and effectively work together in a predefined and agreed-upon fashion (Keevy and Rajab, 2019).

2 **Virtualisation:** A virtual copy of a smart factory is created by linking sensor data with virtual plant models and simulation models.

3 **Decentralisation:** Cyberphysical systems have the ability to take decisions on their own and to produce locally thanks to technologies such as 3D printing.

4 **Real-time capability:** Cyberphysical systems have the capability to collect and analyse data and provide the derived insights immediately.

5 **Service orientation:** There is a focus on the needs of the end user.

6 **Modularity:** Smart factories can adapt flexibly to changing requirements by replacing or expanding individual modules.

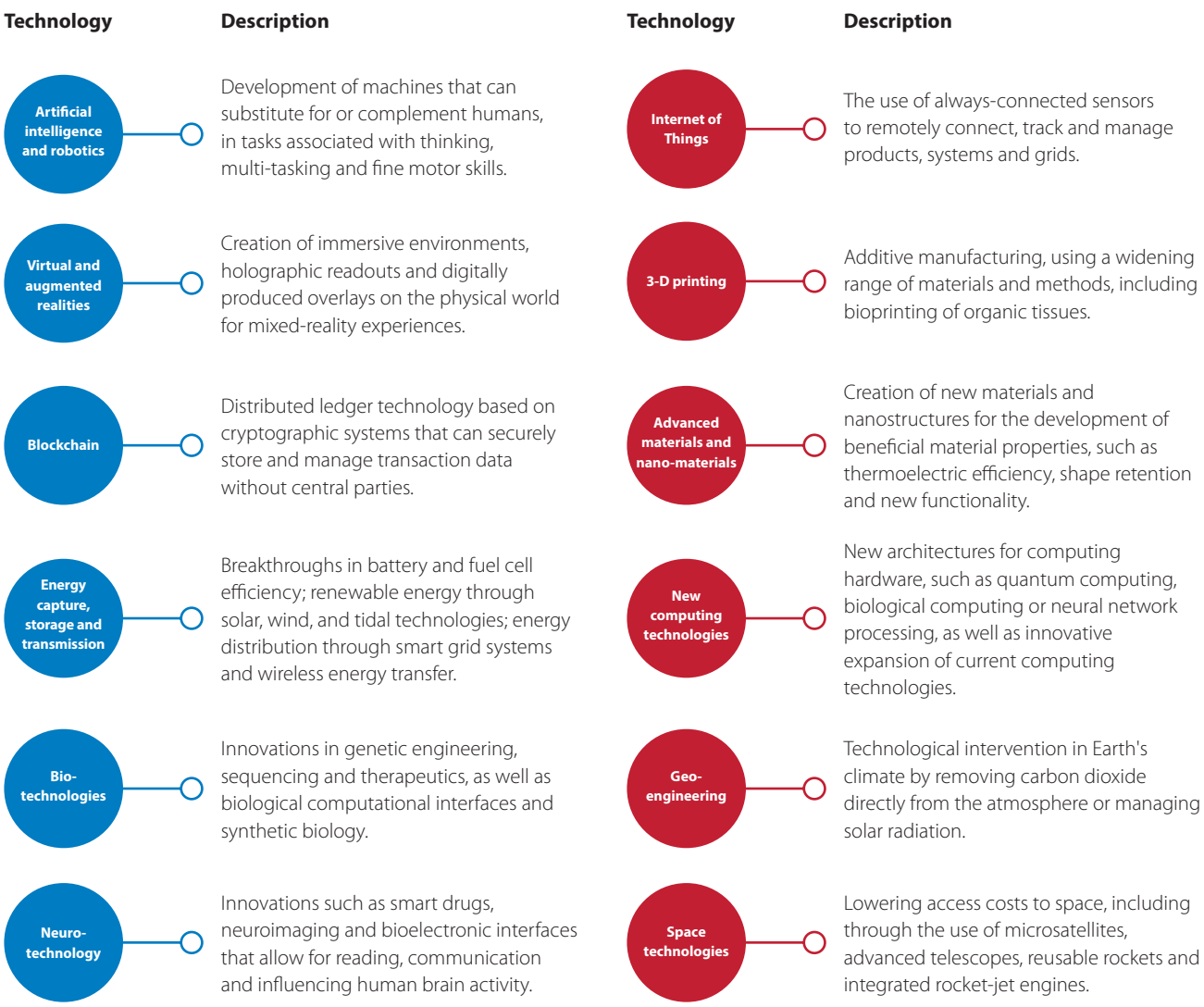


Figure 5: Technologies contributing to future of production
Source: ILO (2020)

Globally, Industry 4.0 is positioned as one of the main drivers of innovation in TVET. Policies for digital TVET should therefore be seen through a lens of adaptation to this new industrial paradigm. While Industry 4.0 is not a universally used term[6], the technologies and trends encompassed by the term are already visible globally. Official policies and strategies in several countries indicate that TVET is reacting to:

- Increased automation of simple and mid-level tasks, thanks to technologies such as AI;
- Increased complexity and cost of equipment used in technical occupations;
- Constantly emerging (new) technologies;
- More complex workflows, involving multidisciplinary teams;
- Increased flexibility, productivity, efficiency and quality and reduced time to market;
- More R&D activities; and
- Development of new skills and talent globally.

[6] Different countries are using different terms to describe their national strategy in terms of Industry 4.0. Terms used include 'Smart Manufacturing' (United States); 'Made in China 2025' (China); 'Manufacturing Innovation 3.0' (South Korea); 'Industrial Value Chain Initiative' (Japan); and 'Smart Nation Programme' (Singapore).

# 2. Scope of the guidelines

The purpose of this document is to provide national stakeholders with a comprehensive set of guidelines that will **facilitate a situational analysis of the nation state context and determine the nation's state of readiness in terms of the digitalisation of TVET and skills development.**

It focuses on the processes, steps and tools that nation states should consider adopting when performing a situational analysis. In practice, this process is tantamount to a detailed **digital TVET and skills systems situational analysis** in the country.

The purpose of a national network is to advocate for and support the acceleration of the digital transformation of their national TVET and skills development systems. The network will also facilitate, coordinate, and support the implementation of different activities around the initiative in their respective countries. The guidelines serve as a framework for the technical secretariat of each national network to envision the initiative in their own context, understand the current issues related to digitalisation of the national TVET and skills development system, and comprehend the broader context in which these issues exist.

Pan African Initiative's role in this process is primarily to operate as a catalyst for an ongoing process of systemic change within an agreed framework. As the national networks stabilise, it is these networks that will take ownership of the Pan African network for the acceleration of digital transformation of TVET and skills development systems in Africa. UNESCO and its partners through the Pan African Initaitive will assist countries in establishing a sustainable and operational national network that enables their national TVET and skills development systems to transform digitally.

This is an interim document prior to developing a prospective note and an action plan for the initiative. By following these guidelines, the expectation is that participating countries should start a process that will lead to:

1. Understanding the demand for the digital transformationisation of TVET and skills development systems among stakeholders;
2. Assessing the different types of skills needed and exploring how the digitalisation of TVET and skills development can meet these needs;
3. Assessing how the emerging digital economy (especially due to COVID-19) has impacted the country's digitalisation of TVET and skills development systems and consequently affected the country's economy and labour market, and identifying the most affected sectors and groups; and
4. Reviewing existing policy responses and their objectives and expected impacts, and identifying gaps in policy implementation.

The point of departure for these guidelines is to recognise that the TVET and employment ecosystem is currently a fragmented supply chain, where systems do not 'talk' to each other. The Learning Economy Foundation (2021)[7] states that ideological gaps exist between each of the following core components:

[7] Teter, W. (2021). Learning Assessment and Recognition: Perspectives from UNESCO's Asia and Pacific Regional Bureau for Education. Presented during World Bank Blockchain for Education Workshop, October 20, 2021.

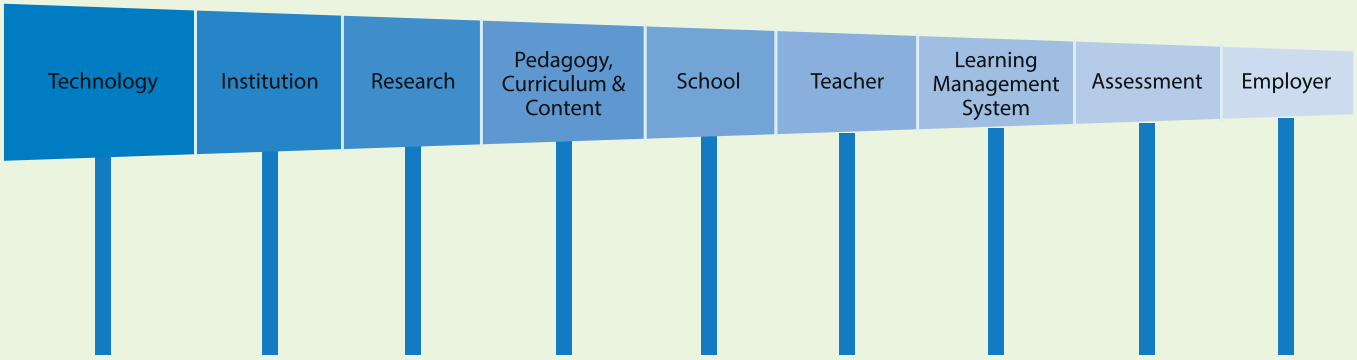


Figure 6: TVET's fragmented supply chain
Source: Learning Economy Foundation (2021)

Digitalisation and innovation are closely related, but not all digitalisation leads to innovation, and not all innovation relies on digitalisation. Even before COVID-19, we were starting to experience innovation that was radical and disruptive, linked to the demand for new skills driven by technological change and the growing use of digital technologies in TVET. TVET needs to step up the pace of its adoption of more advanced innovations in teaching, training, learning, assessment and certification processes.

# 3. Approach

***The guidelines are based on qualitative research methods, levering on proprietary market intelligence acquired from use case studies and semi-structured interviews with policymakers, experts and stakeholders with an understanding of the digital transformation of TVET and skills systems.***

In November and December 2021, UNESCO organised regional training workshops in Dakar, Senegal to introduce participants to strategies relating to the development of sustainable and operational country networks. This document incorporates the findings of a SWOT analysis conducted during the workshops.

Evidence is supplemented by a literature review of relevant published literature that encompassed:

1. Research into megatrends affecting education more generally and TVET in particular;
2. New technologies and their application for TVET and skills development;
3. Technologies affecting the future of work;
4. Reports on the digitalisation of education from international agencies including UNESCO, the ILO, OECD, EU, ETF, CEDEFOP and the World Bank; and
5. Analysis of country-level policies, mainly from secondary sources, with limited primary source analysis where data was available in languages covered by the researcher.

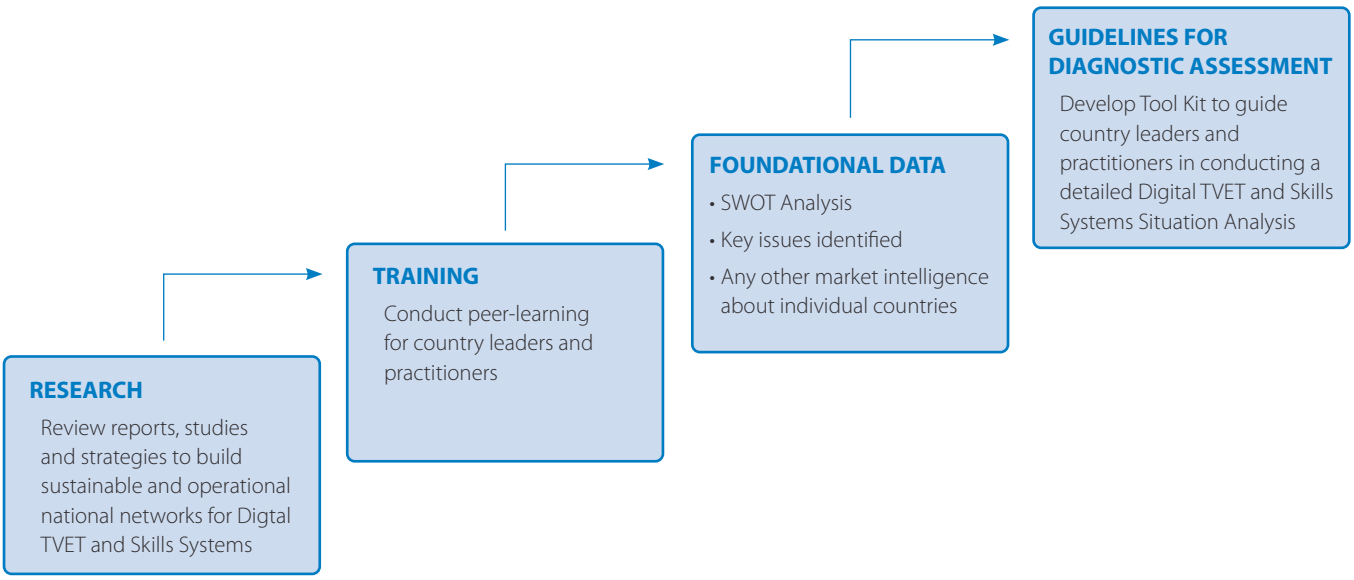


Figure 7: Overview of approach

# 4. Guidelines for situational analysis

These guidelines are designed as a non-prescriptive tool kit to assist participating countries in Africa in delivering a situational analysis that will determine their level of preparedness for the digitalisation of TVET and skills development systems. There is not one single framework or standard approach for undertaking the digital transition necessary in a country.

The guidelines are based on primary research commissioned by UNESCO and the ILO (2020) and the ILO's 'five building blocks' conceptual framework for TVET and skills development systems (2021). In practice, many of the elements in the building blocks are inter-dependent: a framework involves complex interactions between individual learners, workers and the labour market, and a range of institutions and stakeholders in the public and private sectors. These include education and training providers, regulatory bodies and intermediaries such as public and private employment services, business support services and local and regional authorities. There are complex financing and data flows, assessment and certification systems and interactions with different policy domains where the politics of skill formation impact the programmes and policies in operation.

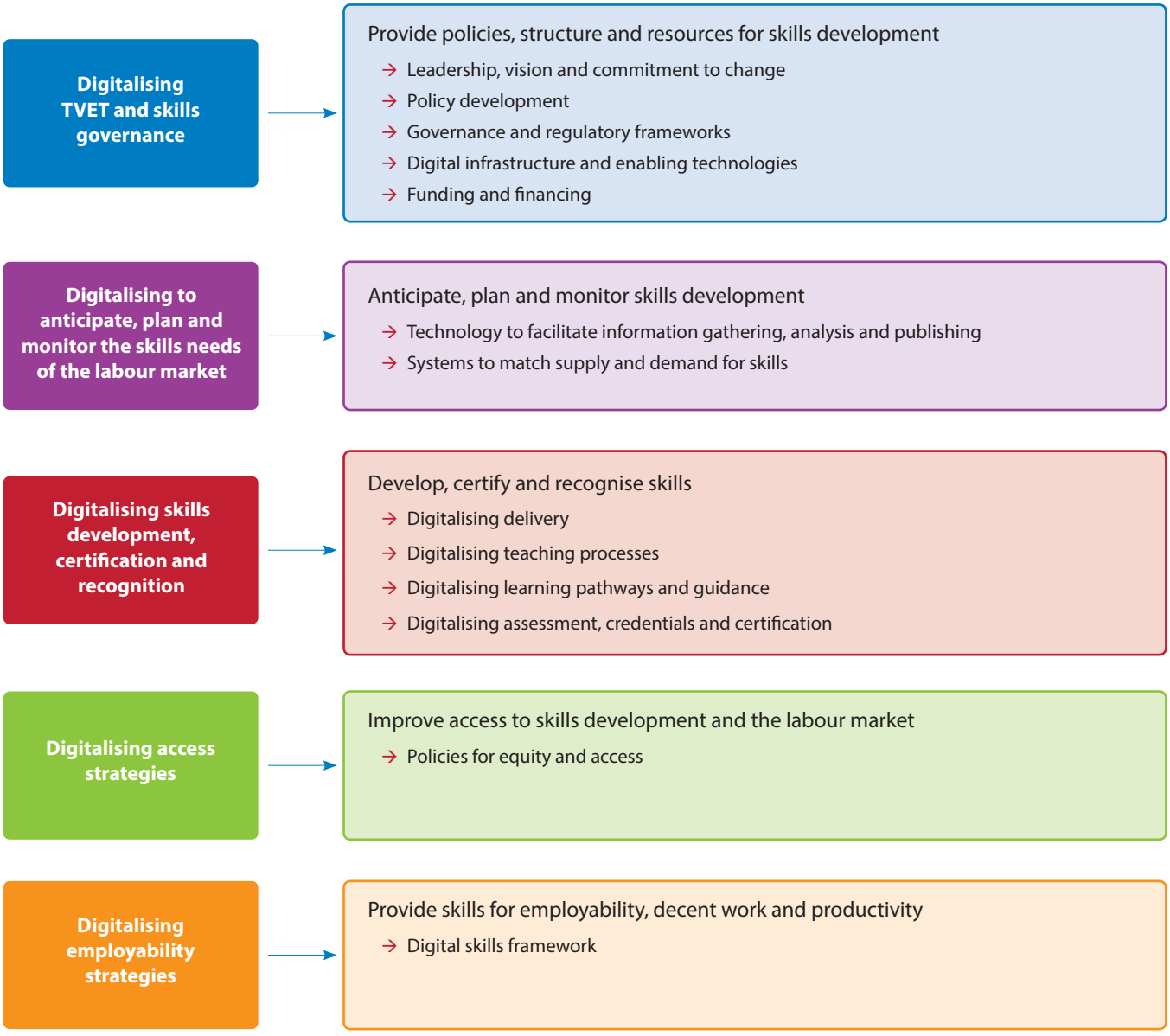


Figure 8: Building blocks for the guidelines

Moreover, few national systems use the same terminology or have the same names and structural relationships for the parts of the system. Each skills system will reflect its own history and context and its own understanding of the role of TVET in its political structure and culture(s). The components are presented as functions rather than assigning them to named authorities or organisations. Rather than positioning these guidelines as the 'final word' on the digitalisation of TVET and skills development systems, they are meant to be triggers for stakeholders to draft a detailed situation analysis. In the process, the guidelines should also help policymakers, educators and the labour market to determine the key gaps in the policies, governance, quality and relevance of current and planned delivery mechanisms.

A situational analysis process tends to follow a set of steps from concept to the delivery of a report (see **Figure 9** below). The guidelines are to be treated as building blocks for the collection and analysis of data and the development of a composite report, with the findings forming the basis for a prospective note and an action plan for the initiative.

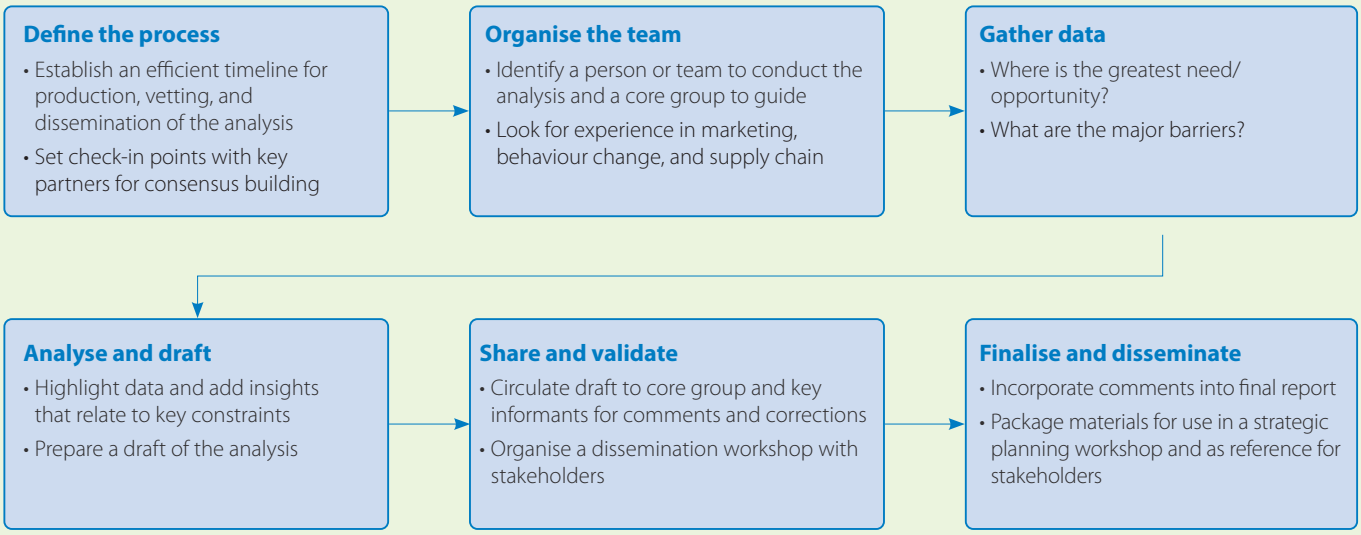


Figure 9: Typical steps in a situation analysis process
Source: Adapted from Mann Global Health (2020)

Developing the situation analysis is a process of organising, analysing and sharing data using a mixed-methods approach that includes reviewing available studies and programme reports; interviews with government, stakeholders and implementers; and, time permitting, targeted site visits. An effective situational analysis establishes a clear, detailed and realistic picture of the opportunities, resources and challenges regarding a particular issue or behaviour. The quality of the situation analysis will affect the success of the entire effort to set a strategic direction and the planning of country-level implementation of the initiative.

## Data collection considerations

**Start with what you know.** Build on the experience of in-country experts to pre-identify challenging aspects in programme stewardship, demand creation or supply to focus efforts early in the process.

**Challenge assumptions** that may be based on past experiences that no longer reflect current reality. Fresh perspectives will bring new insights to create the path forward.

**Focus data collection** on what is needed to set priorities within the plan. For example, you may choose to dive deeper into user-facing elements like demand if it is known that such gaps exist in the programme. Likewise, historical data about the performance of public sector distribution systems may not be relevant if there have been recent changes to the systems; and data disaggregated to a small geographic area may not be useful.

**Bring an inquiring mindset to your analysis.** Work to identify 'clues' that help you understand where condom use is lagging and why that may be. Every market is unique and will require digging to understand the 'story' behind the data and to develop hypotheses. For example, a deeper analysis of the commercial sector may be relevant in a country with high willingness and ability to pay, decreasing donor funding.

**Avoid the instinct to fill all data gaps.** It is generally not recommended to produce new quantitative data or original qualitative data from target audiences. Identified data gaps can be included in the monitoring, evaluation and performance improvement section of the strategic operation plan.

**Don't take easy answers.** Probe for information that will provide insights into what is working and what is not in the current programme. Ask for examples when speaking to third parties to determine the value added by a group, and validate claims.

Developing a situation analysis may take one to two months, depending on the availability of data, key informants, funding and technical support. Other factors that can influence your approach to the situation analysis include the expectations of the primary stakeholders in the ecosystem. The timeframe will be realistic if it focuses on gathering information within specific boundaries: aim to collect what is likely to be useful for identifying the priorities.

Not all data is useful. Consider the following:

| Type of data | Description |
|---|---|
| **Validated data** | What is known. Based on multiple, rigorous, externally validated data sources. This is the gold standard, but it is often not available or recent. |
| **Good data** | What a person knows. Based on multiple credible sources. Combining data points (even if not statistically comparable, such as surveys or reports using different sampling methods) can be very useful at this level. |
| **Some data** | What a person thinks. Based on partial data but containing gaps that matter. Project data will often fit in this category. More useful if supported by other sources. |
| **Personal experience** | What a person has seen. Based on implementation experience and/or individual experience. Much of the information from in-country experts will be here – it is useful, but consider whether it is based on recent experience or supported by other data. |
| **Gut feeling** | What a person believes. Based on received wisdom or unsubstantiated assumptions. Often worth sharing, but beware of unintended biases. |
| **Guess** | Could be, but who knows? Based on what might or might not be true. Generally, not that useful. |

Table 2: Types of data collected during a situation analysis

**Format for these guidelines**

The guidelines follow a simple format with the intention to generate responses that may be collated into a situation analysis report:

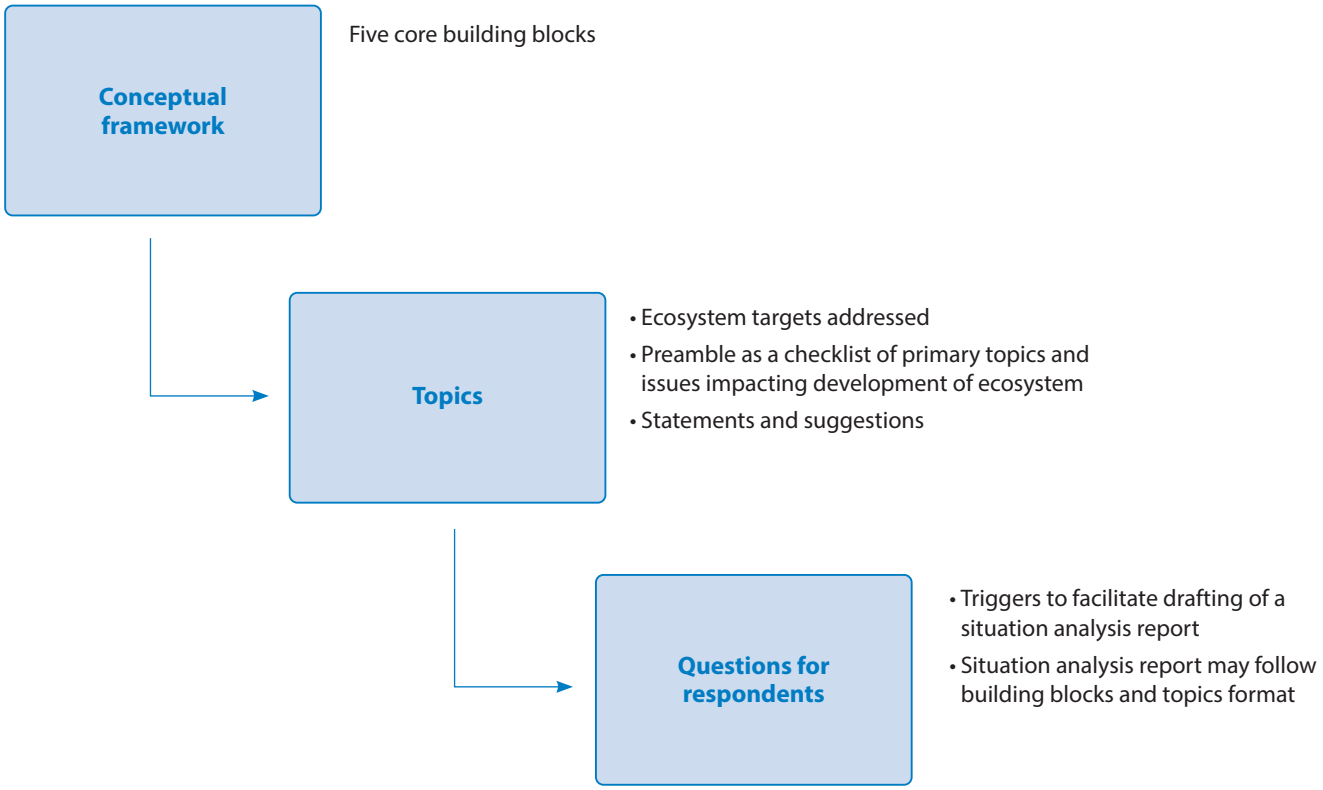


Figure 10: Format for the guidelines

## 4.1 Digitalising TVET and skills governance

At the core of governance is a commitment from the national and/or regional government, industry and education institutions to take ownership of the process for the digitalisation of TVET and skills development systems – to provide policies, structure and resources. Within this context, digitalisation is about rethinking national TVET and skills systems using innovative approaches as opposed to considering technology as an 'add-on' to existing organisations, processes or curricula.

The digital transformation of TVET comprises multiple policies and actions at all levels of government but often does not represent a unitary coherent strategy. Initiatives for the digitalisation of TVET might variously reside within institutions, be driven by industry, or be the domain of employment or industrial policy or of ministries of education, to mention just a few. The multiplicity of the different actors involved in a potential high-level digital TVET strategy thus adds complexity to the formulation and implementation of digital TVET strategies.

### 4.1.1 Leadership, vision and commitment to change

**Targets addressed: 1 and 8**

The initiative is a high-profile, medium-term, ambitious change programme with clear targets. It is critical to secure support at the highest level of government at the outset: if such support is not secured, the initiative risks being stillborn.

Strong leadership is required at political, institutional, organisational or even company level to steer a vision and strategy and set examples of how to support the objective of more effective innovation and digitalisation in TVET. Leadership teams at VET school level face a number of challenges since they play a particularly important role in innovation, with schools needing to consider all elements, including organisational structures, pedagogy, learning environments and the curriculum, if they are to become innovative institutions. They also need to consider the relationships between teachers, trainers and learners and how these relationships need to change to make the most effective use of digital technologies.

**Buy-in into strategic approach to TVET digitalisation**

The existence of national frameworks for interaction, co-operation and co-ordination among stakeholders is essential to ensure consistency across the TVET system. From a policy perspective, TVET strategies tend to focus on digital adaptation, with varying degrees of emphasis being given to:

1. Modernising TVET, so that it teaches 'new skills' required by the labour market in terms of both technical and transversal skills;
2. Increasing the responsiveness of TVET to the labour market– in particular improving the sensitivity and the time of response;
3. Better equipping students in TVET for life in the labour market; and
4. To a lesser extent, equipping students with entrepreneurial skills to find or create jobs themselves.

The success or otherwise of the initiative is dependent on government's propensity and preparedness to move from short-term emergency responses to longer-term strategic approaches to digitalisation, digitisation and digital transformation, that can be adapted to local needs.

**Key questions that can be asked may include:**

- Is digitalisation at the core of the country's national development programme?
- Is digitalisation associated with TVET, skills development and the employability of young people in the country?

**Commitment to TVET digitalisation change programme**
It is important to determine which entity and which people are prepared to take up ownership of a change programme. Digitalisation requires energy and the commitment to provide a fresh vision, with proactive leadership and targeted change initiatives.

The success of the initiatives is dependent on the project team(s) being composed of people with the requisite technical, business, analytical, interpersonal, management and ethical skills. It is equally important to foster communication and anticipate change among teams and individuals, involving all stakeholders, to prepare them for the new ecosystem's changing roles and responsibilities.

If there is more than one ministry involved in driving a change programme, it is vital to promote and foster joint work across the various ministries to enable efficient linkages between all parts of the TVET and skills system.

**Key questions that can be asked may include:**

- What is the government's commitment to TVET digitalisation change?
- Which ministry is responsible for driving TVET digitalisation and skills development?
- Which ministry is the sponsor of the initiative?
- Will more than one ministry be involved in sponsoring or participating in the initiative?
- How easy is it to access key decision-makers in the government who can kickstart a digitalisation change programme?
  - → Can you identify and list these key decision-makers?
- Has a multi-disciplinary project team been set up to take up ownership of the initiative in your country? If not, when will it be set up?
- Does the project team include roles such as:
  - → Project sponsor
  - → Project manager
  - → TVET expert
  - → Technology expert
  - → Business analyst
  - → Communications expert?
- Are there fulltime members of the project team?
- Which entity/person does the project team report to?
- Which entity funds the project team?
- What is the availability of change agents within key stakeholder groups? Can you identify these?
- Are you in a position to recommend specific people to this position within your own organisation?

**Stakeholder engagement**
Developing a situation analysis is an opportunity to obtain and secure buy-in and support among key stakeholders in the initiative. Stakeholders should be able to identify tangible value from getting involved in the process in that it should make their work easier and better. Understanding their needs and securing buy-in before the start of any change initiative is of vital importance. The data and analysis produced are more likely to be used by them beyond the planning process – and their activities will have more impact as a result.

In the case of key informant interviews, key documents should be reviewed in advance (e.g., national plans, reports, TOR for coordination bodies and relevant policies). Individuals with comprehensive knowledge and access to reliable data should be identified during the planning process. Later interviews can add more depth and triangulate data; a few targeted interviews early on can provide most of the insights required to support analysis.

Understanding stakeholder needs before the start of the data collection process will make it more likely that the data and analysis produced will be used beyond the planning process, and stakeholder activities will have more impact as a result. Adopting a user-centric, demand-oriented approach while using techniques such as design thinking is likely to maximise inclusion as well as adoption.

**Key questions that can be asked may include:**

- Have you identified key stakeholders who may have an impact on the success or otherwise of the initiative?
- Can you organise an initial briefing session with key stakeholders to ensure that you have access and time to review key documents?

**Strategic communication and promotion**

The success of the initiative is very much dependent on the ability of key stakeholders to promote and push for the creation of national online communities to increase sharing of best practices and online learning and teaching solutions.

As with any other change initiative, there is a need to be as inclusive of different stakeholders as possible, keeping them informed on progress while still moving efficiently toward the final report. One way to address this lacuna is to consider including a larger group in communications about the initiative process as well as gathering data from them while also setting up and using a smaller core group to review and validate findings.

Early on in the situation analysis, it is important to review current communication and collaboration systems and practices to determine how to best effect the systematic digitalisation of effective virtual work processes across the skills system.

**Key questions that can be asked may include:**

- Has someone been delegated to take charge of all communications relating to the initiative? If not, when will this process start?
- Will the communications process be outsourced? to review key documents?
- Can you identify key communications people within stakeholder groups?

**Commitment to transformation and a sense of urgency**

Digitalisation is viewed with scepticism by a significant segment of the educational establishment. There are struggles with infrastructure and with teacher training, and there may be a fear of greater workloads and more bureaucracy rather than greater efficiencies. There is scepticism as to whether digitalisation will actually translate into tangible benefits for citizens – a culture of bureaucracy may yet dominate. In most institutions with sufficient staff capacity there is likely to be optimism, but smaller institutions which clearly need external help may perceive it to bring increased costs.

The challenge is to change mindsets and ideas about technology and TVET, and focus discussions on the real potential for technology within the context of demand-driven competences. Big data is a powerful tool for sociological and policy research when it is combined with, for instance, biographical data from job applicants and qualitative studies of the recruitment process.

Policymakers tend to be hesitant to invest in solutions with the potential of 'quick wins'. And yet, to establish the initiative's ecosystem and meet the ten targets, the commitment to a process of transformation by policymakers has to be matched by a sense of urgency. In the case of digitalisation opportunities, working on a sandbox, use case or pilot project is an excellent way of demonstrating the benefits of applying technology strategically to the TVET and skills development sector. The governments, businesses and institutions getting the most benefit from emerging technologies are those who test their applicability on the basis of pilots that demonstrate practical benefits; have costs which can be controlled; and promise lasting value within the short term. Projects that lever on technology to solve a particular problem or address a specific issue within a prescribed timeframe have more chance of support than initiatives that are purely technologically deterministic. Projects need to have resonance with citizens and the labour market and within traditionally challenging sectors such as agriculture or cultural contexts such as youth unemployment and irregular migration.

**Key questions that can be asked may include:**

- Can stakeholders identify an opportunity for a high-profile TVET pilot project that could address one or more of the ten targets? This could also be an initiative that has been started but which could be transformed and accelerated through a process of digitalisation.
- Do you have an understanding of the timeframes within which the initiative needs to deliver 'success stories' to retain the support of decision-makers?
- Are there procedures in place to include existing IT teams in the early design of online solutions to make sure they support the choice of efficient and inclusive solutions and the implementation and agile evolution of such solutions?
- What would be the level of dependence on external forces (such as funding and external experts) for a transformation project?
  - → Would a transformation project require external support from third-country nationals?
  - → What is the likelihood of a transformation project becoming sustainable in the short or medium terms, without such external support?

## 4.1.2 Policy development

**Targets addressed: 1, 2, 3, 4 and 8**

The linkages between TVET and digitalisation policies are, at best, inferred: in most cases, they are weak. Sometimes, they are contradictory. There is increasing evidence that the digitalisation of TVET comprises multiple policies and actions at all levels of government but often does not represent a unitary coherent strategy for the sector and skills development. The challenges are complex and multi-faceted, and, as the COVID-19 pandemic has demonstrated, it is more important than ever to understand how to prepare TVET to respond. Innovation and digitalisation provide the means to respond to these challenges. Policy choices need to be made in terms of priorities, reforms and investments to manage the digital and green transitions smoothly.

A corollary to the lack of policy focus on digital TVET is that much digital innovation is taking place at institutional level. Such innovation tends to iterate and improve on existing processes through the use of technology. Essential prerequisites for such grassroot innovation include:

1 Institutional management that keeps abreast of technological developments and is open to change;

2 Availability of basic infrastructure such as electricity, broadband, equipment, etc.;

3 Sufficient institutional autonomy to make investments in technology;

4 Ability to create a culture of innovation encompassing all staff in the institution; and

5 Close connection with students and industry, so as to be sensitive to demands for digitalisation.

Generally, TVET institution decisions on investment in technology tend to be driven by business objectives, as opposed to a push for the adoption of specific technologies. Nevertheless, organisations that work directly with institutions, such as associations of institutions or government agencies set up specifically to support institutions, are often powerful vehicles for change.

The 'digitalisation of TVET' cannot be identified as a single area of government strategy: no one single ministry or body is normally responsible for developing policies and regulatory frameworks or taking ownership of the implementation of such a strategy or any underlying programmes. This segmented approach to policymaking and implementation leads to occasionally conflicting agendas and pressures on TVET from several sides to modernise in response to a changing world and changes in industry – reflecting TVET's role as service provider to the labour market. The lack of a single entity with the responsibility for digital TVET policy also means that there is no clear allocation of responsibility for designing strategies as to how digitalisation might be harnessed to increase the scope, quality or impact of TVET.

Digital TVET within the construct of 'government policy' tends to be tantamount to sub-policies which could in turn impact ICT infrastructure, quality assurance and labour market skills. These are likely to include various policies:

1 Core infrastructure policy, including provision of (mobile) broadband, is typically covered by telecoms policies and regulators. Although this is a key prerequisite for digital TVET, education only features as a second-tier rationale for deploying these services, if at all.

2 Industrial and economic policies typically set the pace of digitalisation across the whole economy, often with a country picking certain sectors (such as automotive, nanotechnology, etc.) where it will be a winner. The TVET sector then typically reacts to these decisions by teaching the applied skills required to meet these demands. In some countries, TVET is considered a key partner in defining regional development policy, but its role is still typically subsidiary to that of industry.

3 Policies on digital skills development are often shared competences between 'digital' ministries together with educational strategists.

4 Policies on opportunities for work-based learning (WBL) will also involve job agencies and ministries for employment.

**Official TVET and skills development policies and legislation**
The existence and publication of legislation and/or an official policy related to TVET, technology and skills development indicate a state of readiness for change. These policy documents may also be in the form of national strategies (including those focusing on 'digital' or 'green' issues) and those published by sector skills councils (or the equivalent) to inform decision-making on priorities.

Referencing any change initiative affecting existing policies and legislation is more likely to secure support when it comes to implementation.

**Key questions that can be asked may include:**

- Has your country published any TVET- or skills development-related legislation?
- If there is no official document relating to TVET or skills development, what is the likelihood that policymakers will embrace the opportunities of digitalisation for the TVET sector and the labour market and legislate to demonstrate buy-in?
- If an official document exists, can you summarise the main tenets of the policy? What importance is attributed to skills development?
- Can you identify the authors of relevant policy documents? Is it possible to contact them if you need clarification?
- What are the main drivers for the creation of this policy documentation?
- What social and economic outcomes are they expected to bring about in your country?

**Official policies on infrastructure, connectivity and equipment**

Most countries have regulations and regulatory bodies in place to address issues related to digitalisation, ICT infrastructure and connectivity.

**Key questions that can be asked may include:**

- Has your country published policies which may guide the development of the digital transformation of TVET?
  - → Are there specific policies that associate the digital transformation of TVET with changes to ICT infrastructure, connectivity and equipment?
- If no policies have been published, which entity or entities should be consulted to establish short- and medium-term national plans and initiatives which will impact or improve the state of infrastructure, connectivity and relevant equipment in the country?
- Are there initiatives to ensure that the digitalisation of national TVET and skills systems is inclusive and does not increase the digital divide?
- Are there concrete plans in place for the implementation of these policies?
- Have any specific policies been developed to prepare for or respond to Industry 4.0?
- Does the digitalisation of TVET support policies in other areas such as innovation, regional policy, unemployment and labour policy attraction of FDI?

## 4.1.3 Governance and regulatory frameworks

**Targets addressed: 3, 4, 8, 9 and 10**

While regulation tends to fall within the exclusive domain of the nation state, the internet is global, and frameworks for the regulation of 'digitalisation' are at best nascent.

**Bodies and organisations responsible for digital TVET**
Consider the organisations in your country which have, or should have, an interest in the digitalisation of TVET and skills development. Consider the following:

**Key questions that can be asked may include:**

- Which are the national industry bodies with some interest in or relationship with TVET?
- Which entity is in charge of national skills standards?
- Is there a register of TVET providers? Can you secure a copy?
- Which entity is in charge of TVET quality auditing and assurance?
- Is there a national repository for data relating to TVET?
- Can you identify any regulatory bodies in charge of policies relating to publishing and licensing?
- Can you identify a regulatory body in charge of data privacy security?
- Could you share some examples of new forms of TVET management made possible by digitalisation?
- Do you have examples of digital technologies being used to make TVET management more efficient and/or effective?

**Qualification frameworks and digital governance**
Keevy (2019) explains how quality assurance (QA) systems share some common characteristics: a longstanding emphasis on the divide between formal, non-formal and informal learning; a strong emphasis on the value of formal learning, sometimes at the expense of non-formal and informal learning, further evidenced through the development of recognition of prior learning (RPL) systems internationally; external validation by independent quality assurance bodies; and strong government control and sanctioning of quality measures in most parts of the world.

Digitalisation is inevitably blurring the boundaries between TVET and higher education, and insisting on these boundaries in the 21st century may be ill-advised or even lead to silos. Digitalisation also opens up new ways of doing quality assurance, and QA regulators and policymakers need to be aware that systems must be adapted to account for new quality criteria directly related to digitalisation. It is easier to improve on quality systems if policymakers are exposed to better systems than the ones with which they are familiar: this implies a knowledge of better experiences and processes. In many developing countries, QA regimes remain locked in traditional offline processes which they then try to apply to a digital environment.

Formal learning refers to learning that takes place through a structured programme of instruction and is linked to the attainment of a formal qualification or award (for example, a certificate, diploma or university degree). However, research found that for many people, non-formal and informal learning processes are often the only way in which they gain work skills. Non-formal learning takes place through structured learning programmes but does not lead to the attainment of a formal qualification or award (for example, in-house professional development programmes). An effective TVET system has the capability to recognise and accredit the knowledge and skills learners have gained through non-formal and informal learning following formal recognition processes.

**Key questions that can be asked may include:**

- Is the national qualification framework (NQF) keeping up with new developments in digital credentialling?
- How open are key players in NQF positions in your country to reconsidering old norms in response to digitalisation?
- How are new developments brought about by digitalisation and Industry 4.0 being monitored by authorities?
- Is there a serious commitment to new forms of governance that are decentralised, broader and more citizen-controlled?
- Is there an understanding of the need to position the needs of citizens and learners at the centre of (or as a pre-condition for) any discussions on the future TVET sector in your country?
- What initiatives are in place for skills frameworks that may recognise all the different skills that are acquired in non-formal systems and for getting them recognised?
- Specifically in the case of RPL, to what extent is your country interested in using technologies to enhance RPL mechanisms in order to recognise skills acquired through different forms of learning?

**Quality assurance and digitalisation**

QA policies remain the preserve of higher education alone, although TVET pedagogies and technology systems demand a similar attention to QA for the benefit of the key stakeholders – learners and the labour market. The corollary is that digital TVET is accelerating the hybridisation of tertiary education. Traditionally, so-called 'intellectual' work is often contrasted with 'manual' work: there would be white-collar (office) professions and, on the other side, traders, technicians, etc. Nowadays, such distinctions are no longer possible.

A number of digital-linked trends, including competence-based education, personalisation, micro-learning, and the infiltration of technology into practically every discipline, is leading to a breakdown of the traditional silos between 'technical and vocational' education and 'academic' education, particularly within tertiary education.

Quality systems in TVET are generally organised around quality control rather than quality management or the promotion of a quality culture (that is, a sense of joint responsibility for quality amongst internal stakeholders within the institution), reflecting the limited capacity for TVET institutions to meet the expectations of relevant authorities and other stakeholders. Effective quality assurance tends to be reduced because day-to-day issues take precedence, such as large group sizes, limited facilities and equipment, minimal access to consumables, weak administrative systems and a lack of trained TVET assessors. Furthermore, there are competing demands on funds, and many emerging TVET systems are reliant on donor support, which limits long-term sustainability. Typically, the types of metrics collected include admissions or graduation rates, or the overall satisfaction rates of students. Digitalisation can facilitate the collection and analysis of such structured data, particularly through the digitalisation of feedback forms. Real-time learner feedback systems allow teachers to secure instant feedback on lessons, even from large classes, and to improve content quality. They also enable administrators such as TVET institutions, TVET managers or government leaders to use information on performance to properly allocate resources and customise programmes according to the needs of students and teachers. Tying quality assurance data to the burgeoning field of learning analytics promises to give valuable insights that will allow the personalisation of education and granular performance data for students and teachers.

At national level, governments and quality assurance agencies often work closely on issues surrounding recognition, accreditation and quality assurance. With respect to quality assurance and accreditation in particular, four approaches have been identified in dealing with the challenges posed by e-learning and distance education:

1 **Creation of specific criteria:** Countries, such as Singapore, China, New Zealand and Malta, have specific, comprehensive sets of criteria for e-learning providers and/or distance teaching institutions.

2 **Mainstreaming into overall quality assurance:** Several other countries have updated or reviewed their existing quality assurance criteria and found that a single set of criteria can cover all types of institutions. A notable example of this is the UK, which moved from advisory guidance in its code of practice to a mainstreamed system that is neutral on modes of delivery.

3 **Hybrid/Personalised system:** While at the moment only partially implemented or under discussion, quality assurance systems can have a standard 'core' applicable to all kinds of education and organisations, with add-on 'modules' specific to distance or e-provision.

4 **No approach** – Other systems have not considered the impact of e-learning on their criteria, sometimes creating perverse results such as limitations on the size of classrooms or requirements for physical facilities which are not relevant to e-learning.

QA is even more necessary in the new era of multiplicity and diversity, but it needs to evolve to accommodate micro-credentialling, SSI, digital credentialling, etc. QA in the new world will be more private sector-driven, more open and more digital. This will include industry and vendors, as the supply and demand value chains are completed in more direct, and to some extent also more unpredictable, ways than have been possible to date.

**Key questions that can be asked may include:**

- Do TVET quality assurance systems take digitalisation into account?
- Does digitalisation open up new ways of doing quality assurance, e.g., through the adoption of new metrics, learning analytics, etc.? Can you provide specific examples?
- Are there examples where quality criteria have been changed to encourage digitalisation?
- Are you aware of any examples of QA which are hindering digitalisation? Can you cite examples?
- What are the possibilities of funding for the creation of digital platforms or tools for feedback on the quality of training providers and student learning outcomes?

## 4.1.4 Digital infrastructure and enabling technologies

**Targets addressed: All**

The digitalisation of TVET and skills development systems is correlated with the nation's (and region's) technology capabilities – the various elements of digital infrastructure and technologies already in place or planned to be in place within prescribed timeframes. The initiative is also very much dependent on the propensity for key decision-makers at policy, TVET and labour market levels to put their trust in technology as an enabler of socio-economic and cultural change.

**State of readiness of digital infrastructure**

The digital infrastructure in a nation state has much to do with the country's aspirations to maximise on the opportunities of digital TVET, skills development and Industry 4.0.

**Key questions that can be asked may include:**

- What is the state of digital infrastructure in your country? Consider the following components:
  - → The **internet backbone** (including submarine communication cables and facilities that are used by tier 1 networks for interconnection)
  - → **Fixed broadband networks** that connect regions and cities with high-speed wired internet, including last-mile connections to homes, businesses, data centres and related facilities – typically supports applications such as video conferencing and remote control of equipment
  - → **Mobile telecommunications** or cellular networks such as 3G, 4G and 5G that provide wireless broadband internet and communication services. An innovation in this area is low-cost global satellite internet, which should allow anyone on Earth access to a mobile broadband connection with only a compatible router.
  - → **Communications satellites** that provide network or information services
  - → Other network infrastructure such as **wi-fi networks**
  - → **Data centres** or facilities that manage computing, data storage and network services
  - → **Cloud computing** or platforms that offer the offloading of computing tasks from a local device to a computer hosted in a data centre. It is associated with computing, data storage and network services on demand, enabling

users to use a small, relatively low-powered device, while at the same time having access to the computing power of hundreds or even thousands of machines. Cloud computing depends on broadband to communicate between the local and remote devices.

  - → **Other cloud-based platforms** for developing, deploying and operating software services

- What is the availability of core enabling technologies? Consider the following:
  - → Systems or software that is primarily concerned with **automation** as opposed to being a tool for users
  - → Applications or software that is meant to be used as a tool by people using **mobile apps**
  - → **APIs and integration** or services that allow various systems, platforms and applications to work together and share information. In some cases, an API is so widely used that it becomes important to the normal operations of an economy.
  - → **End-user devices** such as mobile phones and laptops
  - → **Internet of Things (IoT)** such as robots, machines, sensors, facilities, infrastructure, products, vehicles and environments that are operated using an internet connection
- Which technologies are being introduced, or are about to be introduced in the short term (say, in the next two years), in key stakeholder organisations? Or in any organisations with which you have a direct relationship?
- Which international/national and/or regional initiatives are in place to develop or upgrade national ICT platforms and interoperability standards to support new digital applications and promote secure access?
- In the case of a firm commitment to digital transformation at national or regional levels, are the requisite ICT teams in place at the earliest stages of the digital transition to anticipate all the linkages, and to retain them as allies all through the process of implementing, maintaining and upgrading relevant technical solutions?
- In the case of infrastructure projects funded by international organisations, what is the level of preparedness at national and/or regional level to take up ownership of these projects and ensure sustainability?
- What are the chances of sustainability in terms of ensuring that hardware and software are maximised over a significant period of time?
- What technologies do you believe are driving innovation in TVET and which have relevance for the labour market?
- Do you believe that low-level or mature digital technologies still hold the most potential for transformation of the TVET sector in the short term? Or should your country focus on emerging technologies?

**Emerging technologies with potential to drive digital transformation in TVET**

The affordances of emerging technology in daily lives are being explored as new modes of teaching and learning, both in and out of the class or training centre, with content delivered interactively, asynchronously and in blended or totally online format.

In a learning context, ubiquitous computing infrastructure for broadband, mobile broadband and cloud computing is a pre-requisite for most applications of digital learning: in places with poor educational infrastructure, it can often be a prerequisite to be able to deliver **any** educational or training opportunities.

Mobile is the primary interface for the development of TVET-related apps. Simple apps such as school companion apps that can be accessed by both students and parents are potential game changers in some contexts. Mobile, internet and decentralised technologies are coming together to enable institutions to collect fees and empower the end user (the student) in the process by removing the middleman. Some organisations are exploring crypto currencies as a means of removing incumbent and predatory fee structures.

Applying the ILO (2020) model for technology particularly suited to TVET transformation agendas:

- What is the commitment of government to providing **ubiquitous computing**[8] to all parts of the country?
- Consider **collaboration technologies** with a 'social' element such as Facebook, Dropbox, Google Groups, Google Drive, WhatsApp, Zoom, Teams, etc.
  - → Which collaboration technologies are in widespread use in your country?

[8] Ubiquitous computing is associated with fixed and mobile broadband and cloud computing. Taken together, these technologies allow for individuals to have access to practically unlimited information and computing resources, even from low-cost devices such as mobile phones, from anywhere in the world.

→ Which of these do you feel are particularly suited to digital TVET and skills development?

- **Virtual reality (VR), augmented reality (AR)** and **mixed reality (MR)** form part of a set of immersive extended-reality technologies that are becoming increasingly mainstream, particularly with the renewed attention to the metaverse. At the most basic level of functionality, these technologies could enable students to control systems and software remotely, such as the shared remote control of equipment and simulations of industrial control systems.

  → Is there any interest in exploring VR, AR and MR for digital TVET and skills development?

- **Artificial intelligence (AI)** is a group of technologies and techniques, in particular those linked to deep learning, natural language processing (NLP), recommender systems and signal recognition, that allows computers to interact and learn as well as to interact more like humans. AI applications depend on the existence of massive databases of coded material with which to train machines, thus limiting its applicability in many sectors that do not have access to such data sources. NLP has a broad range of applications within education, including powering search engines, chatbots or help forums which can answer student questions phrased in natural language; the translation of educational materials; and providing artificial mentorship or step-by-step instructions in practical contexts. Recommender systems can be used for personalised recommendations such as books, courses etc. based on user profiling.

  → What is the interest in the use of AI for teaching and assessment in a TVET system?

  → What is the interest in the use of AI to rank learning opportunities and, in a TVET system, recommend (a) educational/training resources, (b) learning opportunities, and (c) personalised career pathways, based on aptitude, educational goals and past performance?

  → What is the interest in the use of AI for the assessment of standardised tests applied to large numbers of students?

- **Blockchain** is a type of distributed ledger technology (DLT) where transactions are recorded with an immutable cryptographic signature called a hash and then grouped in blocks. Every new block includes a hash of the previous one, chaining them together – hence a 'blockchain'. Blockchain technology-based products and services are significantly different from previous internet-based commercial developments and are of particular interest to the education sector in areas such as verifiable credentials, management of student records, intellectual property management, payments and student information system architecture. From a social perspective, blockchain technology enables self-sovereignty, trust, transparency and record immutability; it can also remove the need for a central controlling authority to manage transactions or retain records and enable parties to transact directly with each other without the need for third parties.

  → What is the interest in the use of blockchain for teaching, assessment and accreditation in a TVET system?

## 4.1.5 Funding and financing

**Targets addressed: All**

The digitalisation of components of TVET and skills development systems requires significant funding, particularly when there is a need for investment in infrastructure and related technologies. Decisions on funding for digitalisation of the TVET sector are typically taken at the level of education ministries or related national agencies. In the case of developing economies, in addition to state aid, this process often involves private-public partnerships and foreign grants, donations, loans and incentives from actors such as development banks, development and aid agencies, and foreign governments.

Funding and financing are inevitably associated with strategic planning programmes and return on investment. One of the maxims of TVET funding is that many investment efforts are rendered obsolete unless digital transformation can directly contribute to the upskilling and reskilling of the labour force. According to AFD (2014), African nation states devote too small a share of public expenditure on TVET and skills development. Training funds are often created to compensate for the lack of public financing by extracting a fixed contribution from the private sector in the form of training and apprenticeship taxes; however, states tend to consider this as parafiscal revenue, with a knock-on negative effect on the sector. Innovation and digitalisation are not necessarily cheaper options than traditional approaches to learning. Indeed, ICT-based learning can be resource- and labour-intensive. They also carry the risk of failure, which in turn risks deploying funds up front on activities that may not bear fruit. Funding models need to be more flexible and allow for risks in ways that may be unfamiliar.

The corollary is that the pandemic has renewed interest in the EdTech sector, and the private sector in particular is investing in ongoing and new projects which lever on emerging technologies to re-think education systems, including the delivery of 21st-century skills.

Digitalisation is also associated with the democratisation of the entire funding process since it allows for transparency through QA, with ratings on specific interventions becoming increasingly transparent through an ever-improving feedback system.

**Key questions that can be asked may include:**

- Is digitalisation perceived to be raising or lowering the cost of TVET in general?
- Does technology enable/facilitate new forms of financing for TVET? If so, explain.
- Are any new or special financing programmes available for the digital transformation of TVET?
- Do policymakers associate an investment in digitalisation and technology with a likely increase in the quality of TVET?
- Are the following types of skills development funding programme in place:
  - → Pre-employment training funds
  - → Continuing training funds
  - → Equity funds (particularly for disadvantaged groups such as unemployed youth and those working in the informal sector)?
- Have specific funds been allocated for the initiative? Does the commitment extend beyond encouraging key policymakers and practitioners to attend training courses?
- Are relationships in place with organisations that have an interest in funding digital transformation projects in the region?
- Are specific funds available for a pilot project that can be positioned as a flagship for the digitalisation of TVET and skills development?
- Can high-profile use case studies be identified that will resonate with both the labour market and government?

## 4.2 Digitalising to anticipate, plan and monitor the skills needs of the labour market

The premise for digitalisation is a commitment to change, reflecting the impact of technology on society. Technology and social change together condition innovation: we need to recognise the rise of networked individualism and people who are born digital with access to affordable mobile technologies where the common interface is the screen and the most popular massive online open course (MOOC) is YouTube. Most learning today is uncredentialled and often decontextualised. Whether you are learning via YouTube or exchanging a textbook for a PDF: there are formal and informal knowledge exchange systems that are empowering global citizens, a veritable trending universality. When we talk about labour market training and how people can get and keep and grow certain jobs, in a sense we are trying to use outmoded forms of measurement to get data on things that are fundamentally new.

Digitalisation inevitably emphasises the need to tap into global knowledge rather than keep looking at nation-state fixes. Only use case studies can persuade nation states to learn from each other.

Digital TVET needs to be associated with practical, quality, verifiable education – a more efficient, transparent, comparative system that is fit for 21st-century purposes. The scepticism about whether digitalisation will actually translate into tangible benefits for citizens is often the result of deeply rooted fears that a culture of bureaucracy may yet dominate opportunities for innovation.

The labour market is aware that skills need to be rebooted. A very large percentage of lecturers in TVET schools come from industry. By their very presence and the need for continuing professional development (CPD), they are inevitably delivering new approaches and demonstrating that they have up-to-date skills and knowledge. The labour market needs of the nation state need to be identified on the basis of reliable data or labour market information (LMI). Digitalisation is critical for an efficient LMI system, since the sector is data-dependent and so the accuracy, currency and reliability of labour market information is critical. It is also connected, with the system being highly interdependent: stakeholders rely heavily on reliable and prompt reportage and real-time access to information and analysis.

### 4.2.1 Technology to facilitate information gathering, analysis and publishing

**Targets addressed: 4, 6 and 10**

A skills system can be viewed primarily as a dynamic information network, with a business-to-business network in place between the key agencies in the system, and a public network for employers and learners.

**Labour market information systems**

The systems and tools for gathering and analysing LMI vary significantly from one country to the next, from the rudimentary to sophisticated digitalised systems dependent on granular data generated by specialised technology.

In the case of TVET skills development curricula, it is vital that there are close and dynamic links between government, training organisations and social partners to better inform the design and delivery of in-demand skills and training. The labour market and the skills needed to improve employability, particularly that of young people in Africa, need to be directly linked to TVET and learning outcomes.

Typically, national TVET and skills systems include websites/portals to exchange curated information between stakeholders. They also include a variety of more or less interconnected components such as:

1. Existing distinct sources of national LMI that can be collated into one-stop-shop LMI services, including statistics on labour force earnings and labour conditions surveys, employers' skills surveys, vacancy data, training offers and occupational information;
2. Job boards or portals;
3. Certification platforms for training and accreditation of training institutes;
4. Individual portfolio tools and matching engines linked with vacancies; and
5. Cross-service referrals linked to individual case management when systems are interoperable.

For the purpose of the initiative, it is important to determine the state of the national LMI network and system for gathering, analysing and publishing LMI as a means of identifying gaps or weaknesses and new digital solutions available to improve performance.

**Key questions that can be asked may include:**

- Which digital technologies are being applied to LMI? Are there any reports relating to the digitalisation of LMI? Is it possible to get in direct contact with the authors if necessary?
- How are digital technologies being used to anticipate, pilot and implement LMI according to the local needs and organisations?
- What are the opportunities for improving collaboration between ministries and national agencies in charge of LMI, education and employment, due to the interdependency of collected and utilised data?
- Do key ministries such as the ministries for labour, employment and education have research and development teams and/or expert profiles in frontier technologies to ensure a dynamic and integrated approach to labour market planning?
- Can you identify the main social partners in your country? Are social partners involved in discussions on how TVET can respond to digitalisation?
- Do social partners have a position on the digitalisation of TVET? Please summarise.
- Is there employer support for competency frameworks, talent analytics and skills-based hiring?
- Are there formal communication processes in place between government, training organisations, industry and social partners to anticipate training for all staff members to ensure the efficient uptake and adoption of the new tools and processes?
- Are end users involved in the design stages of TVET curricula?

**Adaptation of TVET to provide future skills for future jobs**

Studies indicate that policy work on future skills is adopting a three-pronged approach that involves:

1 Anticipation of skills needs as well as areas of de-skilling through surveying of emerging technology;

2 Teaching of transversal skills, in particular learning-to-learn skills, which will allow for persons to adapt to future changes to the labour market through continued and lifelong learning; and

3 Improving the reactivity of educational systems to emerging trends – this requires close cooperation between education, research and industry to allow for TVET systems to provide skills training in emerging areas.

Digitalisation is becoming the driving force behind lifelong learning and flexible learning pathways for meaningful work. Distance learning technologies, micro-learning and the evolution in support technologies such as scheduling software is significantly expanding TVET institutions' capacity to offer flexible learning opportunities at times and places which are driven by learner needs rather than institutional needs. Concurrently, the continued digitalisation of processes within industry means that to remain relevant, workers typically need to return to education or training at several stages across their working careers. Indeed, the notion of one 'career' over a worker's lifetime is being gradually eroded. Typically, workers and companies prefer that such education or training is either seamlessly integrated into the workplace or can take place simultaneously to workplace demands, without disrupting normal workflows.

Taken together, these trends are seeing a rise in 'just-in-time learning', whereby an individual will undertake an initial TVET training with a dedicated TVET institution to gain access to the labour market, and then continue to avail themselves of additional trainings provided by their employer or by a mixture of TVET institutions, as their career goals and job requirements evolve. These trainings might be integrated into their job as micro-learning courses, or they may take the form of evening classes, online courses or online trainings. Lifelong education and training pathways are also significantly increasing the complexity of workers' CVs. Innovations in digital credentials, e-portfolios and CV software are aiming to ensure that CVs can still be presented concisely, while at the same time providing verification and visibility of the full lifelong learning pathways.

The requirements of just-in-time learning are also leading to significant innovation in the areas of skills assessment, with multiple companies and governments developing tools that can assess a student or worker's current skills and suggest new skills which may assist career development.

Digital technologies are particularly effective when used as blended learning tools to work in social practices (teamwork, peer-based learning, collaborative problem solving), and especially when they are linked with real problems or project-based learning. They can also bridge the perception gaps between the key stakeholder groups of government, TVET institutions, learners and the labour market. Blended learning is the most important systemic trend in teaching and learning being accelerated by digitalisation.

There is an ongoing emphasis on the need for digital skills at every level of TVET in terms of adaptation to workplaces where manual tasks are being taken over by digital tasks and for servicing digital workplaces in terms of programming and engineering-related skills.

**Figure 11** provides a visualisation of potential future skills – yet there exists a global problem in ensuring that a sufficient number of qualified applicants who actually possess such skills enter the skills pipeline. This appears to be caused by a number of complex issues, including access to high-quality STEM education; the overall (un)attractiveness of digital skills to graduates, especially as exacerbated by gender and racial stereotypes; and a lack of adaptation of curricula to a digital world.

Despite concerns about decreasing job opportunities due to digitalisation, there are clear career prospects for skilled workers with a high-quality initial and further training background oriented to Industry 4.0.

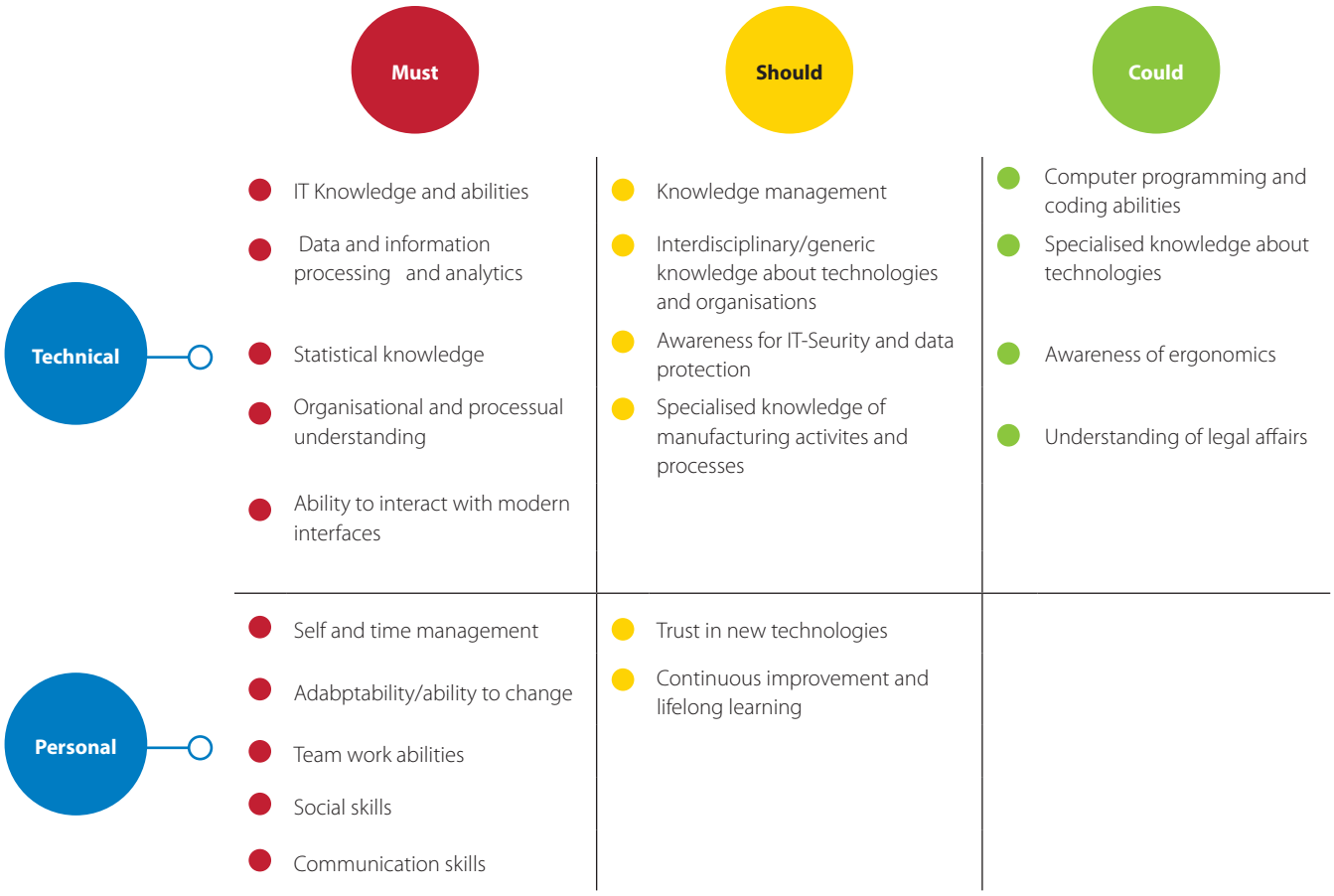


Figure 11: Future qualifications and skills required from TVET
Source: ILO (2020)

**Key questions that can be asked may include:**

- Can digitalisation be positioned as a prerequisite for lifelong learning and 21st-century skills, which in turn will lead to labour mobility and employment? Do you believe this is more likely to resonate with policymakers and learners?
- Is there any interest in your country in expanding the provision of higher vocational education and training and professional higher education?
- Can digitalisation form the basis of ancillary campaigns to increase the status and attractiveness of TVET as an alternative pathway to higher education?
- On the basis that apprenticeships continue to be popular in most countries, what opportunities exist for higher-quality apprenticeships, particularly through the mechanism of dual studies, to fill the gap of well-qualified workforces with target-related technological qualifications and work experience?
- Are any apprenticeship assessment systems in place, based on data, to determine effectiveness and impact?

## 4.2.2 Systems to match supply of and demand for skills

**Targets addressed: 5 and 7**

An effective skills anticipation and matching system is essential to the labour market so decisions can be made, measures can be instituted and corrective actions can be taken to meet needs and avoid imbalances.

Skills needs anticipation can be broken down into a number of key elements, namely data, methods, tools, analytical capacity and institutions. Technology and the digitalisation of approaches, methods and tools applied to it can therefore support the anticipation of future skills needs to avoid a skills mismatch and strengthen training and skills development systems. The ILO Skills Technology Forecast (STF)[9] is an approach for development cooperation work in skills anticipation initiatives that focuses on identifying and responding to the skill implications of technological change in sectors affected by technology. Aligning supply and demand requires policy decision-making on aspects such as the number of people to train per occupation or specialisation, the number of training places to fund, or the outcomes of labour market placements: the use of data that can be retrieved, aggregated, analysed and compared from multiple online tools and platforms plays a huge role in facilitating visibility, evolution in time and forecasting. This requires specific technical skills as well as strong technical links between the different platforms as enablers of such a digital transition.

Digital TVET reinforces the fundamentals of TVET as a three-party collaboration that is very much dependent on close collaboration between employers, students (or employees) and educational institutions and – frequently – the support of government as policymaker. Digital TVET increases the strength of and need for these interlinkages in that it requires:

1. Close collaboration between all three parties in designing learning experiences which realistically simulate workplace scenarios and which eventually give access to real-life scenarios;
2. Tighter feedback loops between educational institutions and the workplace so as to allow for quicker detection of emerging skill needs;
3. The adoption of student-centred teaching and learning approaches, in particular through the design of education around skill frameworks matched to micro-learning units by the workplace in collaboration with educational institutions; and
4. Continuous rotation of staff of TVET institutions in and out of industry to ensure experience in the latest practice and on the latest equipment.

Modern collaboration platforms facilitate the interaction between these groups, be it through real-time monitoring of apprenticeship placements, online surveys of employer needs or the creation of virtual workplaces which can be used by students and teachers.

[9] ILO. (03 June 2016). Skills technology foresight guide.
https://www.ilo.org/skills/areas/skills-training-for-poverty-reduction/WCMS_534225/lang--en/index.htm

**Role of skill standards in matching supply and demand for skills**

Although the format and content of skill standards vary across countries, they typically have the following characteristics:

1 **Industry-based:** Skill standards are developed in close consultation with industry and employer representatives to reflect current workplace tasks, roles and skill needs, in contrast to the body-of-knowledge or discipline-based curricula in most schools and universities.

2 **Performance-based:** Skill standards include performance criteria that are task-related verbal statements which describe what learners need to be able to do in workplace or workplace-like settings (e.g., apply safety measures in the workplace). Skill standards also provide guidance on the 'authentic' evidence of competence required by performance criteria rather than, for example, completing essays, assignments or quizzes.

3 **Standardised:** Skill standards are developed for specific sectors or occupations and provide agreed national frameworks that can inform the development of courses and assessments based on the performance criteria in the standards. This provides a degree of standardisation, which can influence training delivery so that the training outcomes are similar for a particular accredited course delivered by any registered provider.

The analysis of data captured in the whole ecosystem informs and serves the evolution of and changes to be made to the training standards. Digital tools allow for changes in skills demand identified in the learning management information system (LMIS) to be translated into new or modified standards and qualifications which are produced through an agreed and established collaborative process with industry, in a more flexible way, using online communication tools. These characteristics of standards-based curricula and competency-based training and assessment methods aim to provide a more systematic connection between training outcomes and employer needs on the job, so graduates are more 'job ready' and employable.

Digitalising access to training standards is also a way of ensuring that all stakeholders are able to access and understand job and skill profiles as well as career paths in sectors where the standards form part of an integrated sector framework of skills and qualifications.

The use of portals or websites to access online catalogues and information libraries on training standards also facilitates their linking to other portals or websites and, accordingly, establishing key connections to provide a thorough and possibly seamless experience to end users. Training standards can be connected to other key labour market information services such as job boards, skills development opportunities, recognition of prior learning (RPL) portals, and skills assessment or profiling tools to identify potential skills gaps.

**Key questions that can be asked may include:**

- What are the national processes for aligning skills supply and demand from the labour market?
- Is there a business case for implementing national skills standards?
- Are skills standards perceived to deliver training outcomes which more reliably meet identified demand?
- Is digitalisation being used to benchmark national labour market analysis systems?
- Do digitalisation and standardisation allow for new ways of improving labour market relevance, efficiency and effectiveness through actions taken before, during and after studies? Are any examples available of local studies?
- Do digitalisation and standardisation allow for new ways of improving the quality of teaching?
- Is there an understanding of the need to adopt a user-centric approach when designing client-facing solutions that use data visualisation tools to provide relevant data aligned with end users' needs?

## 4.3 Digitalising skills development, certification and recognition

Digitalisation is changing the education ecosystem and the relationships between trainers/teachers and learners: the pandemic has taken online learning mainstream in many higher-education and TVET organisations, where learning continues to be hybrid or blended.

Digital technology needs to be deployed in ways that stimulate young people's interest in joining technical or technology courses. WBL is key to the acquisition of experiential, practical skills, and TVET needs to determine how digital tools can best support WBL by making greater use of immersive technologies like VR and AR that are linked to artificial intelligence.

Technology has the potential to reinvigorate WBL by meeting new skills needs and offering experiential, practical learning either within schools (e.g., through onsite labs, kitchens or restaurants, junior or practice firms, or simulations) or in companies or other workplaces, particularly for apprenticeships. There is also scope to improve cooperation and dialogue between TVET schools and companies through jointly used digital tools for learning and training (in particular between teachers and in-company trainers). However, it is important that the pros and cons are weighed up carefully and that the optimum blend is achieved between real-world and virtual experiences. ICT decouples learning from fixed times and places and therefore has the potential to replace the physical separation of learning in two locations and to improve coordination of knowledge acquisition and practical learning. The potential of digital tools to support project-based WBL also needs to be exploited further: project-based WBL helps to develop transversal skills, and digital platforms can unite individuals from different subject backgrounds.

The recent spate of apprenticeship programmes and the attempts to do generational work is uniquely government work, as opposed to initiatives from the labour market. Digital TVET is driving a positive transformation in the quality, quantity and type of apprenticeships. Since it is often only cost-effective to provide students with adequate training on these technologies at the workplace, they are serving to further strengthen the value proposition for apprenticeships. Technology is facilitating the management of apprenticeships by assisting in the processes of:

1 Discovery of placements, through the provision of matching platforms and job portal platforms for apprenticeships;

2 Monitoring of placements, through technologies which allow for the sharing of live logbooks between multiple parties; and

3 Evaluation of placements and wider apprenticeship schemes, through technologies which allow the benchmarking of evaluation results and matching with specific apprenticeship providers.

Additionally, technology is allowing for the creation of new types of virtual apprenticeships. These typically involve students taking on a job within the parameters of an apprenticeship contract from a remote location, sometimes even in a different country.

More generally, digitalisation is providing an opportunity to rethink how TVET providers cooperate with companies, which still have the greatest access to the latest technologies.

It is vital that the right set of skills is imparted by TVET. ICT can be used to deliver TVET in cost-effective ways, implementing green skill modules combined with digital skills development and providing opportunities for virtual mobility.

While implementing or consolidating the digitalisation of learning management for course delivery, TVET institutions should consider new digital options to support the whole learner experience. These include pre- and post-course functions such as learner engagement, partnerships with employers, uptake of skills in the workplace, and improving graduate employability.

The frontier of digital TVET is in experiential learning, i.e. 'learning by doing'. Simulation technologies tend to focus on either the simulation of basic skills such as welding or the use of customer-service software, or on the simulation of advanced and specific skills such as the use of specific industrial control systems. While investment in such systems carries a lower risk and lower cost than creating workplace scenarios, creating and maintaining such simulations requires significant investments in manpower as well as equipment, often involving cutting-edge technology which has not yet been standardised and which may be considered outdated within mere months. As such, the role of educators as creators is changing. Educators may still create educational materials to simulate basic skills; particularly where such simulation packages are licenced as open educational resources, they can be repurposed for different training environments at low cost.

For the simulation of advanced skills, resources can often no longer be created by educators. It rather depends on manufacturers of the live systems to create training or simulation modes, which educators then guide students through, or where training is provided during apprenticeships.

It is essential that TVET providers should have the requisite skills and resources to support, facilitate and monitor the outcomes of a blended approach to skills development, and that individuals can develop the appropriate skills and attitudes to engage in this new teaching and learning experience.

### 4.3.1 Digitalising delivery

**Targets addressed: 5 and 7**

When viewed globally, low-level or mature technologies still hold the most potential for transformation in the short term. Even in advanced economies, basic pedagogies such as those enabled by distance learning or those enabled by digitally enhanced classrooms have not yet been mainstreamed across the entire educational system. In many cases, this is due to basic infrastructure issues. Thus, relatively low-sophistication interventions, such as ensuring that all classrooms and all students have access to broadband and making available tools for the production of digital resources (e.g., authoring tools and open educational resource repositories), can make a significant difference. There is scope for improvement even with the deployment of low-tech software, which can be just as effective as more expensive variants – sometimes more. What is more important is how to design systems where the teacher is no longer locked into old broadcast teaching models.

**Key questions that can be asked may include:**

- As a primer to the guidelines, consider how digitalisation may help address challenges that TVET has been facing for many years. Consider issues such as the attractiveness of the sector; links or otherwise with the labour market; qualifications frameworks; funding, etc.
  - → To what extent can technology help in addressing historical/structural TVET issues/challenges?
- Is there an opportunity to open a discussion with interested stakeholders about training and digitalisation with LMI, employer organisations and the private sector, to ensure transformation is demand-driven, according to specific requirements of the local labour market?
- Is it possible to define at the outset a set of KPIs for tech-enabled solutions that can be measured through a data-driven approach, using learning analytics? This would allow for analysis and comparison among systems and solutions and deflect potential problems further down the change programme.
- Are clear guidelines and solutions provided to implement and evaluate a national learner-centred approach to blended learning?

**Physical and digital infrastructure in the TVET sector**
Consider both physical and digital infrastructure. In the case of physical infrastructure, consider physical facilities, buildings, libraries, laboratories, workshop layouts, and quality and type of equipment.

**Key questions that can be asked may include:**

- Are training facilities and premises generally suited for digitalisation?
- Do the materials and technologies used by training facilities comply with industry standards?
- Are safety precautions for all learning and training environments in place?

**Readiness of TVET staff for digitalisation**
The pandemic exposed numerous lacunae in the state of preparedness of teaching institutions and teachers in general for the turn to the digitalisation of teaching and learning. Planning for institution-wide quality improvement of technology-enhanced learning requires TVET organisations to address information technology systems, services and support for technology-enhanced learning.

**Key questions that can be asked may include:**

- Are there institution-wide policies and governance covering technology-enhanced learning?
- How has the pandemic changed plans for technology-enhanced learning?
- Is there staff support and professional development for the effective use of technology-enhanced learning?
- What are the ratios of teaching and training staff to learners?
- What is the overall quality of TVET curricula and teaching materials? Is the institution's TVET programme up to date and relevant?
- Are the institution's teachers and trainers passionate and competent in their fields?
- Do TVET teaching staff have the qualifications, experience and aptitude to maximise the affordances of technology? Are there procedures in place to determine TVET staff's readiness for digitalisation?
- Do the institution's principal, manager, teachers and trainers feel comfortable with using new technologies or technology-integrated teaching? Do they view their experience positively? If not, why?
- Does the institution provide student training for the effective use of technology-enhanced learning?
- Does the institution provide student support for the use of technology-enhanced learning?

### 4.3.2 Digitalising teaching processes

**Targets addressed: 4, 5 and 7**

Many processes in TVET institutions have yet to be digitised: there is still an over-reliance on traditional tools, pedagogy and, in some cases, paper practices. Yet competition among TVET institutions will inevitably be down to the introduction of digitalisation processes, which will change the core of existing business models. TVET colleges have no choice but to change and refine their programmes to align them to the labour market, which is increasingly knowledgeable about the affordances of technology.

Digitalisation has increased students' awareness of quality, and they will demand more from service providers, institutions and the labour market. Digitalisation changes the dynamics of teaching; digital natives have the tools to become more critical of the quality of TVET and of the potential return on investment (RoI) of their learning pathways. In some countries, students have asked for the traditional course materials to be replaced by real-life case studies – this too is a direct result of digitalisation.

Education departments or TVET schools need as a bare minimum to organise training on information technology for teachers. In practice, the digital competence of teachers is a key limiting factor for digital TVET, with initiatives often being the domain of lone professionals attempting to provide high-quality digital TVET on their own. Many teachers remain in a passive state while being aware of the need to master stronger digital ability and secure more information if there is going to be systemic change in teaching and learning, or at least an acceleration due to digitalisation.

In practice, digitalisation requires competences in the following roles:

1 **Instructional designers:** The role of these professionals is to design learning pathways which may involve a mix of school-based and work-based learning. It also involves the commissioning and managing of learning components such as distance learning, simulation-learning experiences, etc.

2 **Teachers:** The role of these professionals is mainly to guide individuals through a set of learning experiences – digital technology increasingly means that their role is not the delivery of information but assisting with the interpretation of information. In larger courses, teachers may be supported by community moderators or teaching assistants.

3 **Media creators:** The role of these professionals is to assist with the creation of digitally enabled learning experiences – media design may include photography, web design, filming, 3D modelling or any other creative work that may be required by the provision of the courses.

4 **Assessment and skills experts:** Just-in-time learning requires the unbundling of courses into distinct skills and the creation of assessment tools which allow for the assessment of these distinct skills.

Matching these profiles involves strengthening the range of skills available to TVET providers to include skills beyond pedagogical and industry-specific knowledge. There is a clear need to widen the pools of expertise within TVET and to enhance the training of teachers to work in a digital-first, student-centred educational environment. It is also necessary to ensure a constant 'revolving door' of experts between academia and industry.

When implementing the different national training programmes offered to teachers, facilitators or supervisors, technology needs to become a facilitator of coordination and collaboration between the professionals who work in education. Pedagogical training on delivery, assessment and certification, and competency-based curriculum/continuous improvement of trainers through in-service/out-of-service needs to include exposure to industrial skills and the realities of the workplace beyond the training centre. For instance, it should be a requirement for TVET trainers to have prior industry experience. Teachers and learners need to be encouraged to work with peers to conceive learning as a social experience.

TVET needs market intelligence and forecasting to prepare and build courses for emerging digital skills – we need to be considering data-driven TVET in the coming years.

Governments need to be supported to register all trainers, if a new type of TVET trainer is to emerge that is in turn relevant to the needs of the labour market. Within this context, digital credentials for QA and anti-fraud measures for regulatory bodies are required as a shortcut to ensure that third-party training providers are providing a quality product.

TVET needs to ensure that teachers and trainers are properly supported and encouraged to engage with new pedagogies and digital learning tools. Examples include developing networks or platforms that enable teachers and trainers to share experiences and expertise, appropriate career structures and new models like 'hybrid' professionals.

Teachers and trainers – and indeed all those who accompany learners – need the skills and mindsets to be innovators. Faced with the scale of the changes in VET, there is now a greater need for effective initial training and continuing professional development. In addition, supportive school/workplace environments can provide a clear direction and the space and time for innovation. Provided that teachers and trainers receive the support they need, there are a number of opportunities to seize in terms of integrating new pedagogies and digitalisation. Examples include being able to effectively integrate virtual and physical learning opportunities through blended learning techniques and developing new forms of social learning through online platforms.

At the same time, the development of networks and communities of practice can enable teachers and trainers to share experiences and expertise on training, teaching and learning methods and digital tools. Career structures for trainers and teachers may also need to be adapted to ensure that skills and roles associated with innovation and digitalisation are recognised and appropriately funded. The development of new ways of working may also offer solutions, such as through 'hybrid' professionals, where teachers and trainers work in both VET institutions and companies. This would help to bridge the gap between these two worlds and allow mutual benefits for both.

**Key questions that can be asked may include:**

- What initiatives are in place in your country, at policy level, to raise teachers and trainers' awareness of the possibilities brought by technology?
- What is the state of institute-level support and scaffolding services to assist trainers to:
  - → access quality digital learning materials
  - → repurpose exemplar unit and course designs, and
  - → rework generic session plans to embed quality practices in live online classes?
- How do training actions and capacity building ensure that educational staff are aware of, and prepared to operate in, this new ecosystem, including assisting learners who are struggling to adapt to it?
- At policy level, what basic digital skills development and opportunities are available for teachers and learners to understand how digitalisation and online learning ensure lifelong learning and employment?
- Consider new forms of teaching in TVET enabled by digitalisation. Which will have the highest impact? Why? Can you identify specific relevant cases and/or examples?
- How is digitalisation changing the kinds of skills which are taught in TVET?
- Which skills taught in TVET are becoming more important, and which skills are becoming less important?
- Can you identify any systemic trends in teaching and learning being accelerated by digitalisation?
- Can you provide examples of specific technologies in teaching and learning which are changing the way teachers teach?
  - → Which will have the highest impact? Why? Can you identify specific relevant cases and/or examples?
- How is digitalisation changing the kinds of skills which are required by teachers in TVET?
- Which skills are becoming more important, and which skills are becoming less important?
- How are teachers being prepared for these careers?
- Can you identify any systemic trends in teaching and learning being accelerated by digitalisation?
- Is video being used in teaching or messaging as a communication tool?

Although there is a need for new learning methodologies to maximise the potential of technology, it requires a different type of person to the traditional TVET teacher. We cannot necessarily reboot and reskill teachers; we need to take learning to the next level through a more collaborative, multi-disciplinary approach. This will require a different mindset and a more direct and easily visualisable approach. Interdisciplinarity will help people think critically of how technology can really add value to learning and reskilling.

Digitalisation is changing the dynamics of teaching. It also makes students more aware of what constitutes good teaching and what does not. Digitalisation has increased students' awareness of the quality of TVET and the potential RoI of their learning pathways, and they will demand more from service providers, institutions and the labour market.

The digital knowledge and skills of teachers is a key limiting factor in the development of digital TVET curricula and beyond. The relentless emergence of new disruptive technologies requires TVET staff to be supported by robust continuing education programmes to ensure constantly updated skills. Resistance to change from teachers' unions can also be a major stumbling block to the impact of digitalisation on the TVET sector.

More complex and involved workflows in industry need to also be reflected in TVET institutions. Increasingly, positions which were typically covered by a teacher or instructor are evolving into systems which require a team of specialists (teachers, media designers, programmers, subject-matter experts) to design and deliver trainings.

The cost of equipment means that institutions are often not able to buy the appropriate equipment, and even when they are, these investments may depreciate faster, implying additional costs. These additional costs lead to two interlinked phenomena:

1 TVET institutions must increasingly rely on employers to gain access to equipment. This means that institutions become reliant on either employers or equipment providers subsidising or lending equipment. The need for students to use equipment on employers' premises demonstrates the continuing importance of various forms of work-based learning.

2 Advances and changes in equipment means that students need to be constantly retrained over their lifetime as the equipment is upgraded, and furthermore that changing equipment will likely mean retraining. These trainings are typically organised by employers (in conjunction with equipment vendors), increasing their role as TVET providers.

Digitalisation in the form of distance learning does seem to show benefits in two narrow scenarios, namely:

1 For students who are disenfranchised due to geographical access restrictions to education, such as those living in remote rural areas or those with limited mobility – provided they do not also suffer from other deprivation factors; and

2 For workers who already have limited digital skills and who are looking to acquire other higher-order skills for purposes of social mobility, by allowing learning to take place more flexibly, at times and places of learners' own choosing, via e-learning.

**Key questions that can be asked may include:**

- What is the state of development of skills frameworks and curricula to map the digital skills needs of teachers in education and TVET and integrate them into initial teacher training?
- Is there an interest in using MOOCs and open educational resources (OERs) focusing on specific digital teaching competences for TVET?
- Is there an interest in the introduction of CPD programmes focusing on digital skills for teaching? Such programmes could be introduced at both national and individual institution level.
- Consider CPD and the way digitalisation can become tantamount to evidence-based learning. Can technology be used to determine the quality of evidence-based learning?
- Is there an interest in incentive schemes for teachers to encourage the uptake of digital skills?
- Is there an interest in closer cooperation between industry and training organisations to ensure the latter have a supply of trainers who have undergone digital skills uptake in a work-based context?

### 4.3.3 Digitalising learning pathways and guidance

**Targets addressed: 7**

Digitalisation is deemed not only to reduce the need for guidance but to have changed the very notion of what constitutes guidance. The expectation is that learners can learn individually or collaboratively through a multitude of technology-enabled methodologies, including writing activities, game-like learning environments, simulations and augmented realities. The combination of school and work-based actors (teachers and supervisors) and actions (intertwining learning activities at both locations) is what makes TVET unique as a specific field.

Young people spend much of their time in a highly 'democratised' digital world of individual choice and instant engagement. This is leading to new mindsets about how they want to engage with learning and with trainers/teachers. Space needs to be made for such new relationships in policy and practice. Current research and practice often neglect the possibilities to investigate the role of collaboration in vocational education, where the interaction between people in different locations is fundamental for the effective functioning of the systems.

According to the ILO (2020), six types of digital learning hold promise for a TVET and skills development system:

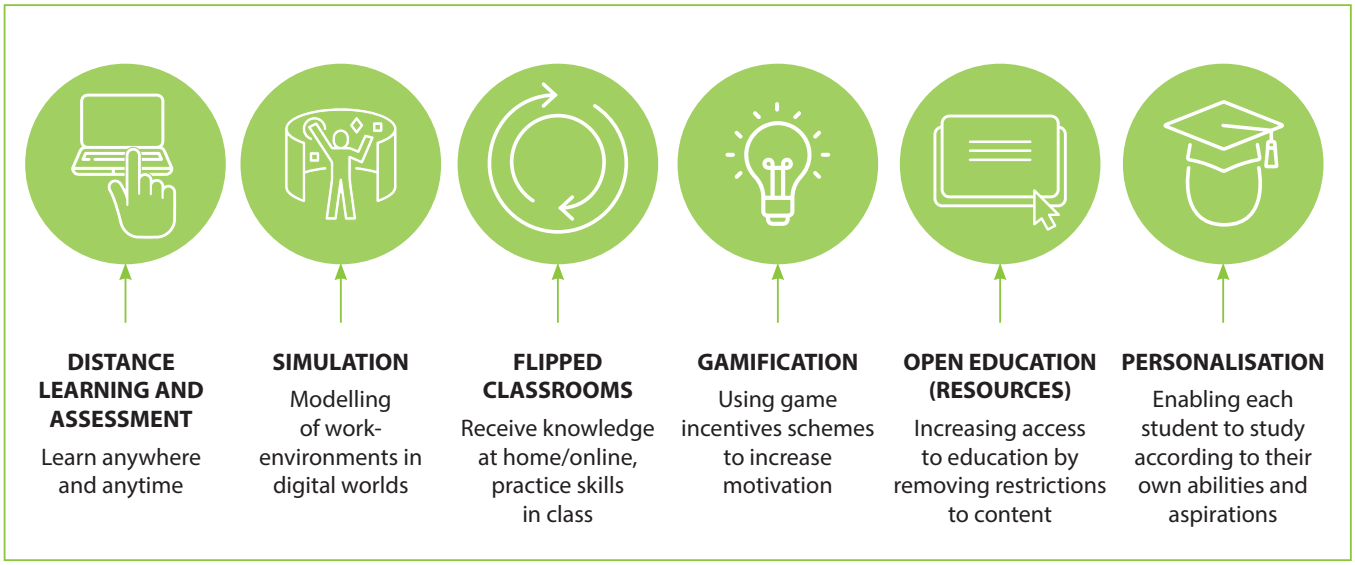


Figure 12: Six areas of digital learning holding promise for TVET
Source: ILO (2020)

**Distance learning and assessment** technologies have evolved from self-study and passive learning to collaborative and experiential learning. MOOCs continue to be associated with student equity through improved opportunities to learn. Distance assessment is also increasingly complementing distance learning through a mixture of technologies, including the detection of plagiarised texts in long-form assignments; remote proctoring to allow students to take examinations from home; and identification technologies using biometric signatures.

**Simulation** through VR-based training allows trainees to learn in a realistic, immersive yet risk-free environment. It removes the costs of traditional training such as venue hire, travel, consultant fees, or simply time spent away from work. VR training sessions can be delivered remotely by mentors or using software housed within a shared platform, and tend to be more engaging than listening to a talk, reading manuals or watching video demonstrations, with memory recall being significantly higher than with traditional training. The increased interest in the metaverse is likely to take VR training mainstream in the next few years: the visual and practical nature of VR training helps to overcome language barriers and makes it suitable for individuals with different learning styles.

**Flipped classrooms** are at the core of a pedagogical approach whereby direct instruction moves from the group learning space to the individual learning space, and the resulting group space is transformed into a dynamic, interactive learning environment where the educator guides students as they apply concepts and engage creatively in the subject matter. Technology is particularly important for the pre- and post-class elements of the flipped classroom in that:

1 Video and other interactive media provide an equivalent or superior information delivery mechanism to 'lecture style' information delivery – especially in that they allow students to study at their own pace;

2 Integration with learning management systems (LMSs) allows educators to ensure that students have actually followed the pre- and post-course materials;

3 Integration with instant messaging or email allows communication with the educators to happen throughout the process; and

4 Online assessment allows formative assessment to be applied for individual learning outcomes to ensure mastery of the subject.

**Gamification** is defined as the introduction or application of elements of games into non-game contexts. Games and the elements that make up games have been incorporated into other areas of life throughout history. This is particularly true of education, where the need to ensure student interest and participation has meant that game mechanics – such as rewards and group tasks – have become core teaching tools. Three gamification elements are of particular relevance to TVET:

1 Mechanical elements, such as incremental progression, onboarding and instant feedback;

2 Personal elements, such as status and visibility, collective responsibility and leader boards or rankings; and

3 Emotional elements – in particular, the psychological state of flow.

Mobile and gaming technologies such as 3D components for TVET are an attractive training proposition for young people.

**Open educational resources (OERs)** are teaching, learning and research materials in any medium (but increasingly digital) that reside in the public domain or have been released under an open license that permits no-cost access, use, adaptation and redistribution by others, with no or limited restrictions. Learning materials in the TVET sector will be increasingly delivered in an online environment – either totally digital or blended. Local content is ideal for OERs, since it can be repurposed with third-party OERs content. One by-product of the use of OERs is the gradual removal of textbooks for online courses, further reducing the costs of study for learners. OER on its own has limited development impact, but when combined with locally produced content it can significantly lower the complexity and cost of producing materials.

OER's growth on a global scale has been enabled by:

1 Repository technology and cloud computing that allow for the storage of vast amounts of OERs at low cost;

2 Search engines as well as advanced metadata tools such as JSON-LD, schema.org and OAI-PMH that allow for OERs to be appropriately labelled as such, distinguished from closed-licence content, and discovered by the public at large;

3 Traceability technologies such as hashing, digital signatures and blockchain that allow for intellectual property rights (including open licencing) to be asserted;

4 Open-source course and OER platforms that allow for OERs to be parcelled into open courses;

5 Social openness: the degree to which pedagogy is didactic or participative, through the use of sharing, collaboration, participation and contribution. This might be enabled through tools such as constructivist MOOCs;

6 Technical openness: the degree to which software/ platforms on which OERs are based are themselves open- or closed-source. The best-known example here is MediaWiki, which is fully open-sourced by the Wikipedia Foundation; and

7 Financial openness: the use of financial models which enable the widest access to the largest number of students. This might include the offering of free education, sponsored education, use of vouchers, pay-as-you-go systems and other innovative financial models.

**Personalisation** and the customisation of learning at an affordable cost is now possible because of technology that can be used to automate any task which is repeatable – in particular, information delivery and standardised assessment. Doing so radically lowers the cost of these processes and allows for different information to be delivered to different students according to their needs and preferences. This leads to:

1 **Levelling the educational playing field through guidance for improvement of students' learning skills and motivation** – In a personalised learning environment, students' preference to follow a vocational or an academic career pathway is determined based on their needs and aspirations.

2 **Encouragement of learning through 'motivational scaffolding'** – This uses technological tools to help students envisage the careers they would like to follow, and then suggests a personalised learning pathway, made up of relevant theoretical and practical components, to reach this goal.

3 **Development of domain-specific key skills** – Rather than a standardised curriculum for all students, each student receives training in the vocational skillset for which they have shown propensity.

4 **Collaboration in knowledge building** – Rather than merely 'consuming' information, students take on a role as active constructors of their own knowledge, often through collaboration with peers.

5 **Teachers' new role in better integrating education within the learning society** – With technology freeing teachers up from the task of information delivery, they take on a new role as guides to help students identify and travel along their chosen personalised pathways.

6 **Freedom to determine time and place of learning** – Students have far more choices about the mode, place and time of learning, with technology allowing them to receive information and collaborate from nearly any location and at any time.

**Key questions that can be asked may include:**

- Does digitalisation open up new pathways for obtaining TVET, in particular via changes in modes of study, duration of study, and place and time of study?
- What is the prevalence of such new modes?
- Do digitally enabled flexible learning pathways have a significant impact on access, employability or other social policies?
- Does digitalisation enable new ways of providing guidance in TVET? Any examples?
- Does digitalisation increase or decrease the need for guidance?
- Does digitalisation change the nature of guidance given?
- Is distance learning seen as being critical to widen access to TVET?
- Is there an element of adoption of OERs such as to allow creators to reuse and repurpose content to create new content, rather than needing to create everything from scratch each time?
- Are trainers prepared to adopt a blended learning approach, combining local content with OERs?
  - → What are the prevalent tools being used by TVET organisations?
  - → Are MOOCs deployed by TVET organisations as part of the curriculum?

- Consider digitalisation within the context of national learning materials, shared as OERs. This could include the development and distribution of core exemplar digital learning materials by industry, and developing or extending an ongoing specialist national function, to maximize investment, efficiency and quality. Is there any interest in implementing a system for the national curation of OERs?
- Technological advances require continuing training and/or retraining, which tends to be offered directly by industry, but less by the TVET institutions. Globally, this implies an increased involvement of industry in TVET and a corresponding decrease in the perceived value of traditional TVET providers. Which entities in your country are responsible for continuing training/ retraining and CPD?
- Is there any interest in 'plug and play'/just-in-time learning such as micro-learning modules, which can be followed at any time, and which teach one discrete skill?
- Is there any interest within TVET institutions to support 'bringing your own device' (BYOD) schemes? BYOD together with scripts, videos, OERs and repurposed material may result in TVET institutions not needing to invest in technical infrastructure other than broadband and relevant content.
- Is there any interest in exploring regional digital centres whereby students in remote locations can secure access to materials without tech centres or labs in almost 500 tech institutes – enabling students to access high-quality equipment and connect with teachers and peers from remote locations?
- Is there any interest in levering on the gig economy for virtual apprenticeships?

### 4.3.4 Digitalising assessment, credentials and certification

**Targets addressed: 6 and 7**

There is no parity of esteem for TVET versus academic pathways: the latter option carries more status. The social lack of recognition of TVET as a viable alternative to academic pathways inevitably means that TVET is not the learner's first choice. Neither will industry pay for TVET: TVET graduates invariably earn less money than their academic counterparts. This leads to a continuous cycle that needs to be broken.

Traditional learning in TVET is furthermore characterised by a degree of fragmentation. Students typically alternate between intense periods of classroom or workshop activity with a teacher/instructor, WBL with a mentor and self-learning. The emergence of always-on, free and easy-to-access communication technologies, and mobile messaging in particular, is paving the way to a new model which might be called persistent learning. Here, students stay in near-constant contact with each other, their tutors and their mentors via messaging apps – thus bridging the gaps between learning periods typical of the traditional model.

The pandemic, together with other developments during the months preceding it, has starkly illustrated that digital credentials are not only useful but also necessary for global citizenship and mobility (Grech et al., 2021, Dale-Jones et al., 2020). The corollary is that there is an increased risk of the potential abuse of data and information under the guise of the pandemic, not least for the purposes of surveillance. Keevy (2021) writes about 'credential fluency' – the increasingly seamless relationships between the recognition of formal, non-formal and informal learning made possible through a user-centric approach, digital forms of recognition, improved data interoperability and closer alignment between learning and the world of work. A sole focus on the qualification itself is insufficient. Qualifications are always only 'proxies' for what someone can do, and work chiefly because of social trust, proving the value of trust in educational purposes and activities (UNESCO, 2021).

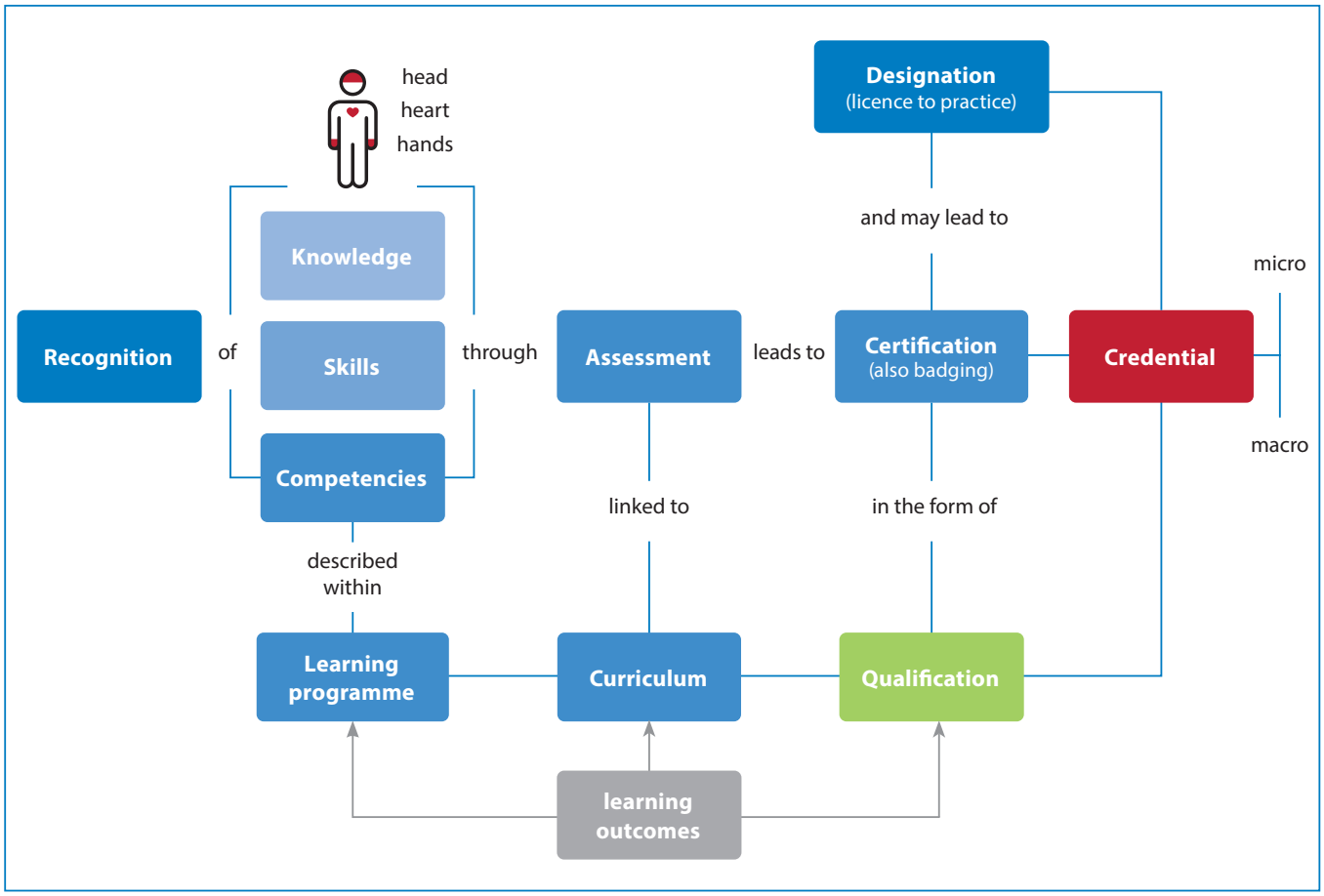


Figure 13: Digital credentialling system
Source: Keevy (2021)

One of the most significant expressions of personalisation in TVET is through **micro-learning**, which represents the mastery of a limited set of skills or competencies rather than broader and interrelated sets of skills such as full qualifications. Aside from participation in programmes at school, micro-learning allows students to participate in programmes outside formal regulatory frameworks which offer unaccredited certificates that do not count towards an award course.

These micro-credentials and badges provide a well-rounded picture of employee competencies, skills and other important verifiable information to employers. Consequently, Hurst (2015) proposes that the use of **digital badges** in workplace settings and in TVET may emerge as the most prominent area of adoption. Employers can use micro-credentials to overcome skills gaps within their workforce, as part of training programmes which better fit the needs and constraints of employees. Digital badges can be used as a dynamic response to local priorities and labour market needs – helping to streamline processes of upskilling, while making progress more tangible. Individuals gain valuable digital badges that demonstrate their learning, while managers and organisations can better measure the impact of workforce development activity.

The emergence of micro-credentials indicates that the labour market is looking for new and more flexible ways to recognise skill sets developed in response to changing technologies, employment structures and work requirements. It is also a direct response to the need for the workforce to upgrade their skills throughout their careers, or as they change careers. Micro-credentials are also an incentive for people to take up short courses to top up and secure additional, accredited skills. The industry training sector is brokering more flexible learning pathways, and micro-credentials are at the core of this new approach to lifelong learning. Micro-credentials need to start to be recognised as part of national qualification frameworks, since people will need to keep upgrading their skills throughout their careers.

As ongoing, in-field training, accreditation is to a degree dependent on self-attestation, making it difficult to determine quality and mitigate against fraud. The move to digital credentialling and blockchain notarisation can provide a solution from an economic and incentives perspective as well as a means of monitoring QA of the training programmes. Multinational corporations like IBM, Microsoft, Ernst and Young, Bosch, Daimler, Adidas and Amazon are making major commitments to micro-credentials as part of their professional development programmes and are developing partnerships with educational institutions to leverage credentialling programmes. The advent of alternative credentialling like micro-credentials is therefore a major game changer for TVET institutions.

**Self-sovereign identity** (SSI) predicates that the user must be central to the administration of identity. SSI is often met by resistance from stakeholders who are sceptical about sharing their data pools, due to, amongst other reasons, perceived loss of autonomy. While there is currently a high level of scepticism, many of the stakeholders have expressed interest in collaborating but require clarity about how the service will operate and how it will be governed and 'owned'.
The 'true' owners of the data must be recognised as the individual members of the public whose data is being stored (West et al., 2021).

It is vital to not just secure local recognition of credentials but to also link local frameworks to national and international frameworks: advocacy on recognition at national and international levels is as critical as exploring the potential of, say, blockchain for the notarisation of digital credentials. The future of credentials is dependent on countries recognising each other's TVET qualifications and on giving digital education parity of esteem. TVET needs to collaborate with professional unions and the labour market to ensure such recognition takes place; there needs to be a process of TVET equivalence in different nation states.

Digitalisation should be used as a pilot for online assessments. It is already becoming standard practice in TVET that assessments are partly carried out online. Assessments are rooted in the 'old world' of needing to prove credentials and learning outcomes. Investing in digital assessment pilots can become a primer to reconsider long-standing practices such as textbooks for online courses and may also lead to the reduction of costs of study for both TVET institutions and learners.

**Key questions that can be asked may include:**

- Are there processes in place to review current or legacy approaches for assessing practical skills?
- What is the propensity of training organisations to redesign traditional course work as online-friendly evidence-based assessment tasks using digital tools such as e-portfolios, learner-generated video and web-conferencing, especially in workplace settings?
- What kind of technological solutions are available to document, store, verify and facilitate the cross-border recognition of skills and qualifications?
- What are their pros and cons in terms of security, accessibility (such as in low-connectivity environments) and usability?
- What are the challenges for the adoption of solutions for verifiable credentials by policymakers?
- What is the interest of policymakers and trainers in decentralised technologies?
- Is there any understanding of the concept of self-sovereignty among policymakers?
- Is there any interest in exploring verifiable credentials? Do flexible TVET systems exist to facilitate the seamless transfer of credentials and parity of esteem between TVET and academic pathways?
- Can a digital TVET system contribute to flexible entry arrangements so as to facilitate all potential learners, even if the entry level is not reached or if there are issues with proving prior accreditation, as may be the case with refugees and displaced populations?
- Is there recognition that increased flexibility implies a structural, irreversible shift towards lifelong learning?

## 4.4 Digitalising access strategies

Digitalisation must be seen to improve access to skills development and the market. Regardless of gender or background, everyone must be equipped with the skills to deal with the challenges of, and benefit from the opportunities afforded by, digitalisation.

In a technology-driven world, all new jobs require ICT literacy at a higher level than that currently provided in foundation schooling. Yet digitalisation needs to be associated with using technology to teach and learn – as opposed to 'teaching about technology'. Digital TVET is positioned as a means of encouraging young people to follow industry training to secure meaningful and rewarding employment and as a means of responding to skills shortages in the process. The history of distance learning has always been about access – including for people in remote places and islands in a rural context.

For people from disadvantaged backgrounds, innovation and digitalisation have the potential to provide new types of learning opportunities that can widen access to TVET. At the same time, poorer households are less likely to have access to ICT – as the COVID-19 pandemic has acutely highlighted – and these are the same households that are less likely to successfully engage in education and training. These two factors combined bring a risk that, without appropriate action, the increasing spread of digital learning might unintentionally widen the digital and learning gaps, including when it comes to TVET through self-directed learning. Regarding gender equality, women continue to be under-represented in many occupations and senior positions. Providing digital TVET, especially to learners and trainees with special needs and disabilities, can be challenging for training providers. Likewise, providing employees with disabilities with the appropriate support, tools and technology to work can be problematic when work is undertaken remotely.

Marginalised people such as refugees and irregular migrants should have access to all TVET programmes nationally in their country of residence or of displacement, and not just to academic courses. There are several issues related to physical access to TVET and skills development for marginalised people:

1 TVET schools and centres may not be where refugees are, that is, in remote areas;

2 Lack of transport to or accommodation near schools;

3 Refugee status and other legal issues may deny refugees from being legally allowed to work even once they have TVET qualifications; and

4 Reluctance of national government policies to recognise existing credentials from other countries.

UNHCR believes that in the case of marginalised people, TVET must be positioned as a set of long-term programmes offered by national educational systems, recognised by the labour market, that lead to providing additional life, market and employability skills. For online education to become more credible and useful in the workplace, it must enable people to move seamlessly from TVET to academic pathways and vice versa.

Digital tools also provide aids for cognitive and physical impairments and can also be adapted for lower resource contexts, helping overcome some infrastructural barriers. For instance, the lower resource content tool includes technology that shrinks files and then delivers content in a suitable form to mobile devices. If digitalised training products and services are being introduced, to avoid further marginalisation of people with disabilities, assistive technologies must be included in all digitalisation strategies, ICT procurement policies and operational training.

Beyond marginalised people, there is a legacy of second-chance learners, for example, people who want to consider job changes; lifelong learning is enabled because of distance learning, which is increasingly technology-enhanced. Communication is critical in informing target user groups of the affordances through digitalised training products and services; so is research of targeted groups or population capabilities (infrastructure, equipment and connectivity), as well as skills and attitudes, to ensure access to and uptake of such opportunities.

### 4.4.1 Policies for equity and access

**Targets addressed: 1, 2, 3, 4, 8, 9 and 10**

It is too early, in many countries, to determine if digitally enabled flexible learning pathways have a significant impact on access, employability or other social policies. At the moment, digitalisation is not necessarily allowing for new ways of improving labour market relevance through actions taken before, during or after studies.

Digitalisation and access strategies need to address issues already cited in other parts of the guidelines:

1 The provision of guidelines, regulations and frameworks for the integration of broadband and connectivity services in TVET institutes are basic access and equity measures.

2 When adopting flexible and blended learning approaches, robust no- or low-tech alternatives need to be embedded at the programme design stage, to avoid further disadvantages for those who face barriers related to infrastructure and/or equipment.

3 Technologies are already available that may expand or strengthen RPL mechanisms in order to recognise skills acquired through informal, non-formal or formal learning and to assist users to participate in and complete a TVET programme.

4 Data can be retrieved from existing systems to make informed decisions and continuously improve content, processes and the organisation.

5 The strategic use of technology will ensure the integration of career guidance and employment functionalities in the skills development lifecycle, providing adapted counselling before training happens and linking recently graduated learners to potential employment, traineeships or apprenticeship opportunities. Guidance should recognise the need to equip learners with devices they can use (even offline) to ensure the continuity of the learning experience outside the classroom – whether it be for research and homework purposes or for self-paced learning activities.

6 Teachers and learners need support to maximize engagement with and adoption of the new learning ecosystem, pedagogical approaches and the technologies and devices they will be using.

ILO's (2021) model for sustainable empowerment in digital transition is built on the concept of 'holistic capacity development', strengthening capacities at individual, organisational, system and network levels, as visualised in the capacity development butterfly **(Figure 14)**. Such capacity development activities (including infrastructure, equipment, skills development and attitudes) need to take into account local dynamics and specificities, so as to allow further inclusion of the most vulnerable groups.

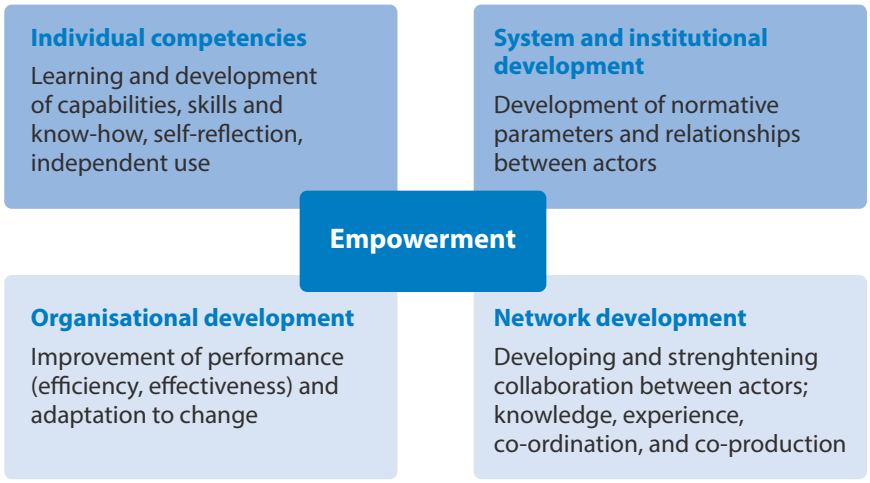


Figure 14: Empowerment through holistic capacity development
Source: ILO (2021)

TVET needs to address the digital divide, particularly amongst adults already in employment. Providing opportunities for such persons to re-enter TVET to acquire new digital skills is a major focus of policy in practically every country.

Innovation and digitalisation should be used to support the inclusion of disadvantaged and marginalised groups and ensure equal opportunities, for example, in relation to women's position in the labour market. This could include placing a greater focus on how social background, ethnicity and gender can affect people's engagement with the digital world, and actively supporting the recruitment and training of women in TVET to tackle gender imbalances in occupations and senior positions.

**Key questions that can be asked may include:**

- What is the state of the digital divide in your country?
  - → Are any official policy documents available on the subject?
- Does digitalisation create or exacerbate existing digital divide problems? How are these being addressed?
- What is the state of national awareness on the need to improve equity, including the need to address issues such as gender and disability marginalisation?
  - → Are any official policy documents available that address the need to improve equity?
  - → Are there any policies related to TVET, gender issues, technology and the labour market?
  - → Are there any policies related to TVET, disability issues, technology and the labour market?
- Would an increase in TVET provision combined with digital technologies in marginalised regions help address social challenges such as drug abuse and violence?
  - → Would an improvement to internet connectivity assist with TVET provision in marginalised regions?
- Can digitalisation facilitate school-to-work transition programmes for youth with disabilities and access to pathways for vocational training?
- Are you aware of specific technologies that improve disadvantaged and marginalised groups' access to, participation in, or completion of TVET?
- Does the digitalisation of TVET have an impact on improved access to education, particularly by marginalised groups?
- Is digitalisation creating a need for more readmissions in TVET colleges?
- Can communication campaigns be developed in the short term to explain how digital TVET may open up employability opportunities? Particularly for disadvantaged groups?
- Are inter-agency referral and outreach systems in place that would benefit from digitalisation to streamline, extend and enhance communication options for information and advice services?
- Are there processes in place for RPL (including informal and non-formal learning pathways)?

## 4.5 Digitalising employability strategies

Irrespective of the country, there is a need to strengthen local tripartite collaboration between government ministries, employers and workers' organisations, as well as with the private sector, to ensure that skills development opportunities (supply) match the required and needed skills (demand) in the labour market.

The future of work involves the automation of manual repetitive labour and a growth in digital jobs. In particular, workers will be expected to use technology to variously work beside, manage or instruct machines. These new labour market requirements emphasise higher-order knowledge and skills and require policy focus on higher technical skills for the labour market: they also represent a generational challenge for educational institutions. Higher technical programmes increasingly focus on the provision of entrepreneurial and transversal skills, while academic programmes include a more explicit professional element, which is blurring the distinctions between these two modalities of education.

Digitalisation hollows out all the hubris of our institutions. The notion that a student's life should orbit the institution is outdated. Institutions need to understand why they exist and why they have physical infrastructure which is not central to education. The whole mission of traditional education has to be questioned by a new generation of leaders. The dynamic of bottom-up and top-down forces has always been there – what tech has done is to speed things up. It has enabled people to do more in less time. We may well be at a tipping point where digitalisation starts to actually contribute to making TVET more attractive, by making the linkage between learning and meaningful work more relevant.

### 4.5.1 Digital skills frameworks

**Targets addressed: 2, 3, 4, 7 and 10**

Traditional guidance involves the use of skill or aptitude tests by guidance counsellors, who then advise students on potential next steps on their learning pathway or on potential job opportunities. Digitalisation changes this approach by developing skills frameworks supported by relevant digital tools and systems where students can receive real-time guidance on any career pathway of their choice across the entirety of their lifelong learning pathways. A user-centric approach is adopted to online or hybrid career guidance tools and individuals are supported in their use and uptake of such online counselling services.

People with academic qualifications are not necessarily finding employment, and some governments are promoting TVET as a means of trying to inspire entrepreneurship. In some countries, young people can benefit from loan arrangements to try to stimulate an enterprise-oriented, self-employment and start-up culture and to encourage people in formal institutions to rely on such skills.

From a practical perspective, there is a need for access to e-portfolio tools and systems that may provide learner-managed portable evidence of competencies, experience and qualifications to link workplace and institute training outcomes and to empower employability service advisors.

In an ideal world, digitalisation will allow for the development of comprehensive digital career guidance platforms with multi-channelling and career development support to high-quality digital training platforms which, in turn, offer core and technical skills courses.

Skills frameworks inevitably imply systems to recognise credentials. Countries need to have an appropriate regulatory base and technological framework to support the development of digital credentials that reflect granular skills and knowledge development, to support skills matching as well as ownership and portability of individual skills information. The role of government here to visibly support digitalisation through appropriately resourced and knowledgeable institutions cannot be underestimated.

Countries need to develop some basic internal competencies which can enable decision-makers within the 'tripartite collaboration' to review emerging digital applications which support partnerships and collaboration between employers and training providers and extend the role of providers beyond the duration of TVET courses to include providing ongoing learning and improving employability. Within this context, competency-based training and assessment will provide clear and measurable training outcomes to meet employment demand and increase the job readiness of TVET graduates and deliver performance improvement for employers.

**Key questions that can be asked may include:**

- What is the state of career and employment service networks in your country?
- Is there a national entity that is responsible for identifying employability skills in the country?
- Is there a disconnect between the content of current courses and the digital skills sought by employers?
- Is it possible to contextualise employability skills in relation to courses within available TVET courses? Are these courses available as stand-alone short courses and resources in a variety of appropriate formats?
- Is it possible to contextualise available employability skills within known available jobs in the labour market?
- Is open digital access available to all key information, decision tools and communication options, including providing personalised dashboards to provide access to real-time labour market information?
- Is there interest in digitally enabled pathways to automate guidance and improve information delivery to students? Consider:
  - → Self-assessment tools, which allow learners to conduct online tests to either discover or verify their skill profiles;
  - → Personal skills profiles, which allow learners to 'collect', display and share their skills, typically using e-portfolio software; and
  - → Recommender engines, which can suggest suitable employment opportunities based on a certain skills profile or appropriate learning opportunities which will strengthen a CV, to allow students to reach employment targets.
- Is there interest in using digitalisation tools to develop skills frameworks to secure data regarding which learning opportunities teach which skills, and which jobs require which skills? Consider:
  - → **Sector information:** To describe the sector and employment landscapes, including statistics on the sector's manpower and occupational requirements;
  - → **Career pathways:** To show how the occupation roles in the sector are structured progressively based on sector norm. From the career pathways, users can identify vertical and lateral advancement opportunities;
  - → **Occupational descriptions:** To describe the skills requirement, work context and expected profile of a worker performing an occupation;
  - → **Skill description:** Every occupation in the framework contains a set of skills. Each skill captures both occupational/job and personal domains of the skill for holistic development, as well as performance expectations of the skill; and
  - → **Training programmes:** Link the skills in the occupations to academic qualifications, continuing education and training programmes, apprenticeships, recognition of prior learning and other skills-based programmes.

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