▶ **Policy Brief**

November 2021

Digitalisation of TVET and skills development: Leveraging technology to support lifelong learning

Key points

▶ Digital technologies create new opportunities and challenges for TVET and skills development systems which will affect the way they operate and deliver products and services.

▶ Industry 4.0 is one of the main drivers of innovation in TVET and policies for digital TVET should be seen as a response to this new industrial paradigm.

▶ Even though the design and delivery of training was transformed in response to the COVID-19 pandemic, policy makers should take stock of the changes and reflect on the adjustments required to ensure that employment and skills strategies, services and tools improve quality and enhance access to education and training rather than exacerbate the digital divide.

▶ Digitisation of TVET and skills development cannot be considered a single area of government strategy. There is a need for integrated and coherent national digitalisation strategies, developed through social dialogue, that address both the demand and supply sides of skills systems. Such strategies should take a systemic perspective to digitalisation and consider the potential role digital technologies can play across all aspects of a skills system, and not just as a tool to take training products and services online.

▶ Whilst there is not one single framework or standard approach to develop a digitalisation strategy for skills systems, some key principles can be highlighted: Social inclusion should be the key focus of any digital transition strategy; National skills systems need to become integrated systems; Digitalisation of TVET and skills development requires specific digital solutions for this form of education and training; Digitalisation is also about change management as digitalisation changes almost every work role in a system; Building digitalisation capability requires a holistic workforce development approach.

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▶ Introduction

The rapid and dynamic development of digital technologies creates new opportunities and challenges for individuals, enterprises, labour markets and skills development systems alike.

In terms of digitalisation, employment and skills systems have both external and internal pressures. First, they have to respond to the external demand for skills from digital societies and economies and the transition to the new world of work, and secondly, as other sectors do, they have to engage in their own digital transition (ILO, 2021).

This policy brief concentrates on the digital transformation of skills systems and how technologies affect them. It is focused on how skills systems themselves become digitised, not how they respond to the demand for skills arising from digitalisation in the labour market.

Digital technologies create new opportunities and challenges for TVET and skills development systems in the way they operate and deliver products and services (ILO & UNESCO, 2020). Changes in teaching and learning modalities, pedagogical approaches, assessment and certification are taking place and developments such as massive open online courses (MOOCs) or micro learning opportunities, are disrupting established, traditional models in the sector and provide more flexible learning pathways. The use of digital technologies, such as machine learning and artificial intelligence (AI) are also fundamentally changing teaching and learning processes, pushing educational and TVET staff to completely rethink the whole learning experience. Immersive reality technologies, sometimes coupled with interactive and collaborative tools, also promise to support practical, hands-on training, which remains at the heart of skills development and the various settings in which it occurs. The opportunities given by online tools to retrieve, leverage and compare real-time data - through data analytics and data visualisation solutions - also provide solutions for monitoring and learner support, and provide data to enhance future teaching materials and systems. As technology is also transforming the way we assess, certify and recognise skills, it is delivering new models and tools to improve the portability of skills, qualifications and ultimately learners.

Combined, all these changes present a range of significant challenges for TVET and skills development systems as they respond to the opportunity of digitalisation, and the recent and on-going responses to the COVID-19 pandemic have brought a number of these challenges to the fore.

Employment and skills systems have rapidly adapted to the learning crisis and in doing so, have accelerated the introduction of digital technologies. Short-term responses have been found, through the great efforts of public authorities, private agents and civil society. However, the pandemic has highlighted the digital divide and seen uneven access to equipment, tools and skills with evidence that the rush to go online has in some cases widened existing inequalities (ILO, 2020).

As such, even though the design and delivery of training was very much transformed in response to the COVID-19 pandemic, policy makers should take stock of the resulting solutions and reflect on the adjustments required to ensure that employment and skills strategies, services and tools improve quality and enhance access to education and training rather than exacerbate the digital divide (ILO & UNESCO 2020).

1. What does digital transformation mean in TVET and skills systems?

It is possible to distinguish between three progressive stages in the implementation of digital strategies in educational organisations or systems (ILO, 2021). Such an approach provides a helpful working definition and differentiates between the conversion of information to digital forms (digitisation), which is a mostly technical stage, and the utilisation of that information to automate and streamline processes (digitalisation), which can involve significant, often challenging organisational change. Meeting these challenges successfully can lead to the third stage, or digital transformation, where a whole-of-system digitalisation strategy for a national skills system or TVET institute, for example, would occur.

Although TVET and skills systems should take a strategic approach to their digital transition according to their local needs and capabilities, the three stages

defined above do not necessarily occur sequentially as institutions and individuals often drive digital innovation in an organic and ad hoc way.

The development of new digital technologies (digital innovation) creates new capabilities for education, the workplace and societies in general. These capabilities lead to new skills that enable persons to adapt to and benefit from these transformations (digital adaptation), as well as transformations in the nature of education, work and society (digital acceleration) (ILO & UNESCO, 2020).

Industry 4.0 is positioned as one of the main drivers of innovation in TVET (Madsen et al., 2016) and 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, the technologies and trends encompassed by the term are already visible globally, and already official policies and strategies in several countries indicate that TVET is reacting to:

▶ increased automation of simple tasks – and increasingly of 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

▶ increased productivity, efficiency, quality and reduced time to market

▶ more R&D activities

▶ development of new skills and talent globally.

Such developments are also reflected in the five key technologies that are driving innovation in vocational education and training: ubiquitous technology, collaboration technologies, extended reality, artificial intelligence, and blockchain (see Figure 1).

Ubiquitous computing

Ubiquitous computing describes the technologies that give people access to information and computing power through the worldwide web from practically any place in the world. In a learning context, ubiquitous computing infrastructure is a pre-requisite for most applications of digital or blended learning: in places with poor educational infrastructure, it can often be a pre-requisite for delivering any educational or training opportunities. Ubiquitous computing is associated with three technologies: Broadband, which describes high-speed internet, typically fast enough to support applications such as videoconferencing and remote control of equipment; Mobile broadband, which describes technologies such as 3G, 4G and 5G, each allowing the wireless delivery of broadband to computing devices through radio waves; and cloud computing which describes the offloading of computing tasks from a local device to a computer hosted in a data centre. Such tasks can involve anything from storing photos to processing large data sets.

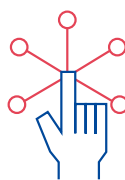▶ **Figure 1: Five technologies driving digital transformation in TVET**
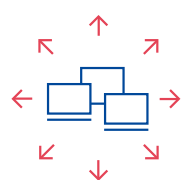
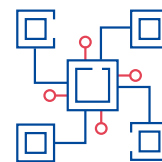| UBIQUITOUS COMPUTING	COLLABORATION TECHNOLOGIES	EXTENDED REALITY	ARTIFICIAL INTELLIGENCE	BLOCKCHAIN
Access to computing power any time, anywhere	Ability to collaborate with anyone in real time	Ability to digitally simulate reality and to integrate digital and physical worlds	Ability for machines to learn on their own, and interact in a human-like manner	Ability to use computers with guarantees as to privacy and security
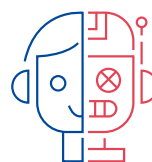
Source: Grech and Camilleri, (2017).

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Collaboration technologies

The digital age, driven by the advent of network computing, the internet and mobile devices, has transformed the concept of collaboration and added new opportunities and challenges. The ability to communicate, exchange information, and collaborate across space and time has given us new forms of working, new types of (virtual) organisation and the reconfiguration of markets. This, in turn, has spurred innovation across different sectors of the economy, enabling heretofore impossible collaboration across national and disciplinary boundaries. Many technologies with a 'social' element incorporated in the software would qualify as collaboration technologies. In a remote learning environment, social interactions enabled by collaborative technologies give the possibility to maintain the human link while learners and instructors are located in different physical spaces.

Extended Reality technologies

Extended reality technologies[1] variously incorporate a range of different technologies, including (Intel, n.d.): Virtual reality (VR), Augmented reality (AR), and Mixed reality (MR) which brings together real-world and digital elements, and allows interacting with and manipulate both physical and virtual items and environments, using next-generation sensing and imaging technologies.

Such immersive technologies have many benefits as they can:

▶ support students to understand abstract concepts through investigating 3D models

▶ allow students to explore workplace scenarios and practices in a safe way by eliminating real-life hazards

▶ foster innovative approaches and contextualise classroom learning with real-life work environments

▶ increase student engagement and encourage hands-on learning

▶ produce cost-savings and ensure a more sustainable training approach in many industries in comparison to equipment and raw or industrial material costs

▶ allow students to learn from failure

▶ quickly reduce time spent in training

▶ include learners that may not have access to workplace learning or industry-relevant equipment, including younger workers

▶ add attractiveness for training in occupations that might traditionally be gender sensitive.

Although the cost of such systems is declining as usage increases, it remains a factor to be considered when priorities for investment are decided.

Artificial Intelligence

AI is a group of technologies and techniques, notably those linked to deep learning, natural language processing and signal recognition, which allow computers to learn and interact similarly to humans. We imagine that the most immediate applications of AI to TVET would therefore involve *Natural language processing* - i.e. the ability to train computers based on large data sets – and *Recommender systems*, which use massive data sets of user preferences to intuit what users might need or prefer to consume next.

Artificial Intelligence (AI) is also increasingly being incorporated in TVET as a key tool to improve student feedback and assessment. When integrated into an LMS or AR/VR tools, AI can use the data from these platforms and technologies to provide more personalised learning pathways or recommendations, as well as more rapid feedback on student learning than they would otherwise receive from an instructor. It can also be applied to identifying at-risk learners and offer more consistent assessment by reducing reliance on a trainer's judgement. Another area where AI is applied in teaching and learning is in student support. Chatbots – or bots – can be used to answer common student questions and can operate across sub-systems, in the form of interoperable chatbots or search engines, to ensure the learners can find opportunities for formal or informal skills development across subsystems, and therefore provide a more seamless experience and access to the resources they need. Other applications of AI include anti-plagiarism software, teaching administrative tasks (such as scheduling), real-time translation, and student engagement. There are, however, ethical concerns to be thought-through when integrating AI in teaching and learning. This includes concerns over student data usage and boundaries of use in teaching environments. Institution and teacher capacity to implement AI is also a limitation.

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1 *Example of how extended reality technologies have been used in VET can be found in the ILO* [Digitalization of national TVET and skills systems: Harnessing Technology to support LLL](#)

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Blockchain

Blockchain, more formally known as distributed ledger technologies, is predicted to offer significant opportunities to disrupt traditional products and services thanks to the distributed, decentralised nature of blockchains, features such as the permanence of the blockchain record, and the ability to run smart contracts. In skills systems, Blockchain technology provides a single secure record of training and experience in transparent form, accessible to employers and institutes for simplified verification. The emerging technology offers protection against forgery and false claims. Training institutions store credentials and certifications on a distributed global ledger, rather than centralised databases. Institutions act as the verifying authorities, ensuring that each academic credential is authenticated directly from the source. Employers can validate credentials of prospective employees without requiring third parties, or a lengthy process. Blockchain offers governments a reliable source of document verification for immigrant workers and highlights any fraudulent claims much more efficiently than currently possible. Blockchain technology also puts trainees or employees in charge of their own credentials.
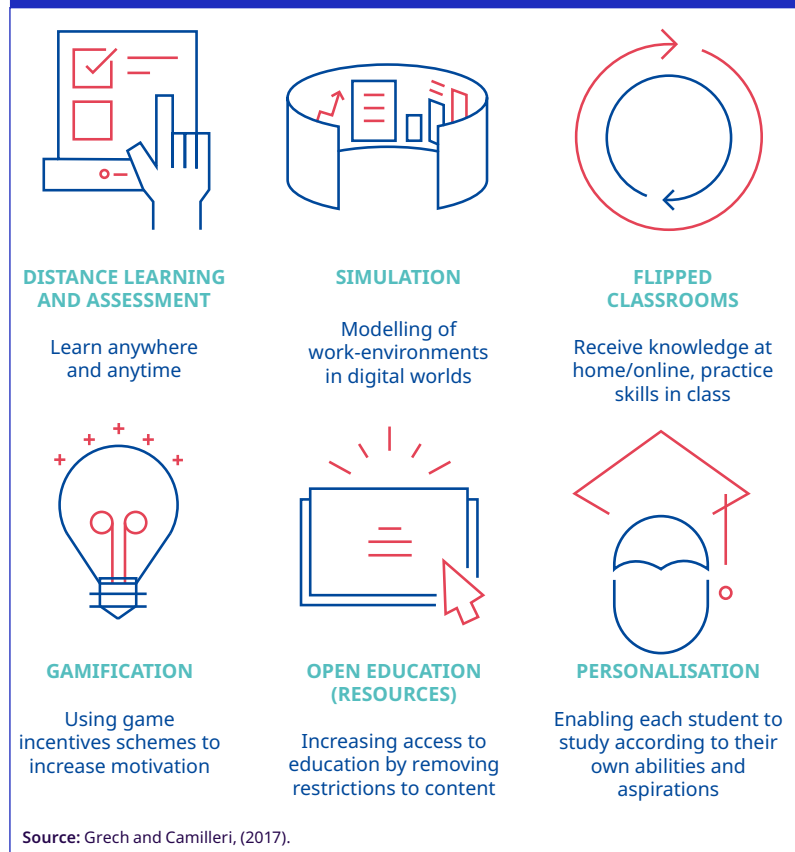
From a social perspective, blockchain technology allows (Grech and Camilleri, 2017): self-sovereignty, i.e. users can maintain direct control over the storage and management of their personal data; trust, i.e. the technical infrastructure gives people enough confidence in its operations to carry through with transactions such as payments or the issuance of certificates; transparency and provenance, i.e. users can conduct transactions with the knowledge that each party has the capacity to enter into that transaction; immutability, i.e. records can be written and stored permanently, without the possibility of modification; disintermediation, i.e.there is no more need for a central controlling authority to manage transactions or keep records; collaboration, i.e. parties have the ability to transact directly with each other, without the need for third parties.

These technologies are affecting six areas of learning that are especially relevant for vocational education and training: distance learning and assessment, simulation, flipped classrooms, gamification, open education (resources) and personalisation (see Figure 2).

All these areas of learning have the potential to address issues such as *relevance* through more personalised pathways, *engagement*, thanks to gamification mechanisms, *efficiency*, using self-paced learning for more theoretical learning and privileging synchronous, ILT for more practical, experiential learning experiences in a blended learning approach, and *flexibility*, using Open Educational Resources (OERs).

▶ **Figure 2: Six areas of learning holding promise for TVET**

DISTANCE LEARNING AND ASSESSMENT
Learn anywhere and anytime

SIMULATION
Modelling of work-environments in digital worlds

FLIPPED CLASSROOMS
Receive knowledge at home/online, practice skills in class

GAMIFICATION
Using game incentives schemes to increase motivation

OPEN EDUCATION (RESOURCES)
Increasing access to education by removing restrictions to content

PERSONALISATION
Enabling each student to study according to their own abilities and aspirations

Source: Grech and Camilleri, (2017).

Although the development of skills (design and delivery) has been the focus of attention during the COVID-19 pandemic, the development, recognition and certification of skills (ILO, 2021) is one of, but surely not the only functional area of skills systems that is impacted by technologies. Digital transformation of TVET and skills systems is not only about design and delivery of training services, but also about management and regulation.

Taken together, the existing trends of digitalisation that have accelerated as a result of the pandemic response, call for the development of integrated national strategies that address both the demand and supply sides of skills systems. Such strategies should provide an integrated program that builds on the pandemic response experience and addresses a number of key issues affecting skills systems, leveraging technologies in a relevant and context sensitive manner.

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2. So why digitalise key elements of skills systems?

Although TVET and skills systems rapidly adapted to the COVID-19 learning crisis and accelerated the introduction of digital technologies, recent ILO & UNESCO research illustrates the need for integrated and coherent national digitalisation strategies, developed through social dialogue, that address both the demand and supply sides of skills systems. Such strategies should take a systemic perspective to digitalisation and consider the potential role digital technologies can play across all aspects of a skills system, and not just on teaching and learning which has naturally been the priority during COVID-19. It has been demonstrated that digitisation of TVET cannot be identified as a single area of government strategy, and no single ministry or body is responsible for taking ownership of the implementation of such a strategy or any underlying programmes. As such, digitisation of TVET and skills systems is rather typically covered by a host of different policies and regulatory frameworks (ILO & UNESCO, 2020).

So why digitalise?

A crisis like the COVID-19 pandemic heightens the opportunities for change, even regrowth. On first glance, the pandemic has delivered the game-changing reason to digitalise education systems – to support remote learning. It is a necessity, so argument is superfluous. In the foreseeable future, the need to sustain online delivery remains an obvious imperative for digitalisation of those aspects of TVET and skills development.

However, although effective online delivery will become a staple requirement of TVET and other education sectors, it is only part of the challenge. The disruption of education has been accompanied by even more drastic disruption of large parts of the labour market in most countries. There has never been a greater need to identify employment patterns, analyse changing jobs and skilling requirements, and match people to opportunities, and all with unprecedented urgency and haste. An efficient, responsive and data-driven skills development and employment services system is needed more than ever.

Some key imperatives for digitalisation remain, heightened in various ways by the impact of the pandemic (ILO, 2021):

▶ To improve skills needs identification and anticipation systems along with the availability of relevant labour market information, adequate tools and methods to devise relevant strategies for TVET and deliver trainings in response to the labour market needs.

▶ To enable data-driven decision-making and inform improved supply side planning - skills systems generally can be perceived as data poor. Digitalisation underpins the design and development of the enhanced analytics and reporting systems to monitor the performance of the system and to inform planning.

▶ To improve quality, efficiency and reliability - Well-designed and implemented digitalised processes can reduce costs, save time and deliver consistency and quality.

▶ To enable an expansion of learning opportunities - The digitalisation of TVET and skills development will bring more visibility to the training offer and expand access to more potential learners who would otherwise not be able to come to centres or schools.

▶ To increase access to and participation in the labour market through skills development -Digitalisation of training support and employment services will enhance the capacity of national TVET and skills systems to reach out and engage more individuals, communities, and marginalised groups. Investment in digitalisation promises better integrated information systems, better communication and more flexible training options to empower citizens to build skills and the opportunities to improve lives and livelihoods.

▶ To increase the credibility of the sector - To be perceived as a credible provider of training products and services in the contemporary marketplace, the overall TVET and skills system need to be able to demonstrate innovative processes, current digital skills and practical competence through digitalised administration, communication and programme delivery.

▶ To improve internal coordination in skills systems - Digitalisation offers the possibility to build bridges and linkages more easily between the different parts of a national skills system to improve communication and integrate data and information systems to improve client services, for example by using technology to link recognition of prior learning with a flexible learning offer.

▶ To provide innovative online and blended training options - A quality digital platform to support online delivery in all industry areas has become a necessity for TVET providers. Teachers have had to adapt rapidly to working virtually and using online communication to sustain learning. Skills systems and providers will need to aim beyond a basic capability to explore the uptake of emerging technologies for education and training.

▶ To enable national, regional and international networking - The use of online technologies facilitates borderless communication among practitioners, enabling a greater sharing of best practices, solutions, training content, therefore building on experience, failures and successes within online learning communities.

All of these imperatives, as well as the key functions of skills systems, are both enabled and accelerated by digitalisation.

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3. How to digitalise key elements of skills systems?

Skills systems involve complex interactions between individual learners, workers and employers, and a range of institutions and stakeholders in the public and private sector. 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 affect the programs and policies that operate.

Given this complex set of actors and interactions, the concept of "building blocks" of skills systems (ILO 2021) has been developed to present a simplified, structuring model of a skills system that highlights the key functional areas. The "building blocks" identify the five high-level functions of a skills development system as:

▶ Building Block 1 - Provide policies, structure and resources for skills development

▶ Building Block 2 - Anticipate, plan and monitor skills development

▶ Building Block 3 - Develop, certify and recognise skills

▶ Building Block 4 - Improve access to skills development and the labour market

▶ Building Block 5 - Provide skills for employability, decent work and productivity

> ▶ Building Block 1
> **Provide policies, structure and resources for skills development**

In providing the legislative base, policy framework and resourcing requirements, national governance in TVET and skills systems is characterised by the establishment and coordination by government of several key agencies. Several ministries other than education will usually have a role in the governance of a national skills system, notably Employment or Labour, Economy, Finance, ITC, or Digital Transformation. Providing a vision, leadership and change initiatives, defining the legislative base, developing IT platforms and interoperability standards, working on digitalising work processes and learning content development and distribution are among the main areas in which governance operates.

Key digitalisation implementation guidelines

▶ Envision digitalisation as a way to rethink thoroughly national TVET and skills systems using innovative approaches, not simply adding technology to existing organisations, processes or curricula.

▶ Prepare to move from short-term emergency responses to longer-term strategic approaches to digitalisation, digitisation and digital transformation, adapted to your own local needs.

▶ Provide a fresh vision, with proactive leadership and targeted change initiatives.

▶ Push for the implementation of policies on infrastructure, connectivity and equipment, to make sure digitalisation of national TVET and skills system is inclusive, and does not increase the digital divide.

▶ Promote and foster cross-ministries joint work to enable efficient linkages between all parts of the TVET and skills system.

▶ Foster communication and anticipate change among teams and individuals, involving all stakeholders to prepare them to the new ecosystem's changing roles and responsibilities.

▶ Review current communication and collaboration systems and practices to implement systematic digitalisation of effective virtual work processes across the skills system.

▶ Develop or upgrade national IT platforms and interoperability standards to support new digital applications and promote secure access.

▶ Include IT teams in the earliest stages of the digital transition to identify key integration issues and maintain their engagement through the process of implementing, maintaining and upgrading relevant technical solutions.

▶ Adopt a user-centric, demand-oriented approach, using techniques such as design thinking to make sure all actors are involved, and thus maximising inclusion as well as adoption.

▶ Promote and push for the creation of national online communities to increase sharing of best practices and online learning and teaching solutions.

▶ Consider implementing national curation, development and distribution of core exemplar digital learning materials, by industry, and developing or extending an ongoing specialist national function, to maximise investment, efficiency and quality for a more sustainable approach.

▶ Include teachers' and trainers' awareness, training actions and capacity building at the policy level, to make sure educational staff is well aware of the possibilities brought by technology, and prepared to operate in this new ecosystem, including tackling with learners having a hard time adopting it.

▶ Include basic digital skills development and opportunities to learn how to learn online at the policy level to ensure lifelong learning is made possible.

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▶ Building Block 2
Anticipate, plan and monitor skills development

In order for TVET and skills systems to better respond to the digitalisation challenge, it is critical that effective skills anticipation and matching systems are put in place. This building block includes areas such as Labour market skills needs analysis, gathering, analysing and publishing Information; the importance of effective skills anticipation and matching, as well as the key role of skills standards in matching supply and demand for skills.

Key digitalisation implementation guidelines

▶ Benchmark relevant national labour market analysis systems to identify digitalisation options which can improve efficiency and effectiveness.

▶ Review the national Labour Market Information (LMI) network and system for gathering, analysing, and publishing LMI to identify gaps or weaknesses and new digital solutions available to improve performance.

▶ Improve collaboration between ministries and national agencies in charge of LMI, Education, and Employment, due to the interdependency of collected and utilised data.

▶ Establish Research and Development teams and/ or expert profiles in frontier technologies within Ministries of Labour, Employment and Education to ensure a dynamic and integrated approach to labour market planning is taken, and that new technologies applied to LMI are being anticipated, piloted, and implemented according to the local needs and organisations.

▶ Review the national processes for aligning skills supply and demand, and (where relevant) consider the business case for implementing national skills standards to deliver training outcomes which more reliably meet identified demand.

▶ Ensure dynamic evolution of TVET skills development curricula, working on establishing dynamic and closer links with the industry/sectors to inform in-demand skills and training offers design and delivery, thus maximising employability and learning outcomes.

▶ Adopt a user-centric approach to designing client-facing solutions that use data visualisation tools to provide relevant data aligned with end-users needs.

▶ Make sure to include end-users in the design stages, and anticipate communication and training for all staff members, to ensure efficient uptake and adoption of the new tools and processes.

▶ Building Block 3
Develop, certify and recognise skills

This building block of the system includes: training providers (public, private, community and employers), who design and deliver skills development programmes for the technical and vocational sector; and the national training provider registration authority, responsible for registering providers and monitoring the quality of their delivery. It also includes digital applications for training providers, the digitalisation of course design and delivery, digitalisation of assessment, and the use of learning analytics for assessing program effectiveness.

Key digitalisation implementation guidelines

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

▶ Inform training offers digitalisation priority setting consulting closely with LMI, employers' organisations and the private sector, to ensure transformation is demand-driven, according to specific requirements of the local labour market.

▶ Refer to national strategies (such as Digital or Green), as well as to Sector Skills Councils (or equivalent) to inform decision-making on priorities. This will also enable finding more support when it comes to implementation.

▶ Invest in long-term solutions, and not quick-wins, proceeding with a thorough needs analysis, and including IT teams in the early design stages to make sure they support the choice of efficient and inclusive online solutions, as well as their implementation and agile evolution.

▶ Define upstream the KPIs you need to be measuring and comparing in a data-driven approach (using learning analytics), to make sure you then opt for tech-enabled solutions that allows for such measurement, analysis, and comparison among systems and solutions.

▶ Review current or legacy approaches for assessing practical skills and re-design them as online friendly evidence-based assessment tasks using digital tools such as e-portfolios, learner-generated video and web-conferencing, especially in workplace settings.

▶ Provide clear guidelines and solutions to implement and evaluate a national learner-centered approach to blended learning.

▶ Expand institute-level support and scaffolding services to assist trainers to access quality digital learning materials, re-purpose exemplar unit and course designs, and rework generic session plans to embed quality practices in live online classes.

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▶ Ensure that all TVET providers have the 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.

> ▶ Building Block 4
> **Improve access to skills development and the labour market'**

Policies, strategies and processes which improve access are embedded in many aspects of the system. In this building block, we focus on TVET and skills system components where digitalisation can have significant impact in increasing access to and participation in training programmes and providing recognition of skills, as well as facilitating access to employment, traineeship or apprenticeship opportunities.

Key digitalisation implementation guidelines

▶ Inform the offer of digitalised training products and services with comprehensive studies of the targeted groups or population capabilities (infrastructure, equipment, and connectivity), as well as skills and attitudes, to ensure access and uptake of such opportunities.

▶ When adopting flexible and blended learning approaches, embed robust no or low-tech alternatives[2] at the programme design stage, to avoid further disadvantage for those who face barriers related to infrastructure and/or equipment.

▶ Provide guidelines, regulations, and frameworks for the integration of broadband and connectivity services in TVET institutes to ensure the impact on access and equity is considered and measures are taken to address it.

▶ Review inter-agency referral and outreach systems and identify digital opportunities to streamline, extend and enhance communication options for information and advice services.

▶ To avoid further marginalisation of people with disabilities, if the decision is made to introduce digitalised training products and services, include assistive technologies in all digitalisation strategies and IT procurement policies and provide awareness and operational training in using the technologies in pre-service and in-service programmes.

▶ Consider using technologies to put in place, expand, or strengthen Recognition of Prior Learning (RPL) mechanisms, to recognise skills acquired through informal, non-formal or formal learning and to assist users to participate and complete the process.

▶ Make the best of data that can be retrieved in all the systems in place to make informed decisions and continuously improve content, process and the organisation.

▶ Maximise the use of technologies to ensure the integration of career guidance and employment functionalities in the skills development lifecycle, to provide adapted counselling before training happens, and link the recently graduated learners to potential employment, traineeship or apprenticeship opportunities.

▶ Provide guidance to equip learners with devices they can use (even offline) to ensure the continuity of the learning experience outside of the classroom – whether it be for research and homework purposes, or self-paced learning activities.

▶ Provide support to teachers and learners to maximise engagement and adoption of the new learning ecosystem, pedagogical approaches and all sorts of technologies and devices they will be using.

> ▶ Building Block 5
> **Provide skills for employability, decent work and productivity**

Measures to develop employability are the main focus of a cluster of policies, strategies, programmes and services operating both within and beyond TVET institutes which together aim to improve an individual's chances of finding employment. The services include career guidance, career education, tutoring and vocational support in TVET. Their role can involve providing curated access to labour market information, helping to identify employment opportunities, providing career guidance and supporting self-assessment of skills and goals. The services have a key role in reaching people who are outside the formal training system, who may be working in the informal economy or be self-employed, unemployed or under-employed. Digital technologies have significant and growing role both in supporting employability services and providing links between the training institutes and workplaces.

Key digitalisation implementation guidelines

▶ Support quality career and employment service networks with open digital access to all key information, decision tools and communication options, including providing personalised dashboards to provide access to real time labour market information.

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2 The World Bank has designed a series of short, pragmatic guides on individual topics within EdTech that supports the target audience to make informed yet quick decisions about EdTech interventions in their work, especially with education ministries, to use remote learning in low resource environments.

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▶ Strengthen local tripartite collaboration between government ministries, employers and workers' organisations, as well as with the private sector, to ensure skills development opportunities (supply) match the required and needed skills (demand) in the labour market.

▶ Implement e-portfolio tools and systems to provide learner-managed portable evidence of competencies, experience and qualifications to link workplace and institute training outcomes and to empower employability service advisors.

▶ Develop comprehensive digital career guidance platforms with multi-channelling and associate career development support to high quality digital training platforms offering core and technical skills courses.

▶ Ensure 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.

▶ Review emerging digital applications which support partnership and collaboration between employers and training providers, and extend the role of providers beyond the duration of courses to include providing ongoing learning and improving employability.

▶ Use competency-based training and assessment to provide clear and measurable training outcomes to meet employment demand and increase job readiness of graduates and deliver performance improvement for employers.

▶ Provide focused development of nationally identified employability skills by contextualising those skills to the jobs and industry within courses, as well as providing stand-alone short courses and resources in a variety of appropriate formats.

▶ Make sure to take a user-centric approach to online or hybrid career guidance tools, and support individuals with the use and uptake of such online counselling services.

Each of these five high-level functions should be looked at in an integrated approach in order to undertake a resilient, longer-term, and more strategic digitalisation of a skills system.

Coordinated action across different ministries or governmental agencies enables a more integrated approach to digitalisation, supports coordinated investments, increases the likelihood of interoperable systems and eventually contributes to more successful monitoring and evaluation (ILO, 2021).

4. Key principles of any digitalisation strategy

Whilst there is not one single framework or standard approach to undertake such digital transition in skills systems, a number of key messages are evident from the literature:

Social inclusion should be the key focus of any digital transition strategy

For each of the high-level functions of a skills system, it is necessary to consider the local capacity building and development of all stakeholders and actors, to make sure technologies are used to serve individuals' needs, according to their own capacity (mainly infrastructure, equipment, skills and attitude) to use them. A user-centric approach combined with universal design has the capacity to improve inclusive approaches to skills development and access to the labour market, thus avoiding excluding further already disadvantaged and vulnerable groups, only leveraging technology whenever it has value to enhance all or part of their experience.

Digitalisation has a pivotal role in national responses to COVID-19

The key functions of national skills systems have been severely impacted by the pandemic. Many governments have been impelled to intervene quickly and decisively in the labour market in previously unthinkable ways, leaving an uncertain pathway and timeline to recovery. Remote teaching has been an emergency response widely considered to be unsatisfactory and unsustainable. The more virtual world which is emerging will be heavily reliant on purposeful planning for the digital transformation of processes and organisations. Digitalisation initiatives have been identified in many countries, including innovative solutions across the full range of activities in a skills system. However, it has also become clear from the country examples that the extent and impact of digitalisation in national TVET and skills systems varies widely. The "next steps" to take are a system-by-system challenge. However, what has changed for all countries is that the time for those next steps is suddenly now.

National skills systems need to become integrated systems

Some national skills systems have developed mature models to manage the overall function of describing and monitoring national skills requirements and managing skills supply through training providers. Many have parts of the whole but appear to lack the necessary legislative agreements between the ministry of labour and the ministry of education, or key coordinating bodies or

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effective connections and information flow. Some will have TVET and labour market functions operating almost independently of each other. The ILO "building block" model suggests the compelling need for the components of the national skills system to be viewed as a whole. The relative complexity of the structures and the wide range of stakeholders in many national skills systems can reduce the visibility of the whole, disguise the critical importance of links and relationships, and exacerbate the tendency in human systems to develop "silos". It is necessary to refresh discussion and inform professional dialogue about the national TVET and skills system as a whole and how the application of digital technologies can increase quality and relevance without negatively affecting access and equitable outcomes.

Digitalisation of TVET requires digital solutions for TVET and skills development

Whilst there are excellent examples of where skills systems and TVET institutions are moving towards digitalisation (see ILO, 2021), the majority of country examples, models and guides can still be found in general or higher education. Solutions need to focus on applied learning for job readiness, national curriculum and quality standards, the close links and partnerships with employers and industry bodies, distinctive training and assessment models for practical skills, the fundamental importance of work-based learning and very different teacher pre-service training requirements and arrangements. This list expands even further when we look at the particular roles of TVET providers and other institutions, which may include industry skills bodies, qualifications authorities and employment service providers. As such, specific solutions that respond to the particular needs of TVET and skills systems need to be developed.

Digitalisation is about change management

Although the process of digitalisation often involves the installation of a new platform or application, the key impact is on how work is performed, work processes that are always changed and often disrupted. Changes to work processes often require the redesign of work roles, which changes skills requirements and requires staff development. Ideally, the discussion about process redesign (and expected improvements and benefits) will have taken place before or during the IT procurement stage, so there is a roll-out plan that includes training and evaluation. Change management also requires the involvement of key stakeholders in defining implementation processes and selecting solutions. This is not only true for IT teams who necessarily need to be involved at the earliest stages, but also true for all types of stakeholders and actors of the new ecosystem, who need to be part of the solution definition and implementation process using design thinking. Leaders in this environment will understand work process design and change management strategies. The change

management approaches in many of digital initiatives are not always explicitly addressed and this is a key measure that should be as part of any digitalisation strategy.

Digitalisation changes roles. For everyone.

It is important to call out one of the major – and often hidden – challenges of digitalising TVET and skills systems. Implementing a learning management system (at national or provider level) together with adopting an industry-based national curriculum (especially if accompanied by nationally distributed training materials) will inevitably change what may be considered the traditional role of a TVET trainer. Rather than working as an individual agent (a "professional") who prepares, teaches and assesses "their" course (as in most university education), they are more likely to be working in a collaborative team environment, with an externally administered curriculum, shared teaching materials prepared by others, and interacting with a range of specialists (in IT, learning design, assessment) not to mention the quality auditors.

Building digitalisation capability requires a workforce development approach

If learning new processes as well as "operating the tools" are both included, the task of building digital capabilities, especially in TVET institutes, is formidable. It is becoming unhelpful to dwell on the shock impact of the early stages of the mandatory uptake of remote teaching in many countries. It is perhaps too early yet to identify patterns in the response of education systems generally. It is not yet possible to discern any articulated overall strategy or approach to capability building for digitalisation in TVET. Capability building for digitalisation in TVET might be better modelled on workforce development approaches used in industry rather than on the "short courses for teachers" which characterises much professional development practice in education and training. This might include workplace-learning features such as describing the (new) processes and tasks required, describing the competencies for the changed roles, and providing a customised programme of development. It might include using the digital technology developed to support this approach. It might integrate competency-based assessment to provide a form of accreditation or recognition for achieving levels of digital capability.

Taking into consideration all of those key principles, the digital transition in TVET and skills development requires a strategic approach to it: supporting changes in all areas of a skills system, for all types of actors, strengthening the role and importance of cross-ministries consultation and social dialogue with the workforce, as well as guaranteeing digital inclusion in any decision-making to ensure more effective and inclusive systems in the future.

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5. How the ILO can support?

The ILO has a long tradition of supporting its constituents to strengthen their TVET and skills systems, efforts that have been redoubled during these difficult times. As the ILO Skills for Employment Knowledge Sharing Platform did since the COVID-19 outbreak, it will continue to hold e-discussions and add key references and tools on distance learning and skills development, acting, together with the Digitalisation of skills system dedicated space, as a vital resource for constituents around the world. At the country level, the ILO is supporting TVET institutes and skills systems agencies to digitalise their programs, activities and processes, providing advice on available tools and platforms, examples of how countries are responding to the challenge, as well as capacity development programmes delivered through the ILO International Training Centre (ITCILO) to support constituents in rapidly developing quality digital training materials and expose them to innovative, yet inclusive technologies, to leverage the opportunities given by the digitalisation of TVET and skills systems.

▶ Bibliography

Main ILO publications:

▶ 2021 - Digitalization of national TVET and skills systems: Harnessing technology to support LLL - An enquiry and action framework

▶ 2020 - The Digitization of TVET and Skills Systems (ILO & UNESCO)

▶ 2020 - Skills development in the time of COVID-19: Taking stock of the initial responses in technical and vocational education and training (ILO, UNESCO & WB)

▶ 2020 - Distance and Online Learning during the time of COVID-19 – Skills for Employment Policy Brief

▶ 2020 - Teaching Online during COVID-19 - Resources for TVET Teachers and Trainers

▶ 2020 - Learning Online during COVID-19 - Resources for Students/Apprentices/Learners/Trainees

▶ 2020 - Managing TVET during COVID-19 - Resources for TVET Managers and Policy makers

Other publications:

▶ 2020 - Education Technology – EdTech Publications (World Bank)