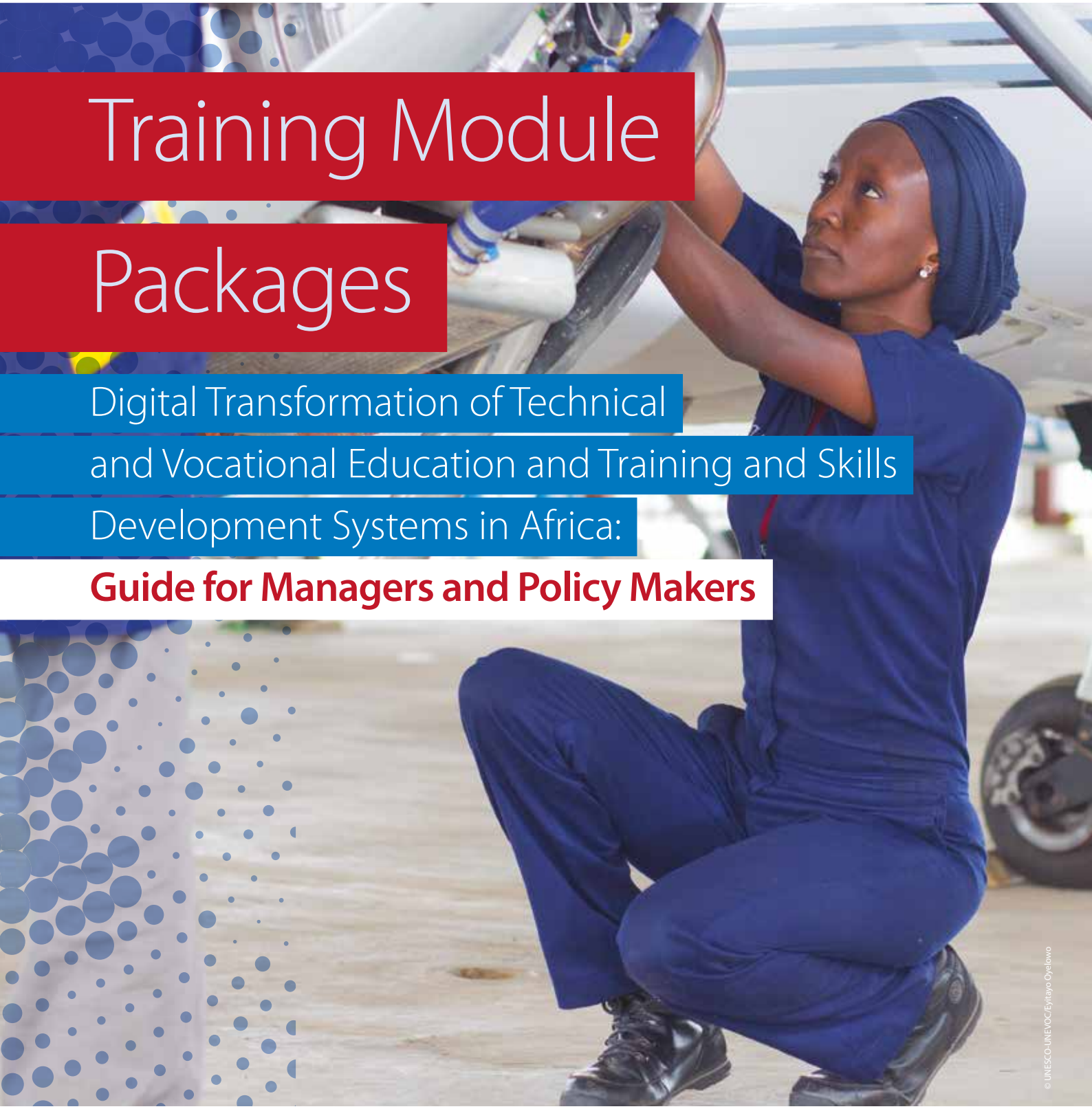
Training Module Packages

Digital Transformation of Technical and Vocational Education and Training and Skills Development Systems in Africa:

Guide for Managers and Policy Makers



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This guide is in its 2021 version. It is revised every two years. If you have any comments on how to improve it, please send them by e-mail to info@digitaltvetafrica.org . Your comments will be taken into account in the next revision of the guide which will be published in 2023.

Foreword

The Education 2030 Agenda, which incorporates the fourth Sustainable Development Goal (SDG 4), extends the targets of universal primary education that were part of the Millennium Development Goals to create inclusive, equitable and quality lifelong learning opportunities for all people. Considering the rapidly changing job market and its social and economic influences on individual lives, the Education 2030 Agenda stresses the need to rethink technical and vocational education and training (TVET) and skills development. The Education 2030 Agenda includes two TVET-related targets: (i) SDG 4.3 on ensuring equal access to affordable and quality TVET for all; and (ii) SDG 4.4 on increasing the number of youth and adults with relevant skills for employment, decent work and entrepreneurship.

One third of the working age population in low- and middle-income countries lack the basic skills required to get quality jobs, leaving them unable to achieve their full productive potential and limiting economic investment and growth. In 2019, **there were 1.2 billion young people** between the ages of 15 and 24, most of them in Africa, and governments are looking for ways in which these young people can be skilled for employment and entrepreneurship. The traditional brick and mortar institutions do not have the capacity to manage such large numbers of learners. Open and distance learning (ODL) and information and communication technologies (ICTs and digital) provide opportunities to increase access, reduce costs and improve the quality of education. In particular, ICT and digital has proven to add value to teaching and learning in TVET. If implemented and integrated adequately and purposefully, ICT and digital certainly increases access for people from marginalized and disadvantaged groups. By innovating the pedagogical approaches to both formal and informal TVET, ICT and digital can improve the transversal skills including numeracy, literacy as well as problem-solving, communication and organizational skills and hence the employability of workers. Ultimately, ICT and digital-enhanced pedagogies **can help build an inclusive society** whereby all persons, regardless of their status, are equally supported to grow socially and economically.

Apart from the advantages presented in the preceding paragraph, the wake of the coronavirus outbreak is accelerating an already growing trend towards the integration of digital tools into education. Like many other industries, the education sector has been severely impacted by the COVID-19 pandemic. Almost all African countries have closed schools including TVET centers to mitigate the spread of the virus, impacting over a million children and youth.

Africa's education and skills systems are designed for face-to-face teaching and learning, and with the current prolonged school closures, there is an urgent need to come up with innovative ways of program delivery. The COVID-19 crisis provides an opportunity to step up the digital transformation of African education systems to build digitally empowered human capital given the need to act steadfastly during the ongoing containment phase but also in preparation for the post-crisis recovery.

Digital tools provide immense opportunities to not only expand access to TVET education but also bring value to on-site learning. A number of core justifications for increasing the role of Distance and e-Learning are predicated on factors such as: (i) reduction of costs related to providing on-site training (ii) better coverage of recipients, (iii) flexibility (iv) constant access to course materials to facilitate understanding and (v) continuous learning. The expanded utilisation of e-Learning is of paramount importance in this period of remote working thus, its incorporation into TVET education should be given highest priority.

The capacity development landscape is changing and technologies are advancing in Africa. In support of people taking advantage of new approaches to training and learning, UNESCO and its partners continue to work with relevant stakeholders in the industry in Africa and globally. For the achievement of a new level of capacity development, a harmonised approach between people, technologies and content is needed. Africa needs to embrace the digitization of TVET so that future generations in the continent can benefit from the long-term implications in the 'new learning space'.

It is against this backdrop that UNESCO, The African Institute for Economic Development and Planning (IDEP) of the United Nations Economic Commission for Africa, The African Development Bank (AfdB) and the African Union Development Agency of the New Partnership for African Development (NEPAD) are collaborating to set up a **Pan African initiative for the Digital Transformation of TVET and Skills Development Systems in Africa.**

The first specific objective of the initiative is to establish a **Pan African training program** on the "***Digital Transformation of TVET and skills development Systems in Africa" in order to create a critical number of leaders*** (high-ranking TVET specialists, managers, policy makers…) and practitioners (instructors, teacher trainers, teacher coordinators…) in Africa, who will be able to support and implement the vision, in their respective countries. This guide is designed to support the Training program for policy makers and high-ranking specialists.

Acknowledgement

This guide was developed as part of the "Pan African initiative for the Digital Transformation of TVET and Skills Development Systems in Africa", under the overall guidance of Dr. Dimitri Sanga, Director of UNESCO Regional Office in Dakar and the direct supervision of Dr. Olivier PIEUME, UNESCO TVET Regional Adviser for Africa.

UNESCO and partners are grateful to the following specialists, members of the Technical Committee of the Pan African initiative for the Digital Transformation of TVET and Skills Development Systems in Africa, who provided valuable insights, comments and editing of the guide.

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UNESCO extends its gratitude to Professor OSINEM Emmanuel, Director of the Centre for Technical Vocational Education, Training and Research (CETVETAR), an UNESCO- UNEVOC Centre at University of Nigeria/Nsukka, who technically supported the development of this guide.

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Introduction

Programme Aim

The overall aim of the training programme is to enhance the competence/capacity of high-ranking vocational education specialists, policymakers and managers in Africa in the digital transformation of Technical and Vocational Education and Training (TVET), for improved workforce and socioeconomic development in Africa.

Programme Goals

The training programme is designed to build capacity/competence in different categories of high-ranking vocational education specialists, policymakers and managers in Africa. This to enable them, in their respective countries, to:

1. Advocate and effectively promote the digital transformation of TVET
2. Promote, strengthen and support the use of ICTs in their national TVET system
3. Promote and support the development of policies for the integration of ICTs into TVET at national and institutional levels
4. Promote and support the development of a strategy for the integration of ICTs into the TVET sector at national and institutional levels

Programme Objectives

The programme is designed so that that learners exposed to the training materials will be able to achieve the following:

- Identify current and emerging issues in TVET
- Develop an understanding of the challenges of TVET
- Identify common uses of ICTs in TVET
- Identify different ways ICTs can be used to support TVET programmes
- Identify and develop an understanding of the specialized uses of ICTs in TVET
- Identify ICT integration readiness approaches
- Develop a planning model for the integration of ICTs into TVET
- Develop policy governing the integration of ICTs into TVET
- Develop specific policies for the integration of ICTs into TVET
- Integrate ICTs into TVET at the national and institutional level
- Develop the institution's ICT vision for ICT-mediated teaching and learning
- Develop the institution's ICT mission for ICT-mediated teaching and learning
- Develop the institution's ICT goals and strategy
- Analyse the cost of integrating ICT into TVET
- Develop awareness of the cost effectiveness of integrating ICT into TVET
- Develop a budget for the integration of ICTs into TVET
- Identify funding sources to support the integration of ICTs into TVET
- Develop a funding proposal for the integration of ICTs into TVET
- Develop an understanding of the potentials of ICT support in TVET
- Familiarize learners with promising international cases of ICT application in TVET

The Structure of Thematic Modules

There are seven thematic modules, and each module is divided into an appropriate number of units. In each unit there are the following:

- Unit Title and Instructional Objective(s)
- Guiding Question
- Unit Flowchart/Concept Mapping
- Relevant training material
- Conclusion/summary
- Transformative reflection exercises
- A set of quizzes
- Practice questions
- References/resources for further reading at the end of each module, for all the units of the module

Delivery Mode

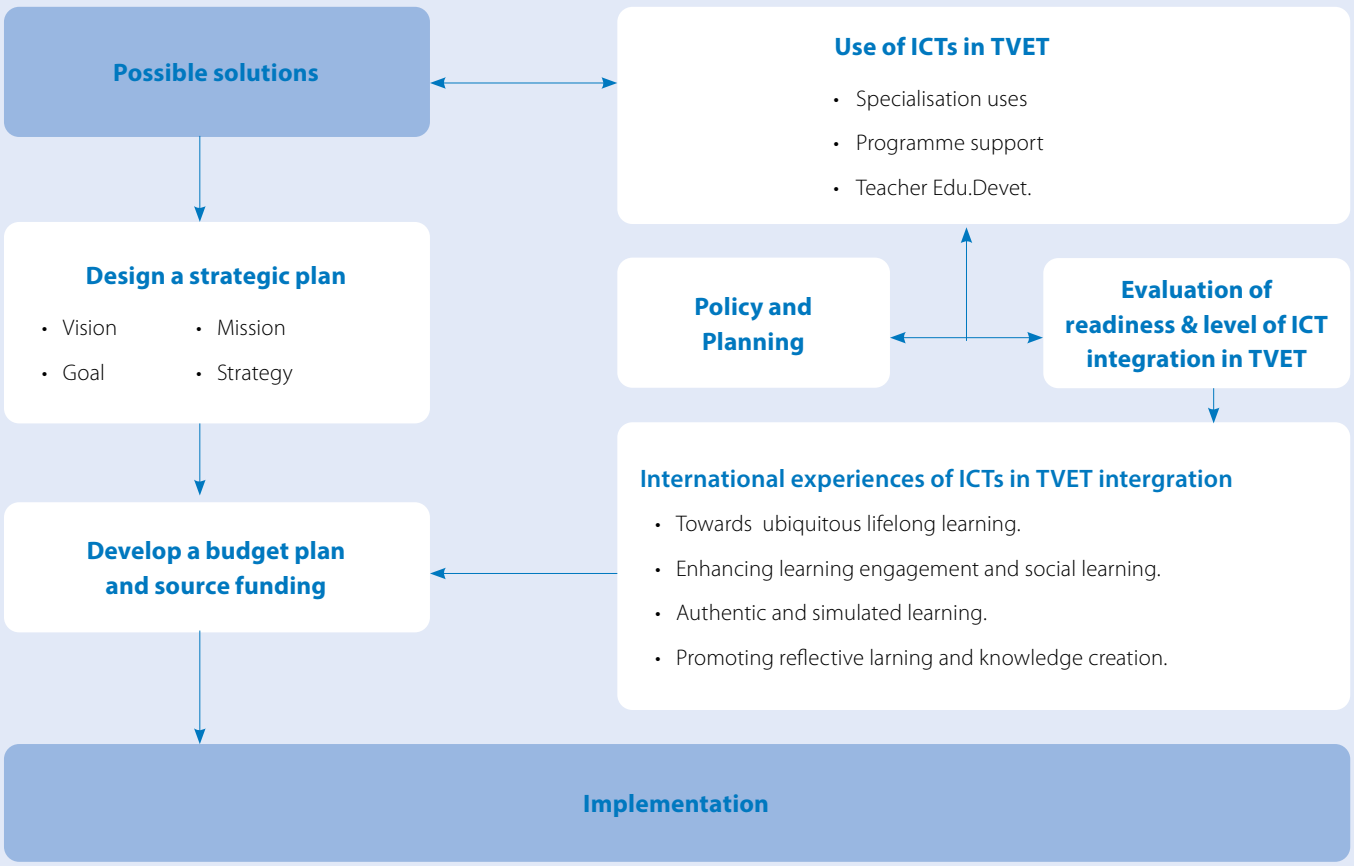
The training programme is structured to be delivered through:

- → Self-directed learning
- → An online interactive learning model
- → A face-to-face training workshop on the practical aspects

Conceptual Schema of Key Components of the Training Programme

The conceptual schema presented and described below shows the key components of the training content, and the logical sequence of presentation that enables the goals of the programme to be met.

TVET issues and challenges in Africa	
Skill mismatch	Greening TVET
CPD of TVET teachers	Staff training and Retention
Blended learning	ICT integration into YVET curriculum
ICT's in TVET	Low participation from other stakeholders
Economic globalisation	Resources for TVET are very limited
Cross-disciplinary tech. integration	Lack of transfer across streams in the education system



The above conceptual model guides the integration of ICTs and digital into TVET. According to this model, the integration of ICTs and digital into TVET must take into account existing problems/challenges. To overcome the challenges, a series of plans must be put in place.

The plan begins with the identification and evaluation of the potential uses of existing ICTs and digital, as well as choosing appropriate planning models, while also ensuring that policies that guide ICT and digital integration are duly followed. A good vision, mission statement, goals and strategy tailored towards the existing organizational vision, mission and strategic goals will give the integration plan its first strong footing.

The next phase begins with a budget plan, with an overview of promising international cases. This will provide a clear understanding of the cost implications, with an estimate of the requirements, sources and possible means of funding. Once affordable financial resources are in place through donations from agencies, grant awards, government and international agency aid, the transformation towards the use of ICTs and digital in TVET begins.

This journey begins with the appropriate deployment of pedagogical principles in the design and development of ICT and digital-mediated learning materials; the conversion of existing resources to ICT and digital-mediated learning materials for TVET; the design, development and evaluation of ICT and digital-mediated learning materials for TVET; planning the use of ICT and digital-mediated learning in TVET; assisting learners with using ICTs and digital for learning, and facilitating (on-site and online) learning in TVET using ICTs and digital.

Training Course Outline

M1 TVET CHALLENGES AND ISSUES IN AFRICA

Unit 1.1 Current and emerging issues in TVET
Unit 1.2 Challenges of TVET in Africa

M2 POTENTIAL USES OF ICTS AND DIGITAL IN TVET

Unit 2.1 Uses of ICTs and digital in TVET
Unit 2.2 ICTs and digital for programme support
Unit 2.3 Specialized use of ICTs and digital

M3 EVALUATION OF READINESS AND LEVEL OF ICT AND DIGITAL INTEGRATION IN THE TVET EDUCATION SYSTEM

Unit 3.1 Dimensions for the evaluation of readiness and level of ICT and digital integration in the TVET education system
Unit 3.2 Approaches and tools for assessing readiness and level of ICT and digital integration

M4 PLANNING MODEL FOR INTEGRATING ICTS AND DIGITAL INTO TVET AT NATIONAL AND INSTITUTIONAL LEVELS

Unit 4.1 Planning Model for Integrating ICTs and digital into TVET
Unit 4.2 Policy Governing the Integration of ICTs and digital into TVET
Unit 4.3 Planning for the integration of ICTs and digital into TVET at national and institutional level

M5 AN ICT AND DIGITAL STRATEGY FOR TVET AT NATIONAL AND INSTITUTIONAL LEVELS

Unit 5.1 Mission and vision for a strategic plan for ICT and digital integration into TVET at institutional level
Unit 5.1 ICT and digital integration goals and strategic plan for TVET
Unit 5.1 Communicating the ICT and digital integration strategic plan for TVET

M6 COSTING AND FINANCING ASPECTS

Unit 6.1 Analysis of the cost of integrating ICT and digital into TVET
Unit 6.2 Budgeting and proposal development for the integration of ICT and digital into TVET

M7 INTERNATIONAL EXPERIENCES OF INTEGRATING ICT AND DIGITAL INTO TVET

Unit 7.1 Understanding of the potentials of ICT and digital support in TVET
Unit 7.2 Promising international cases of ICT and digital application in teaching and learning

TRAINING NEEDS ANALYSIS

This instructional material can be used for self-directed learning, online training or instructor-led face-to-face workshop training. If you are going to study this material by yourself please complete the Training Needs Analysis Scan. This will enable you to assess your own learning needs and assemble various segments of instruction into a learning package to assist you in meeting your learning needs.

We also encourage those who are participating in training programmes facilitated by an instructor to complete the Training Needs Analysis Scan. However, we recommend that you skip the part of the questionnaire on 'Decision'. Your instructor will help you interpret your ratings and advise you on a course of action.

Please use the following Training Needs Analysis Scan to assess your training needs.

Read each competency statement carefully. Rate each competency statement in terms of Degree of Importance and Skill Level as they relate to you, by circling the corresponding number.

Degree of Importance		Skill level	
5	Very high importance	5	Highly skilled
4	High importance	4	Very skilled
3	Important	3	Skilled
2	Low importance	2	Low skilled
1	Very low importance	1	Very low skilled
0	Not important at all	0	Not skilled at all

After completing the Training Needs Analysis, examine your paired responses for each competency statement – Degree of Importance and Skill Level. Use the following Decision Aid to assist you in selecting the appropriate units of instruction to meet your training needs.

Decision aid (for self-directed learners)

Degree of Importance based on self-rating	Skills level based on self-rating	Decision
0, 1, 2, 3, 4, 5	0, 1, 2, 3, 4, 5	Skip unit of instruction
3, 4, 5	0, 1, 2, 3, 4,	Study unit of instruction
1, 2	2, 3. 4	Skim through the material
1, 2	0, 1	Study unit of instruction
0	0, 1, 2, 3, 4, 5	Skip unit of instruction

TRAINING NEEDS ANALYSIS SCAN

M1 - TVET CHALLENGES AND ISSUES IN AFRICA

Unit 1.1 Current and emerging issues in TVET														
Importance							**Competencies**	**Skill Level**						**Decision**
0	1	2	3	4	5	1.1.1	Identify current and emerging issues in TVET	0	1	2	3	4	5	☐ Study ☐ Skim ☐ Skip

Unit 1.2 Challenges of TVET in Africa														
Importance							**Competencies**	**Skill Level**						**Decision**
0	1	2	3	4	5	1.2.1	Develop an understanding of the challenges of TVET in Africa	0	1	2	3	4	5	☐ Study ☐ Skim ☐ Skip

M2 - POTENTIAL USES OF ICTS AND DIGITAL IN TVET

Unit 2.1 Uses of ICTs and digital in TVET														
Importance							**Competencies**	**Skill Level**						**Decision**
0	1	2	3	4	5	2.1.1	Identify common uses of ICTs and digital in TVET	0	1	2	3	4	5	☐ Study ☐ Skim ☐ Skip

Unit 2.2 ICTs and digital for Programme Support														
Importance							**Competencies**	**Skill Level**						**Decision**
0	1	2	3	4	5	2.2.1	Identify different ways ICTs and digital can be used to support TVET programmes	0	1	2	3	4	5	☐ Study ☐ Skim ☐ Skip

Unit 2.3 Specialized use of ICTs and digital														
Importance							**Competencies**	**Skill Level**						**Decision**
0	1	2	3	4	5	2.3.1	Identify and develop an understanding of the specialized uses of ICTs and digital in TVET	0	1	2	3	4	5	☐ Study ☐ Skim ☐ Skip

M3 - EVALUATION OF READINESS AND LEVEL OF ICT AND DIGITAL INTEGRATION IN THE TVET EDUCATION SYSTEM

Unit 3.1 Dimensions for the evaluation of readiness and level of ICT and digital integration in the TVET education system														
Importance							**Competencies**	**Skill Level**						**Decision**
0	1	2	3	4	5	3.1.1	Identify dimensions for assessing ICT and digital integration readiness and level	0	1	2	3	4	5	☐ Study ☐ Skim ☐ Skip

Unit 3.2 Approaches and tools for assessing readiness and level ICT and digital integration														
Importance							**Competencies**	**Skill Level**						**Decision**
0	1	2	3	4	5	3.2.1	Identify approaches and tools for assessing readiness and level of ICT and digital integration in the TVET education system	0	1	2	3	4	5	☐ Study ☐ Skim ☐ Skip

M4 - PLANNING MODEL FOR INTEGRATING ICTS AND DIGITAL INTO TVET AT NATIONAL AND INSTITUTIONAL LEVELS

Unit 4.1 Planning Model for Integrating ICTs and digital into TVET														
Importance							**Competencies**	**Skill Level**						**Decision**
0	1	2	3	4	5	4.1.1	Develop a planning model for the integration of ICTs and digital into TVET	0	1	2	3	4	5	☐ Study ☐ Skim ☐ Skip

Unit 4.2 Policy Governing the Integration of ICTs and digital in TVET														
Importance							**Competencies**	**Skill Level**						**Decision**
0	1	2	3	4	5	4.2.1	Develop specific policies for the integration of ICTs and digital into TVET	0	1	2	3	4	5	☐ Study ☐ Skim ☐ Skip

Unit 4.3 Planning for the integration of ICTs and digital into TVET at national and institutional level														
Importance							**Competencies**	**Skill Level**						**Decision**
0	1	2	3	4	5	4.3.1	Integrate ICTs and digital into TVET at national and institutional level	0	1	2	3	4	5	☐ Study ☐ Skim ☐ Skip

M5 - AN ICT AND DIGITAL STRATEGY FOR TVET AT NATIONAL AND INSTITUTIONAL LEVELS

Unit 5.1 Mission and vision for strategic plan for ICT and digital integration into TVET at institutional level													
Importance							**Competencies**	**Skill Level**						**Decision**
0	1	2	3	4	5	5.1.1	Develop the institution's ICT AND DIGITAL vision for ICT AND DIGITAL-mediated teaching and learning	0	1	2	3	4	5	☐ Study ☐ Skim ☐ Skip
0	1	2	3	4	5	5.1.2	Develop the institution's ICT AND DIGITAL mission for ICT and digital-mediated teaching and learning	0	1	2	3	4	5	☐ Study ☐ Skim ☐ Skip

Unit 5.2 ICT and digital integration goals and strategic plan for TVET													
Importance							**Competencies**	**Skill Level**						**Decision**
0	1	2	3	4	5	5.2.1	Develop the institution's ICT and digital goals and strategy	0	1	2	3	4	5	☐ Study ☐ Skim ☐ Skip

Unit 5.3 Communicate the strategic plan for ICT and digital integration into TVET													
Importance							**Competencies**	**Skill Level**						**Decision**
0	1	2	3	4	5	5.3.1	Communicate the institution's ICT and digital vision, mission, goals and strategy	0	1	2	3	4	5	☐ Study ☐ Skim ☐ Skip

M6 - COSTING AND FINANCING ASPECTS

Unit 6.1 Cost analysis of the integration of ICT and digital into TVET													
Importance							**Competencies**	**Skill Level**						**Decision**
0	1	2	3	4	5	6.1.1	Develop awareness of the cost effectiveness of the integration of ICT and digital into TVET	0	1	2	3	4	5	☐ Study ☐ Skim ☐ Skip

Unit 6.2 Budgeting and proposal development for the integration of ICT and digital into TVET														
Importance							**Competencies**	**Skill Level**						**Decision**
0	1	2	3	4	5	6.2.1	Develop a budget for the integration of ICTs and digital into TVET	0	1	2	3	4	5	☐ Study ☐ Skim ☐ Skip
0	1	2	3	4	5	6.2.2	Identify funding sources to support the integration of ICTs and digital into TVET	0	1	2	3	4	5	☐ Study ☐ Skim ☐ Skip
0	1	2	3	4	5	6.2.3	Develop a funding proposal for the integration of ICTs and digital in TVET	0	1	2	3	4	5	☐ Study ☐ Skim ☐ Skip

M7 - INTERNATIONAL EXPERIENCES OF INTEGRATION OF ICTAND DIGITAL INTO TVET

Unit 7.1 Understanding the potentials of ICT and digital support in TVET														
Importance							**Competencies**	**Skill Level**						**Decision**
0	1	2	3	4	5	7.1.1	Develop an understanding of the potentials of ICT and digital support in TVET	0	1	2	3	4	5	☐ Study ☐ Skim ☐ Skip

Unit 7.2 Promising international cases of ICT and digital applications in teaching and learning														
Importance							**Competencies**	**Skill Level**						**Decision**
0	1	2	3	4	5	7.2.1	Familiarize learners with promising international cases of ICT and digital applications in teaching and learning	0	1	2	3	4	5	☐ Study ☐ Skim ☐ Skip

Module 1

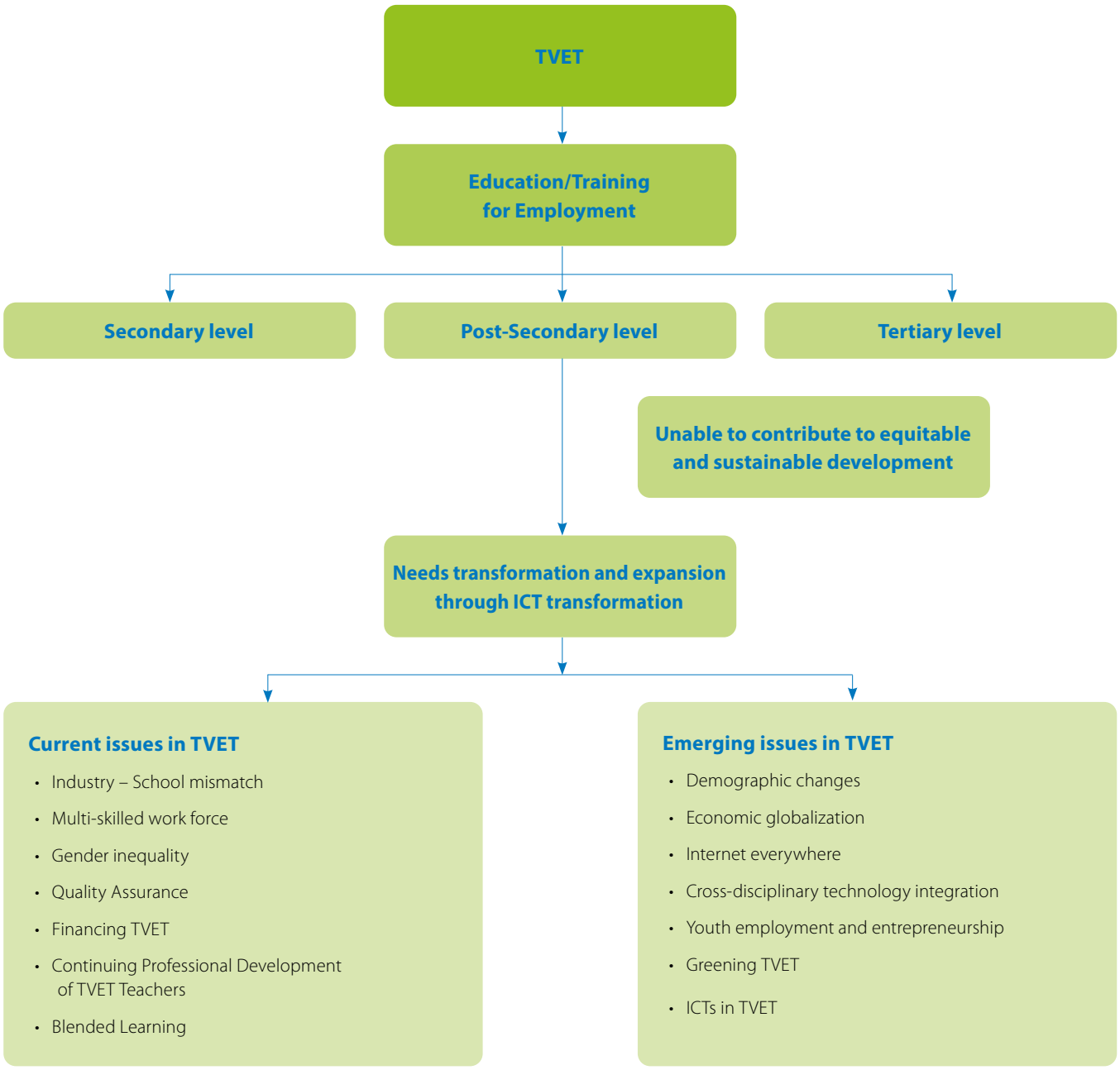
TVET ISSUES AND CHALLENGES IN AFRICA

Unit 1.1 Current and emerging issues in TVET

Objective 1.1.1

Identify current and emerging issues in TVET

What current and emerging issues are associated with TVET in your country?



Introduction

UNESCO defines Technical and Vocational Education and Training (TVET) as follows: Technical and vocational education and training is understood to be integral to education and lifelong learning and to refer to all forms of learning of knowledge, skills and attitudes relating to the world of work. TVET comprises education, training and skills development activities relating to occupational fields, production and livelihoods. Transversal skills, citizenship skills and skills that enable lifelong learning are integral components of TVET. TVET involves a wide variety of learning and skills development opportunities. It can take place at secondary, post-secondary and tertiary levels. TVET can include other programmes leading to vocational qualifications and other skills development opportunities attuned to national and local contexts. TVET also encompasses continuing training and professional development undertaken as part of in-service arrangements or individual and collective initiatives (UNESCO, 2015a, p. 2). TVET programmes and courses can be full-time or short and episodic. They can be provided by government, non-government, public, private, for-profit or not-for-profit organizations, employers, religious groups, donor organizations or other providers. They can be delivered through face-to-face, hands-on, computer-based, online or blended teaching and learning. The programmes and specific forms of provision depend upon the governing structures, constitutional provisions, economic and social needs, stakeholder interests and other prevailing circumstances in each particular country.

Marope, Chakroun and Holmes (2015) observe that TVET is steadily rising up the agenda in global debates about, and government priorities for, education and national development. It is also being debated in terms of the strategic and operational priorities of regional economic communities, but the sector's capacity to meet the demands being placed upon it is often limited. They suggest that simply scaling up TVET provision in its current form is not only unlikely to be feasible, but also unlikely to be an adequate response to meet demand, and that the nature and roles of TVET systems in contributing to more equitable and sustainable holistic development will require their continuous transformation and expansion. This book identifies the ways in which information and communication technology-based (ICT and digital-based) methodologies can contribute to such transformation and expansion. Some readers of this book may be familiar with the nature of TVET and how it works, but less knowledgeable about open, distance, online and blended learning. Others may be familiar with ICT and digital-based modes of delivery but less familiar with the needs and challenges facing the TVET sector.

The Demands

Calls for Transformation

As a leader in the global debate on TVET's role, UNESCO has argued for profound transformations in the conceptualization, governance, funding and organization of TVET. Such transformations would ensure the sector is capable of responding effectively to the many economic, equity and sustainable transformational challenges of the twenty-first-century world. At the first plenary of the Third International Congress on Technical and Vocational Education and Training, 'Transforming TVET: Building skills for work and life', held in Shanghai in May 2012, representatives from 107 countries examined the role of TVET in inclusive and sustainable development; in the second, they looked at how TVET needed to be transformed to achieve better work, life and lifelong learning opportunities. The resultant Shanghai Consensus made recommendations for actions to be taken by governments to enable TVET systems to respond to these challenges. One of the Congress's core recommendations, under the heading '1. Enhancing the relevance of TVET,' was to 'Promote the integration of ICTs and digital into TVET to reflect the transformations taking place in the workplace and in society at large' (UNESCO, 2012a, p. 6).

The more recent Qingdao Declaration (UNESCO, 2015b), the first global declaration on ICTs and digital in education, was released at the conclusion of the International Conference on ICT and digital and Post-2015 Education in Qingdao, China. This declaration, which was approved by participants (including education ministers and deputy ministers) from more than 90 countries, affirmed the delegates' collective understanding of how to unleash the full potential of ICTs and digital to achieve the educational targets for equity, access, quality and lifelong learning set by the Sustainable Development Goals (SDGs) for the next 15 years. In its preamble it states: 'To achieve the goal of inclusive and equitable quality education and lifelong learning by 2030, ICT and digital – including mobile learning – must be harnessed to strengthen education systems, knowledge dissemination, information access, quality and effective learning and more efficient service provision'. It encourages governments, industry partners and all other education stakeholders to join forces and share resources to create equitable, dynamic, accountable and sustainable learner-centred digital learning ecosystems. The declaration also recommends that UNESCO support international cooperation in this field by establishing a clearing house on good practices for, and lessons learned about, technology-supported innovations in education.

In another watershed event, in partnership with UNICEF, the World Bank, UNFPA, UNDP, UN Women and UNHCR, UNESCO organized the World Education Forum 2015 in Incheon, Republic of Korea, hosted by the Republic of Korea. More than 1,600 participants – including over 120 ministers, heads and members of delegations, heads of agencies and officials from multilateral and bilateral organizations, and representatives of civil society, the teaching profession, youth and the private sector – from 160 countries adopted the Incheon Declaration for Education 2030. This sets out a new vision for education for the next 15 years and a Framework for Action for achieving inclusive and equitable quality education and lifelong learning for all (World Education Forum, 2015).

The year 2015 marked the end of the Education for All (EFA) initiative .This global commitment to provide quality basic education for all children, young people and adults was launched at the World Conference on Education for All in 1990 by UNESCO, UNDP, UNICEF and the World Bank. The participants endorsed an 'expanded vision of learning' and pledged to universalize primary education and massively reduce illiteracy by the end of the decade. At the Millennium Summit in September 2000, the world's leaders committed their nations to the eight Millennium Development Goals (MDGs) for addressing extreme poverty in its many dimensions, and promoting gender equality, education and environmental sustainability by 2015. In 2015, the member countries of the United Nations then adopted the proposal for the pursuit of 17 Sustainable Development Goals aimed at ending poverty and hunger, improving health and education, making cities more sustainable, combating climate change and protecting oceans and forests. To reflect these new trends, issues and needs in education for development, UNESCO (2015c) revised the goals for TVET to read as follows:

- To empower individuals and promote employment, decent work and lifelong learning
- To promote inclusive and sustainable economic growth
- To promote social equity
- To promote environmental sustainability

UNESCO recommended that the States Members should, in accordance with their specific national conditions, governing structures and constitutional provisions, develop policies for transforming and expanding TVET to address the great diversity of learning and training needs. It made particular reference to the needs of out-of-school young people; low-skilled adults; the unemployed and vulnerable workers; disadvantaged and marginalized groups; rural, remote, nomadic and migrant communities; the stateless; the disabled and those affected by conflict or disaster.

The Needs of Young People

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The second UN Millennium Development Goal sought to ensure that, by 2015, children of both genders everywhere would be able to complete a full course of primary schooling. While this goal was not actually achieved, significant progress was made in this regard. In 1999, only 81 per cent of children in the developing world were attending primary school. Today, the figure is around 92 per cent. The growing success in achieving universal primary education has resulted in a surge in demand for post-secondary education, training or work. Between 2000 and 2013, the number of out-of-school children of lower secondary school age shrank from 97 million to 65 million. But progress in this area has been slowing since 2007. Secondary education is still reserved for a privileged fraction of the population in most countries. For example, in sub-Saharan Africa, less than half of secondary school-age children attend secondary school, leaving millions of young people without the academic and life skills they need. In developing countries , the youth unemployment rate exceeds 12 per cent, more than three times the adult unemployment rate. In the Middle East and North Africa, around one third of young people are unable to find work, and for young women in those areas, the unemployment rates are around 45 per cent (UNESCO-UNEVOC, 2014). This inevitably has a devastating effect on these young people's personal welfare and self-esteem. In addition, according to the International Labour Organization (ILO, 2014), more than half of the developing world's workers, or nearly 1.5 billion people, are trapped in a vicious circle of insecure, low-productivity and low-income occupations and limited ability to invest in their families' health and education. This dampens growth prospects not only for these people and their local economies, but also for the generations to come.

Needs in the Informal Sector

In some developing countries, where the informal sector provides over 70 per cent of non-agricultural employment, the best option for many of the uneducated, undereducated and even qualified unemployed young people may be to help them develop the knowledge and skills needed for self-employment or for establishing micro, small and household enterprises (Langer, 2013). As the Commonwealth of Learning (COL) (2014) observes, employment in the informal sector was once considered a temporary feature that would dissipate with economic development, but it is now being shown to be a permanent feature in much of the developing world. The informal sector encompasses all jobs that are not recognized as standard income sources, on which taxes are not paid and where people work without pay, for little pay or in exchange for something other than money. This sector involves more girls and women than boys and men. They are often forced into precarious and menial tasks, or self-employment where they earn less than men or even no pay at all, and they are often denied the protection of international labour standards and human rights (Chant and Pedwell, 2008). Skills development for the informal economy is therefore clearly important for achieving equity, sustainable socioeconomic development, social cohesion and peaceful societies. UNESCO-UNEVOC has

developed a skills development package entitled 'Learning and Working' to promote awareness and motivational campaigns to encourage marginalized groups in the least developed countries to enrol in TVET courses for self-employment to improve their economic situation. The skills development package comprises a set of short films and a series of documents that support the activities presented in the films, an Overview, a Campaign Flyer, Information for Stakeholders, a Facilitator Guide and an Activity Checklist. The package is not in itself a tool for skills development but is described instead as an 'eye-opener' and 'discussion starter', and it is anticipated that the targeted groups will be encouraged to engage in tasks similar to those shown in the films. However, as Walther (2011) observes, all of the proposals for building skills in the informal sector will require a paradigm shift in the design of the technical and vocational skills development, financing and certification systems.

Measures Needed

UNESCO (2015c) also recommends the following for the transformation of TVET:

- The encouragement, recognition and validation of informal and non-formal learning.
- The development of well-articulated outcomes-based qualifications, frameworks and systems.
- Policy or regulatory mechanisms that support horizontal and vertical progression and flexible learning pathways, modularization, recognition of prior learning and credit accumulation and transfer.
- The mutual recognition of qualifications at national, regional and international levels to support the mobility of learners and workers.
- The creation of policies and frameworks to ensure qualified and high-quality TVET staff.
- The creation of systems for evaluation and quality enhancement.
- Ensuring TVET is relevant to labour markets.
- Greater national and international collaboration and sharing of research findings, knowledge, experiences and promising practices.

In all of these areas, UNESCO sees scope for new technologies and alternative means of provision.

Current Issues In TVET

Industry-School Skills Mismatch:

There is increased cooperation between TVET authorities and those in industry to bridge the skills mismatch experienced by TVET graduates hoping to be employed in industry. This also suggests that a wider TVET curriculum should be designed with upgraded equipment and facilities, in conjunction with industry using ICTs and digital. UNESCO (2013) records three types of skills mismatches that prevent smooth school-to-work transitions: lack of relevant skills, lack of information about the labour market and lack of work experience. Young people often have difficulties finding jobs because they lack the skills that employers demand. It is observed that many young people leave school without practical skills. One recent university graduate from the Netherlands in a virtual interview (e-forum) by UNESCO in 2013 lamented that 'During my final year of studies… I realized that my fellow students and I had gained very few practical skills that would be of use to the world of work'. Furthermore, some students may realize they lack practical skills but may not really know how to go about gaining these skills (i.e., what exactly employers are looking for). Too little emphasis is placed on the importance of career guidance when preparing students and young people mentally for what comes after school. A final problem was lack of work experience. An unemployed university graduate from Kenya told the e-forum that although she has 'great potential and passion in [her] area of specialization…sadly employers look for work experience, which is sometimes so ambiguous, and you end up not even getting a chance to be interviewed'. She said that her university did not encourage students studying business and management to get jobs and work experience – and that, even on courses where work experience was mandatory, nobody checked whether these jobs were related to students' field of study. 'So you complete your studies and there is a big mismatch', she said.

Multi-skilled Workforce:

There is an increasing emphasis on providing the work experience required for upgrading skills, identifying existing qualifications and upgrading, the introduction of competency-based training and the promotion of retraining. Training content needs to be increasingly selected not only for its relevance to specific jobs but to the range of jobs, as well as for the transfer to jobs in related areas of business and industry. For example, in a manufacturing environment, multi-skilled workers may receive training in all aspects of building products, as well as the ability to perform quality inspections. Such adaptations allow a firm to move workers where they are needed as and when necessary. Companies cross-train employees to increase productivity and reduce labour costs (Kelchner, 2020)

Gender Equality:

The UNESCO Priority Gender Equality Action Plan for 2014–2021 (UNESCO, 2014) calls for accelerated gender mainstreaming in national education systems through the promotion of all forms of gender transformative education. The ILO (2010) stresses the need to bring the experience, knowledge and interests of both women and men to bear on the development agenda, to achieve fundamental changes in the existing power relations between women and men, to develop programmes that enable girls and women to enter occupations in which they are currently underrepresented and, in the developing countries, to combine training in literacy, income generation and health and nutrition. UNESCO Director-General Irina Bokova (Bokova, n.d.) observes that empowerment starts in the classroom.

Access to quality education opens up opportunities for girls and women to make their own informed choices about careers and become everything they may wish to become. It therefore follows that girls/women and boys/men should have equal access to and participation in TVET and that all courses, curricula, materials and work-based learning should avoid gender bias and stereotyping and help achieve gender equality.

Gender disparities are observed in certain TVET fields. In particular, girls and women tend to be underrepresented in fields that require science, technology, engineering and mathematics (STEM) skills and knowledge. Promotion of equal access by Girls and Women to Technical and Vocational Education is highly necessary to increase participation and transition to STEM-related careers. TVET systems are often gender-biased, affecting men's and women's access to specific learning programmes or occupations. In turn, such gender divisions contribute to the perpetuation of gender inequalities at work and in society at large. The UNESCO Institute for Statistics estimates the percentage of female students worldwide in vocational programmes to be 44 per cent (ILO, 2015).

Photo Credit: Shipyard worker
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Quality Assurance:

The quality of a TVET programme requires a set of specific characteristics through which mandatory standards set by TVET authorities, as well as stakeholder and labour market expectations, are met (Baryamureeba, 2014). TVET initiatives and activities should be monitored to ensure that they are relevant to the needs of the labour market. According to Baryamureeba (2014), to ensure quality in TVET, responsible national authorities should establish criteria and standards, subject to periodic review and evaluation, undertake benchmarking from other countries, applicable to all aspects of technical and vocational education, including:

1. All forms of recognition of achievement and consequent qualification
2. Staff qualifications
3. Ratios of teaching and training staff to learners
4. The quality of curricula and teaching materials
5. Safety precautions for all learning and training environments
6. Physical facilities, buildings, libraries, laboratories, workshop layouts, quality and type of equipment

Some of the questions that need to be answered to attain high-quality TVET include:

- Is the institution's programme up to date and relevant?
- Are the teachers and trainers passionate and competent in their fields?
- Are the facilities and premises suited for the purpose?
- Are the materials and technologies used of industry standard?
- Are the management processes of the institution effective?
- Does the institution have connections to real life and the world of work? (Baryamureeba, 2014).

Financing TVET:

Floating TVET programmes require a level of financing to ensure efficiency. TVET systems should therefore be financed from a range of different funding sources, including contributions from the different stakeholders that will benefit. Some governments have put in place financing incentives to encourage individuals and employers to engage in education and training, and co-financing.

Continuing Professional Development of TVET Teachers:
In the face of the changing roles of TVET, pedagogy and technical diversities, TVET teachers should be continuously kept abreast of these transformations to be relevant in a changing society. Educators are transformed from being imparters of knowledge to facilitators of learning and creative thinking.

Blended Learning:
This is the combination of face-to-face learning and computer-based or online learning in TVET delivery. ICT and digital in TVET demands a flexible and blended approach, recognizing the crucial role of teachers in its delivery.

Figure 1: Elements of Blended Learning

Emerging Issues In TVET

According to Ampuyas (2014), evolving trends in TVET include the following:

1. Demographic changes:

The TVET discipline has witnessed a decline in the student population recently. This projected decline will most likely affect demand for TVET teachers and trainers and for TVET facilities. Having fewer TVET graduates may also lead to labour market shortages for people with TVET qualifications. Ageing TVET practitioners who are not replaced is another demographic challenge. Increased migration from urban to rural societies affects the population of TVET practitioners, with some trades sometimes becoming extinct in some areas due to lack of personnel for continuity. This also leads to disparities between urban and rural areas. Similarly, rapid technological changes demand that workers continuously update their knowledge and skills, thereby reducing the personnel population in some trade areas. Increases in average lifespan and declining birth rates are creating ageing societies.

TVET is increasingly seen as a promising route for many young Africans who lack the foundational skills, means or interest to take a more academic track. However, the formal TVET system in most countries in the region remains small in terms of both enrolment and public expenditure. In 2017, on average 5.9 per cent of students in secondary education enrolled in vocational programmes – not a large change from 2010 when it was 6.5 per cent. These levels are below what would be expected, given countries' level of income and historical experience.

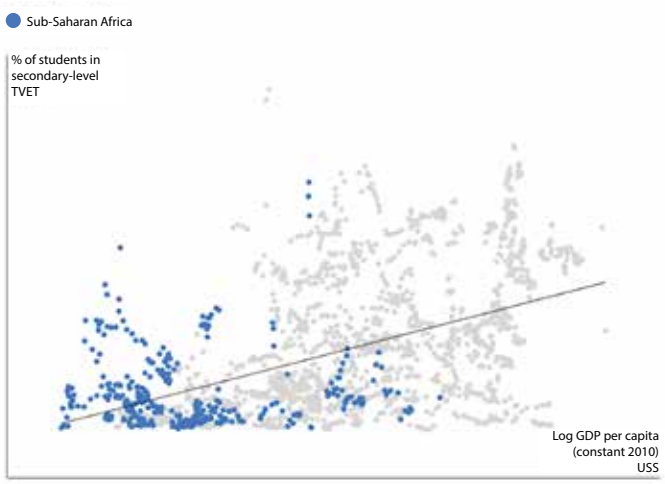
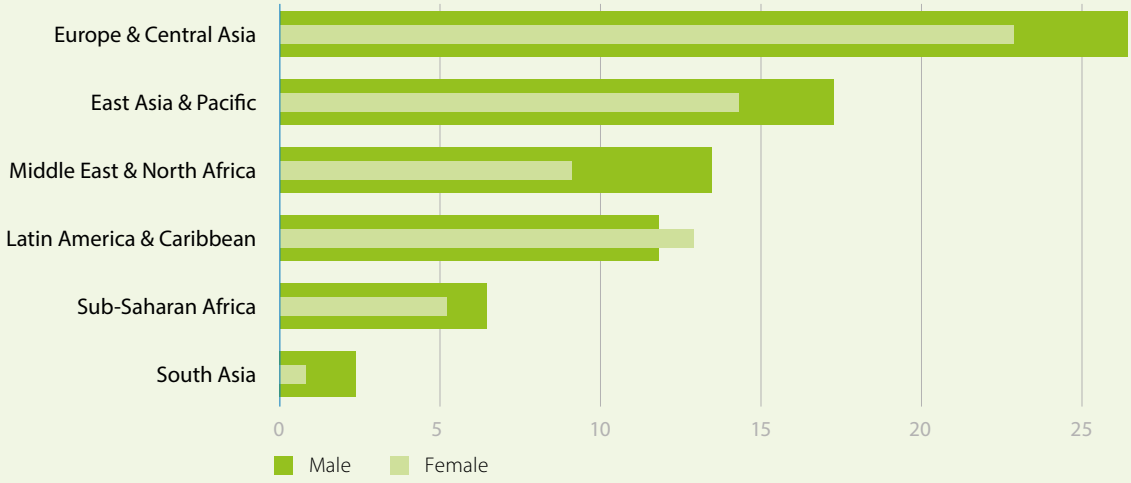


Figure 2: Correlation between TVET Enrolment at Secondary Level and GDP per capita over time across countries
Source: UNESCO Institute for Statistics

The region clearly lags behind others: the share of male and female students in secondary education enrolled in vocational programmes is 6.4 and 5.2 per cent respectively. In contrast, the share in Latin America is 12 per cent for young men and 13 per cent for young women, while in the Middle East and North Africa the rates are 14 and 9 per cent respectively.



2. Economic Globalization:

This is another trend in TVET, as the changing global value chain requires new thinking. The increasing interdependence of world economies as a result of the growing scale of the cross-border trade in commodities and services, the flow of international capital, and the wide and rapid spread of technologies, all influence TVET delivery (Shangquan 2000).

3. Internet Everywhere:

Virtual activities drive new business models and norms through the Ubiquitous Internet. The influence of the Internet's burgeoning development on the future global economy grows deeper every day. Because the Internet creates unlimited business opportunities, its assault on established legal, social and cultural norms will be even more marked than it has for the past 10 years. The explosive growth in the quality and quantity of information available, as well as information security, will become even more urgent issues that continuously shake up real-world behaviour patterns.

4. Cross-disciplinary technology integration:

Integration aims for innovations based on user needs, usually involving cross-disciplinary technology integration. Technologies that now satisfy user needs depend on the creation of major cross-disciplinary technology integrations that are increasingly strongly connected to social and human aspirations.

5. Youth Employment and Entrepreneurship:

Today, 73 million young people are unemployed worldwide, and three times as many are underemployed. Those working in the informal sector often face low wages, no benefits and a higher probability of being laid off. A further 621 million young people are said to be 'idle', not in education or training, and not looking for employment. Young people make up 17 per cent of the world's population and 40 per cent of the world's unemployed. Young people are the boon of any nation and any development policy that does not take into account their aspirations will invariably fail to achieve its desired objectives. According to Joseph Schumpeter (2008), entrepreneurship plays an important role in the capital and output growth of an economy and subsequent economic development. Entrepreneurship plays an important role in curbing youth unemployment. Entrepreneurship has the potential to create youth employment and integrate the young people into the economic mainstream while addressing some of the socio-psychological and delinquency problems that arise from joblessness (Chigunta, 2002; Curtain, 2001). Entrepreneurship education is defined as a collection of formalized teachings that informs, trains and educates anyone interested in participating in socioeconomic development through a project to promote entrepreneurship awareness, business creation or small business development. According to Chigunta (2002), effective youth entrepreneurship education prepares young people to be responsible, enterprising individuals who become entrepreneurs and contribute to sustainable economic development. Entrepreneurship education equips students with the additional knowledge, attributes and capabilities required to apply these abilities in the context of setting up a new venture or business.

6. Greening TVET:
TVET should provide an enabling environment for making transitions to a low-carbon economy and a climate-resilient society. Individuals should be trained with knowledge for applying energy efficiency measures, renewable energy technologies and upgraded skills for emergent energy markets. TVET should equally include elements of sustainability, especially in the way scarce training materials are conserved and waste materials are disposed, as influenced by global climate change. Sustainability approaches such as greening the campus, greening the curriculum and training, greening research, greening the community and workplace, and greening institutional culture are key elements.

7. ICTs and digital in TVET:
ICTs need to be harnessed to provide more widespread access to TVET. However, due to the impact of ICT on education, there are issues to investigate:

1 How will ICT developments impact our educational practice?

2 Will we experience a drastic change in teaching and learning strategies?

3 Will we adopt a new learning paradigm in the next decade or two? New developments in information technologies have opened up new prospects in teaching and learning. In addition, enhancing the capacity-building of TVET educators and administrators so as to make them aware of the potential of ICT in educating and training the learners of tomorrow. Educators must be transformed from those who impart knowledge to those who facilitate learning.

Conclusion/Summary

This unit discussed current and emerging issues in TVET. Current issues discussed included industry-school skills mismatches, a multi-skilled workforce, gender equality, quality assurance, financing TVET, continuing professional development of TVET teachers and Blended Learning. Emerging issues in TVET cut across demographic changes, economic globalization, Internet everywhere, cross-disciplinary technology integration, greening TVET and ICTs in TVET. Managing these issues in TVET in different countries and environments has given rise to various challenges in TVET delivery.

Transformative Reflection

Now that you have completed this segment, focus on the following transformative reflections:

1 Focus on your knowledge and experiences of issues surrounding TVET (including those not on the list).

2 Examine how these issues have been handled in your country in ways that either promote or impede TVET.

3 Consider what should or should not be done, in line with what you gained from this module, to address the issues examined.

Unit 1.1 Quiz

Self-assessment questions

Multiple choice Circle all the correct answers that apply for each question. There may be more than one correct answer.

1. TVET should be integral to education and:

A. Employment

B. Jobs

C. Lifelong Learning

D. Skills Development

2. Transformation and expansion in TVET can be achieved through:

A. Vocational qualification

B. ICT integration

C. Continuing Training

D. All of the above

3. An exception in TVET delivery groups is:

A. Out-of-School Young People

B. Vulnerable Workers

C. Marginalized groups

D. The Elderly

4. Low employability of TVET graduates is caused by:

A. Unpopular Training

B. Industry-School mismatch

C. Wrong qualifications

D. All of the above

5. The key factor influencing TVET delivery, and a result of the growing scale of cross-border commodities, is:

A. Internet Everywhere

B. Economic Globalization

C. Technology Integration

D. None of the above

6. Satisfying user needs depends on the creation of:

A. Emerging Technologies

B. Human needs integration

C. Human aspiration

D. Cross-disciplinary technologies

7. TVET labour market shortages can be caused by:

A. TVET institution demographic changes

B. Technological changes

C. Ageing societies

D. Reduced lifespan

8. Efficient TVET policies should consider:

A. The economy

B. The government

C. Young people

D. All of the above

9. Greening TVET considers:

A. Using Solar power

B. Environmental transitions

C. Enabling environment

D. Energy efficiency

10. Widespread access to TVET is enabled by:

A. Advertising

B. ICTs

C. Institutions

D. The informal sector

11. Financing TVET programmes should be carried out by:

A. The government

B. Industry

C. Stakeholders

D. All of the above

12. Effective TVET delivery will require:

A. E-learning

B. Mobile Learning

C. Web-based Learning

D. Blended Learning

13. The changing roles of TVET demands:

A. Continuing Professional Development

B. Continual technology testing

C. Continuing professional change

D. Continuing technology gain

14. Gender divisions in TVET programmes encourage:

A. Inequality

B. Bias

C. Bridging

D. Inelasticity

15. A multi-skilled workforce encourages the following:

A. Work flexibility

B. Reduced wages

C. Reduced work output

D. Skill diversity

16. Gender disparities are observed in the following TVET fields:

A. Science

B. Technology

C. Engineering

D. All of the above

17. Skills mismatches are of the following types:

A. Lack of flexibility

B. Lack of relevant skills

C. Lack of information about the labour market

D. Lack of work experience

18. A type of skill development package is:

A. Skills growth

B. Learning and working

C. Jack in the box

D. None of the above.

19. A skills development package can include the following:

A. A campaign flyer

B. A facilitation guide

C. A writing pad

D. An activity checklist

20. Current workplace transformations can be reflected through:

A. TVET upgrades

B. Integration of ICTs into TVET

C. UNESCO

D. UNEVOC

Practice Questions

1. Based on your reflections, write out the issues around TVET experienced in your country

2. Perform a SWOT analysis on each issue as regards efficient delivery of TVET

TVET CHALLENGES AND ISSUES IN AFRICA

Unit 1.2 Challenges of TVET in Africa

Objective 1.2.1

Develop an understanding of the challenges of TVET in Africa

What challenges are associated with TVET in your country?

Challenges of TVET delivery

Global Challenges

- The world of work in the 21st century
- Digitalization
- Access and Equity
- Gender discrimination and stereotyping
- The status and attractiveness of TVET
- Quality of TVET systems

Specific African Challenges

- TVET does not respond to the demands of the market and the needs of industry
- TVET does not promote the priorities of the government, especially its economic policy.
- Most developing countries place less value on TVET than university or college tertiary education.
- Resources for TVET are very limited
- Lack of transfer across streams in the education system.
- Poverty is still a deterrent.
- Low participation from other stakeholders.
- Lack of industry experience for many TVET teachers
- Lack of motivation for students to invest in TVET education
- Brain drain
- Staff training and retention
- ICT Integration into TVET Curriculum
- Apathy of policymakers/law-makers
- Value system
- Unacceptable infrastructure and training facilities

The Challenges

The proceedings of the 2012 Third International Congress on Technical and Vocational Education and Training on Transforming TVET held in Shanghai (UNESCO, 2012a) reveal the massive challenges faced by governments and other TVET stakeholders in the States Member in expanding access to and improving equity in TVET provision, and the status, relevance and quality of TVET provision. Each of these challenges has a bearing on the others and illustrates the need for profound transformations in policymaking, leadership, governance, resourcing and course and programme provision. The Congress concluded that if TVET is to expand the student demographic in line with national development goals, improve the effectiveness, efficiency, relevance and quality of its provision and address the transversal and longitudinal nature of the learners' needs, the sector needs to be both reactive (developing knowledge and skills relevant to the jobs that people currently hold or recently held) and proactive (initiating change based on anticipated work demands and lifelong possibilities). The Asian Development Bank (2009) states that in many countries, particularly those with rapidly evolving labour markets, TVET faces multiple challenges in its efforts to achieve these aims. Because the sector has strong links to both formal and non-formal labour markets, it is often the responsibility of several line ministries, and in many countries governments combine the roles of policymakers, regulators and training providers. As a consequence of poor coordination, capacity and funding, TVET in these countries often provides slow, inflexible and inadequate responses to the needs of the labour markets and employment expectation and performance gaps.

The World of Work in the Twenty-First Century

As UNESCO-UNEVOC and UNESCO-UIS (2006) point out, the principal original goal of TVET was to prepare participants directly for work. However, with globalization, the transition from the Industrial Age to the Knowledge Age and the revolutions and innovations in science and technology, there is now a need for new domains of knowledge and new disciplines in all levels of education and training. The distinctions between white-collar professional, managerial and administrative work; pink-collar jobs concerned with customer interaction, entertainment, sales or other service-oriented work; and traditionally blue-collar (or manual) jobs are blurring. Technology, outsourcing and globalization are downgrading the status and pay of some traditional white-collar jobs, while many blue-collar jobs now demand high levels of knowledge and problem-solving and technical skills. In addition, today's university and college graduates face a much more uncertain and fast-changing world of work. The Foundation for Young Australians (FYA) (2015) describes how the technologies that automated millions of routine transaction jobs, such as clerical work and production jobs and assembly-line work, are now rapidly encroaching on more complex routine and non-routine tasks. As a consequence, some 40 per cent of the current jobs in Australia are considered at high risk of automation over the next 10–15 years, and nearly 60 per cent of the present generation of students – and 70 per cent of TVET students – are being trained in occupations where the vast majority of jobs will be radically affected by automation within this time frame. The FYA sees a need for a national enterprise skills strategy to ensure that young Australians are prepared for the economy of the future and equipped with the tools to drive economic and social progress. It concludes that these students need to be helped to develop the flexible skill sets, enterprise skills and digital and financial literacy skills that will prepare them for the new job opportunities that will open up in the future in areas such as health care, elderly care and the digital and green economies. It also suggests that young people will need to learn through a mix of teaching and learning, experience, immersion and peer-to-peer learning to ensure that they thrive in this new work order.

Digitalization – the integration of digital technologies into every aspect of work and life – will create endless opportunities for reshaping and improving economies and societies. But in the US, the UK and other advanced economies, there are concerns that digitalization, combined with globalization and the offshoring of manufacturing, will lead to increased unemployment and growing income inequality. The Committee for Economic

Development of Australia (CEDA) is one of many organizations highlighting the need for more funding for, and cooperation in, preparing for the huge changes in the workforce that will be caused by computerization and automation. It predicts that as computing power continues to increase, it will not just be the low-paid, manual jobs that are at risk. In many jobs in the manufacturing and service industries that involve low levels of social interaction, creativity, mobility, dexterity, data gathering and analysis, more and more tasks will be automated (CEDA, 2015). In many OECD countries, investment is shifting markedly from tangible assets such as land, property and machinery to intangible assets such as computerized information and scientific and non-scientific research and development, etc. These are the key drivers of shareholder value in the knowledge economy. Turner (2014) points out that when General Motors was at its peak in the US, it employed over 800,000 people. Today, Microsoft, worth over US$340 billion, employs only 100,000 people; Apple, worth over US$741 billion, has 80,000 people on its payroll, while Google, valued at over US$367 billion, has 50,000. In October 2014, Facebook, with an equity value of US$170 billion and only 5,000 people on its payroll, acquired WhatsApp – a company that employed only 55 people – for US$19 billion. Renewable energy and other industries that do not yet exist will create new jobs, but in the world of work in the twenty-first century, employees will need to be capable of undertaking tasks that are less routine and involve complex problem-solving, teamwork and interpersonal negotiation skills. Who will be employable and who will be unemployable will very much depend on the capacity of TVET to help those entering the workforce and those already in the workforce to develop and continually upgrade their knowledge and skills to cope with such challenges. Micro, small and medium-sized enterprise changes in the business world are rewriting the expectations and required competencies of all managers and workers and necessitating continuing education and training for both these groups. However, while managers and the younger, better educated and more highly skilled employees in larger companies may have opportunities to participate in training and upgrade their knowledge, skills and qualifications, there are fewer such opportunities for those working in micro, small and medium enterprises (MSMEs). The OECD (2005) defines MSMEs as non-subsidiary, independent firms which employ fewer than a given number of employees. This number varies across countries. The most frequent upper limit designating a medium-sized enterprise is 250 employees. Small firms are generally those with fewer than 50 employees, while microenterprises may have fewer than five workers or simply be family concerns. Governments worldwide recognize the importance of MSMEs as drivers of growth, job creation and poverty alleviation, not only in the developed world but also in the micro and craft enterprises of developing countries. In most OECD countries, MSMEs account for over 95 per cent of all enterprises and provide 60–70 per cent of all jobs. The skills and commitment of those employed in this sector are significant factors in the success and survival of these small businesses, and yet they are far less likely to receive any training than workers in large firms, due to a reluctance or inability on the part of their employers to release them or pay for their training (OECD, 2013). Badawi (2013) observes that there is a great need for TVET to provide more informal, formal and work-based skills training for managers and workers in MSMEs and also to increase the self-reliance and income and purchasing power of those in rural areas by providing training for starting up new enterprises. Again, the scale and extent of the training needed to provide first-hand understanding of entrepreneurship, on how to start new businesses and avoid failure, how to scale up and add value to existing businesses, how to innovate and strike out in new directions and how to achieve thriving and sustainable enterprises are truly challenging.

Access and Equity

UNESCO-UNEVOC (1999, p. 3) pointed out that in addition to preparing people for the world of work, TVET is expected to be an instrument for social cohesion and integration. It stated that the States Members needed to make their TVET programmes comprehensive and inclusive by:

- Promoting special initiatives and efforts to ensure equal access for and participation by girls and women.
- Making programmes available to the unemployed and to marginalized and excluded groups.
- Promoting flexible access to lifelong learning and training, and enabling vocational guidance and counselling to reach all members of society.
- Introducing and applying ICTs and digital in teaching and learning.

The list of challenges for TVET in tackling social inequities and exclusion is seemingly endless. It is estimated that 76 per cent of the developing world's poor live in rural areas (Ravallion, Chen and Sangraula, 2007). Maclean and Wilson (2009) emphasize the need for TVET to educate the poor; under-served minorities; women and girls; and illiterate, semi-literate and innumerate learners in areas where traditional subsistence farming is declining or no longer sustainable, economic growth is slow or stagnant and unemployment levels are high. Heinemann (2011) identifies the need for more smallholder training to develop farming systems that are more productive, profitable, sustainable and responsive to issues of environmental management and climate change.

In 2013, UNESCO-UNEVOC organized a virtual forum aimed at collecting knowledge, experiences, innovative ideas and promising practices in TVET that aim specifically at tackling youth unemployment. The event attracted over 300 participants from 80 countries and established that in some countries there is an excess of skilled workers and a shortage of skilled jobs; in others, there are skills shortages in some sectors and high levels of unemployment in others; and in yet others, many young people (particularly rural young people and young women) lack the foundational, cognitive, non-cognitive and technical skills that employers demand. TVET is widely recognized as having a key role to play in tackling youth unemployment because of its orientation towards the world of work, and there is evidence to suggest that TVET yields higher returns than either general secondary or tertiary education because of its focus on developing work-relevant skills. However, the participants concluded that TVET institutions would need to undergo a major transformation to ensure that young people acquire the basic skills and relevant training they need to enter the world of work with confidence, and that far more evidence is needed to confirm the kinds of interventions and design and implement the specific youth-focused TVET programmes needed to get young people into the world of work (UNESCO-UNEVOC, 2013).

The training and retraining needs of middle-aged and older people also demand attention. Bloom, Canning and Fink (2011) predict that by 2050, more than 22 per cent of the world's population will be aged 60 or older, compared with 10 per cent in 2000. Karmel and Maclean (2007) suggest that the ageing of the world's population now sits alongside globalization, climate change and the knowledge revolution as a phenomenon that will affect the labour market and future training needs. For many people, living longer will mean working longer. Bloom et al. (2011) suggest that older workers are often regarded as a burden on society and that recruiters prefer younger candidates for jobs. Across the world, in virtually all industry sectors, bias in hiring or rehiring older workers and age discrimination in the workplace are endemic. Mature workers commonly complain that they are overlooked when applying for jobs, training or promotion and are pressured into taking redundancy packages or early retirement due to restructuring or other operational reasons. But in economies where knowledge rules, the experience of older workers will grow in value, so employers may want their older workers to stay on longer and share their expertise. Reallocating physically demanding tasks to younger workers, organizing flexible work schedules, providing

wellness programmes and offering ongoing training in new skills are all measures that could help retain the older segment of the workforce. However, re-skilling older workers in the ever-changing work environment presents some challenges. The older workers may have lower qualifications than the younger generation and lack confidence in their ability to change. They may need encouragement and special provision to entice them into further training.

In the face of shrinking wage employment opportunities in the formal sector, it is also inevitable that many older workers will face redundancy. Manual jobs have limited lifespans, and changes in skills requirements, economies and organizational finances and the introduction of new technology will lead to many people losing their jobs. These older workers may not have had to look for a job for some time, so they will need help in reviewing their abilities, motivations and job prospects; researching market opportunities; and retraining or considering self-employment. Ideally, all of such training should be provided while they are still in employment. The ageing factor will also impact the TVET workforce. Guthrie and Loveder (2007) report that in Europe, the Americas, Australasia and parts of East Asia, the sector is already experiencing a surge of senior and experienced managers and staff approaching retirement age. McGrath (2004) suggests that TVET systems are facing considerable demographic need to capture as much knowledge as possible from these personnel before they retire.

A number of impediments prevent more widespread TVET responses to training and retraining needs in developing countries. These include insufficient numbers of teachers, trainers and resources; low levels of schooling, literacy and numeracy in the communities; and uncertainty about the future of the agricultural and rural non-farming sectors. Bennell (2007) also attributes the under-provision of vocational and skills training for agriculture and rural development to an 'urban bias' (p. 4) in public and private TVET provision, and suggests that a multi-sector approach by a wide array of public and private organizations is needed. Economic, educational, employment and social inequality between rural and urban areas leads many to be attracted by the sometimes illusory allure of better opportunities in cities and larger towns. So great is the scale of rural to urban migration in developing countries, and so low are the educational and skills levels of the newcomers that authorities do not have sufficient resources to provide the jobs, training and social services needed, and so many of these new arrivals end up being unemployed or underemployed. Added to this phenomenon is the problem of peoples dislocated by conflict. While this is first and foremost a humanitarian catastrophe in many countries of the Middle East, Europe and beyond, the surge in asylum seekers raises questions about other countries' ability to integrate newcomers into the economy, which again has ramifications for TVET and its capacity to enable migrants to be educated, find jobs and achieve a more orderly and effective entry into cities and towns.

Other groups unable to access TVET appropriate to their development needs are those living in Small Island Developing States (SIDS). These remote, low-lying coastal countries have small but growing populations, limited resources and a narrow resource base; are excessively dependent on volatile export markets; have fragile environments and are vulnerable to natural disasters. In addition, they need special attention in terms of educational development for economic growth and job creation.

The human rights of ethnic, cultural, religious and linguistic minorities; domestic workers; people with HIV/AIDS and HIV/AIDS orphans are explicitly set out in the Universal Declaration of Human Rights, but these people are all too often denied opportunities for education. The right to education for all children, young people and adults with disabilities is also asserted. In developed countries, the deaf or hearing-impaired, the blind or vision-impaired and those who suffer from physical, psychiatric, neurological, learning or intellectual disabilities, chronic illnesses or serious medical conditions may be able to receive special individualized support for their schooling and training. But in the developing world, 98 per cent of children with physical or mental impairments are not enrolled in school,

and they consequently lack even the most basic literacy and numeracy skills and are prevented from participating in any form of skills training or employment programmes (Calderbank, 2009).

Prisoners, of whom there are currently over 10 million worldwide, are another group in need of education and training (Warmsley, 2013). The significance of this challenge has been acknowledged by the appointment of a UNESCO Chair in Applied Research for Education in Prisons whose role is 'to promote, stimulate and encourage applied research on various aspects of correctional education and to foster more in-depth consideration and concrete actions in this matter on an international level' (UNESCO-CEGEP, 2012, p. 5). Offenders are among the most poorly educated in society, and many hundreds of thousands are released from prison annually to face the daunting prospect of re-entering society and trying to find employment. A large proportion of ex-prisoners return to prison within a relatively short time, and the human and financial tolls of such recidivism are enormous. Research in the US, Canada and the UK shows that appropriately supported rehabilitation programmes for prisoners, including TVET, can save communities the costs associated with repeat criminal behaviour (Chavez and Dawe, 2007). Studies show that recidivism rates decrease when inmates or parolees are helped to envision a different future for themselves and receive education and training that helps them become productive members of society (Bloom, 2006). In the US, the Government Accountability Office (GAO) recommends that post-release education and training should begin as early as possible during prison terms, that offenders lacking secondary school qualifications should be helped to undertake further study and gain the knowledge and skills required to find a job, and that those who have attended secondary school but lack any qualifications should receive vocational training (James, 2014). In France, around one third of prisoners in 2012 were able to undertake some form of vocational training leading to a certificate that would enable them to embark on study towards a diploma. This resulted from collaboration between the Ministry of Justice and Ministry of Labour in accordance with the provisions of the 2009 Careers Guidance and Vocational Training Act, which grants those in prison the same access rights to education as the rest of the population (Samuel, 2016).

Gender Discrimination and Stereotyping

Gender discrimination and gender stereotyping are endemic in many institutions, and TVET is no exception. Science, technology, engineering and mathematics (STEM) courses in TVET tend to be associated with male students, and programmes such as dressmaking, hairdressing and cookery are deemed to be the preserve of female students. In Benin, for example, less academically able girls are derogatorily referred to as following the 'c' option (couture, coiffure and cuisine) (Konayuma, 2007). UNESCO (2014) calls for measures to be taken by States Members against gender-based discrimination, including encouraging their TVET institutions to change their admissions procedures, curricula, pedagogy, materials and work-based learning to ensure gender mainstreaming and gender equality.

Greening, Climate Change and Sustainability

The ILO (2011), Skoufias, Rabassa, Olivieri and Brahmbhatt (2011) and many others anticipate that climate change, the need to reduce carbon emissions and moves towards cleaner energy will affect jobs in all sectors in developing and developed countries alike. Kastrup and Winzier (2014) report on a UNESCO-UNEVOC virtual conference held in November 2013 that highlighted the importance of systematically integrating green competencies into TVET curricula, training regulations and training programmes in teacher training, in-company training, colleges, training centres and training for the informal sector. The participants concluded that it was important for learners not only to gain green qualifications that would meet future labour market needs but also to make green skills, attitudes and knowledge part of work and life, to ensure sustainable development and corporate social responsibility, improve the competitiveness of companies and increase employment rates. UNESCO (2015c) also sees it as incumbent upon TVET to foster a sense of environmental

responsibility, to promote critical understanding of the relationships between society and the environment, and to contribute to the development of the innovatory methods and technological solutions that are needed to address climate change and preserve environmental integrity.

Marope et al. (2015) examine the transformation of TVET through three overlapping 'analytical lenses': the economic growth lens, the social equity lens and the sustainability lens. They observe that it is now generally accepted that sustainability is an integral part of any meaningful notion of development and it therefore follows that well-functioning TVET systems have a crucial role to play in addressing the sustainability challenges identified at Rio+20 (see United Nations, 2012). These include creating clean and decent working conditions for all; producing clean and sustainable energy for all; ensuring that all people have access to the food, water and nutrition necessary for their health and well-being; managing sustainable cities and building clean transport systems; protecting the oceans and building resilience in the face of natural disasters. Marope et al. suggest that in most cases, TVET systems are failing to contribute to the enormous transformational challenges of sustainability. They argue that TVET systems need to anticipate the rise of new environmental products and services, including renewable energy and green technologies, and to train people for new green jobs and the greening of many existing jobs. They also see a need for TVET to heighten awareness among learners of their ethical responsibilities, to avoid exhausting natural resources and harming the environment through resource use, and to safeguard the environmental systems for future generations.

The Status and Attractiveness of TVET

The poor image of TVET relative to academic education is a matter of concern and, as confirmed by the UNESCO-UNEVOC TVET Strategy 2016¬¬–2021 virtual conference, the issue of its status and reputation needs attention, as does the economic case for TVET and its benefits for individuals, employers and the economy in general (Campbell, 2015).

The status of TVET varies across the globe. The European Union has identified TVET as an essential tool in its attempts to prepare young people for work in the modern economy and to ensure that Europe remains competitive and innovative in the face of increasing global competition and shifting demographics (European Commission, 2011), and TVET has always been considered a key component of the education systems of countries such as Germany, Austria and the Netherlands. However, in other European countries such as France, the UK, Italy and Spain, TVET was for a long time devalued in society, and participation rates vary considerably even today. Participation in TVET is 55 per cent in Austria and 45 per cent in Belgium, but still only between 20 per cent and 40 per cent in the majority of other EU countries. In Ireland it is only 17 per cent and in Portugal 12 per cent (Kirchberger, 2008). Hutton (2015) reports that in the UK colleges do their best but are beset by structural difficulties and starved of resources, and their professional standards are not high. He argues that the days of simply paying lip service to the importance of training need to end, and that there must be a well-understood, generously funded training ecosystem in which companies take responsibility for training and apprenticeships, where the government takes responsibility for ensuring proper funding by levying companies for training costs, where there is a codified system of vocational qualifications linked to both academic qualifications and on-the-job experience, and a training system organized on the basis of lifelong learning.

TVET has an image problem in Asia. Ratnata (2013) observes that parents in Indonesia, China, India, South Korea and Russia much prefer their sons and daughters to attend university than a TVET institution. In Pakistan, the Chair of the Centre for Labour Advocacy and Dialogue reports that:

> "Employability of those graduating from the TVET system [is] currently very low . . . due to the poor quality of instruction . . . and a lack of training that matches the employers' requirements. No wonder, TVET institutions remain unpopular among the youth. … It is … a stigmatized part of the education system".

(Ghayur, 2015, paras. 8-9)

Majumdar (2011) confirms that similar views are held in most of the Asia-Pacific countries due to poor quality teachers, outdated curricula, mismatches between graduates' skills and job requirements, weak policymaking and fragmentary TVET provision by governments and other providers, lack of quality assurance and the impact of various cultural, economic, social and political factors. The story is the same in Africa. The Minister of Education in Nigeria, a country with some of the worst global educational indicators, admits that:

> "One crucial challenge affecting TVET in Nigeria is low societal estimation of TVET. In view of the negative public perception of technical/vocational education, and the gross gender imbalance, there is constant need for creating public awareness, especially to attract women and girls".

(Oweh, 2012, para. 5)

Ghana is another country where the poor perception of TVET severely limits the numbers of young people attracted to vocational training, while also limiting funding for the sector and thus the quality of provision, all of which have serious consequences for the national economy (Bortei-Doku Aryeetey, Doh and Andoh, 2011).

Winch (2013) looks at the challenges of making TVET a more attractive option. He attributes the poor image and status of the sector to a number of social dynamics and attitudes. In developed and developing countries alike, parents strongly influence their children's career decisions by promoting the desirability of certain kinds of jobs, lifestyles and social roles. These influences are reinforced by schools adopting an academic ethos rather than a labour market orientation. The technically and vocationally oriented schools and colleges then come to be regarded as the low status preserve of the economically disadvantaged, offering low-quality courses, teaching, facilities and qualifications. Winch also shows that across the globe, poor training and supervision and a lack of connection between TVET training and job requirements result in high non-completion rates, student dissatisfaction with apprenticeships and traineeships and lack of demand from employers. He also observes that while trade unions generally show a strong commitment to TVET, where they operate informal apprenticeships, they may fear that formal TVET will undermine their ability to control entry into certain trades, and where trades that have traditionally relied on unskilled and unqualified labour are transitioning towards qualifications or upskilling, TVET may be seen as threatening the employment and conditions of their members.

Recommendations for improving the image, status and relevance of TVET have been made in a number of major international forums. The Shanghai Consensus (UNESCO, 2012a) concluded that profound transformations were needed to demonstrate the pivotal role of TVET in promoting economic prosperity and social cohesion. UNESCO (2012a) observed that TVET needed to focus not only on the basic entry-level and technical and vocational skills for specific occupations but also on developing the higher-order skills demanded by globalization, and generic attributes required for working and living in the twenty-first century: communication, problem-solving, teamwork, digital literacy, creativity, initiative, leadership, the ability to work independently and a willingness to engage in lifelong learning. UNESCO (2012b) also argued that the public profile of TVET needed to be strengthened by placing it firmly within the post-2015 global development agenda for ending poverty, transforming lives, protecting the planet, developing new modalities of delivery involving a broader partnership with multiple stakeholders, and ensuring multicultural and ethical dimensions for sustainable growth.

As the East Asia TVET Provider Network (2012) observes, there are many avenues for promoting the sector and its constituent parts: through the mass media, direct promotions, publications, business forums, conferences, public meetings, open days, case studies and research findings; profiling centres of excellence; best practice awards; and granting recognition of qualifications between providers. There is also enormous scope for international exchange on policies, instruments and approaches, both North-South and South-South.

Quality

Winch (2013) stressed that no amount of promotion or image-making can rescue TVET systems that are lacking in quality. In many cases, quality assurance (QA) has yet to be fully embraced by TVET. Much more needs to be done by the sector to provide incontrovertible evidence to potential students, parents, employers and the wider community that TVET courses and qualifications are of the highest possible standard.

In these days of borderless education, workforce mobility within regions and demand for mutual recognition of qualifications, it is important to adhere to some common or internationally agreed-upon quality framework. The EU has developed the Common Quality Assurance Framework (CQAF) to increase transparency and consistency in TVET provision between Member States. A set of coherent quality indicators including input, process, output and outcome measures enable TVET systems and institutions in the EU to improve, monitor and evaluate their QA policies and procedures. Other regions could similarly collaborate in developing principles, standards and quality indicators for States Members to assure the quality of their TVET systems and benchmark these indicators against those of other nations. National QA systems are also required along the lines of the Australian Vocational Education and Training (VET) Quality Framework to ensure consistency in the way nations' TVET providers are registered, operated and monitored.

Another way of assuring and demonstrating quality is to seek certification from the International Organization for Standardization (ISO).12 A number of TVET providers across the globe have sought and obtained ISO 9001:2008 certification. This certification confirms their ability to consistently provide products and services that meet customer requirements and applicable statutory and regulatory requirements and conform to international standards, and that their systems are subject to continuous improvement. The recently launched ISO 2100113 standard on Educational Organization Management Systems (EOMS) provides a common management tool for organizations providing educational products and services to meet learner and other customer requirements and needs. It is a stand-alone management system standard, based on ISO 9001 (without being a sector application), and is aligned with other ISO management system standards which focus on the specific interaction between an educational organization, the learner, customers and other relevant interested parties.

TVET systems and institutions also need to develop their own rigorous QA policies and practices. They need to embed continuous self-improvement in all of their operations; monitor and assure quality in their curricula, pedagogy, delivery and assessment methods and qualifications; and provide evidence of their relevance to employers' and societal needs. QA is a high-impact strategy for improving educational outcomes in TVET.

As DETYA (2001) advises, applying QA in TVET institutions not only provides for a nationally consistent vocational education training system and mutual recognition, but also improves the organizational health of the institutions, helps to recruit and retain well-qualified and well-experienced staff, and develops capabilities in leadership, management and innovation. The challenge for the sector is getting QA to be taken seriously, persuading managers and staff that it is not a time-wasting, bureaucratic and unnecessary adjunct to teaching but essential for assuring fitness of purpose, correcting faults and failures, ensuring that the reality matches the rhetoric and raising the status of the institutions and sector as a whole.

In spite of the contributions that Technical and Vocational Education and Training can make to developing the formal and informal economy, there are still drawbacks in the implementation of TVET in many institutions in Africa (Kemevor and Kassah, 2015).

Some of the challenges facing technical and vocational education are:

1 TVET does not respond to the demands of the market and the needs of industry. Many of those leading the TVET system look at industry not as partners but as sources of funds. They have no desire to develop partnerships with industry beyond funding. This usually brings about skills mismatches as regards TVET graduates and the industries that employ them.

2 TVET does not promote the priorities of the government, particularly its economic policy. Having been part of education for a long time, TVET still sees itself as part of social policy rather than economic policy, so that TVET managers are not even aware of the country's economic priorities.

3 Most developing countries place less value on TVET than university or college tertiary education. Parents and the community as a whole look down on TVET, with the result that bright students often veer away from this and TVET becomes the dumping ground for those whose academic capacity is not up to the requirements of higher learning. Students in secondary schools are usually divided into the science group and the TVET group based on average academic performance and interests of the students. Very few students opt for TVET, especially among the female enrollees. TVET attracts two or three girls in a school year. This really affects the flow of bright technicians to industry.

4 Resources for TVET are very limited. Equipment from previous investments is left idle, due to expensive trading supplies, no capacity to repair the imported equipment, and few people knowing how to use it. Some of this equipment has already become relics of previous industrial requirements. There has not been much contribution from the private sector to support TVET. The private sector would rather spend money on training their own workforce than ask TVET institutions to do so, because of the poor quality of the course offerings.

5 Lack of transfer across streams in the education system. There is little support for enforcing the idea of enabling students to move from one stream to another with ease, so that they can see a better career path whichever entry route they take. Each part of the education budget safeguards its own offering with very little regard for students' needs or demands. There is not much sharing among institutions or private sector training.

6 Poverty is still a deterrent. Many students leave school after primary or elementary school, or even secondary school, because they are expected to work and help with the family's subsistence. There is no money to support their education unless a friend or relative finds a scholarship for them.

7 Low participation from other stakeholders. This largely results from the relevance of TVET programmes and the lack of skills of TVET graduates in industry. If industry is strongly involved in TVET, the chances are that its graduates can easily find employment. UNEVOC centres from Arab States displayed lower values in continuing education and community service because of difficulties in creating links with communities. The most active categories of community engagement stakeholders were identified as being students, teachers and staff and government. The key factors playing a role in the success or failure of community engagement were institutional factors, political factors and politics, and the contribution of individuals. The main benefits of community engagement were identified as helping to make institutions' education training programmes relevant for students and contributing to the development of communities.

8 Lack of industry experience for many TVET teachers. TVET institutions cannot really hire trainers from industry, because

their fees are much higher. TVET institutions often have to hire fresh graduates from teacher training institutions. Graduates from this type of training institution are sent to technical colleges each year regardless of the schools' needs. These new teachers have few technical skills. The study by Ismail, Nopiah and Sattar (2018) explored the challenges that are faced by vocational teachers (who are assigned to teach skills courses) at public skills training institutions in Malaysia. Among the core challenges faced by vocational teachers identified in the study are lack of interest and motivation in teaching assigned skills subjects, and lack of skills qualifications and industry experience (which are necessary as vocational teachers).

9 Lack of motivation for students to invest in TVET education. Completing TVET in many countries will not land students high-paying jobs. However, TVET institutions offering courses relevant to the needs of the labour market easily attract students that work to support themselves in these courses. Students invest their skills, energy and time on courses that meet their needs, especially financial needs. Alsaaideh's (2016) work showed that the highest contributing factors to students' motivation in TVET education were vocational factors, where the most important factor is the nature of the jobs they were to take up. The second most important were personal factors, primarily the discrepancy between students' academic ambitions and the nature of vocational work. The third most important were social factors, primarily the influence of peers and their academic orientations. The fourth most important were economic factors, with the fluctuating nature of the income for the prospective careers of those who join Vocational Education having the highest influence.

10 Brain Drain. This refers to the movement of technical teachers and lecturers away from technical education, despite them being very much needed for the socioeconomic and technological development of African nations, to another university or to other professions they feel will offer better employment conditions. According to Bassi (2004), about 45% of all Nigerian professionals, including technical educators, have left the country over the years. Between 1997 and 2007 alone, Nigeria lost over 10,000 middle and higher-level managers to western economies. About 500 lecturers from Nigerian tertiary institutions have continued to migrate each year, particularly to Europe, America and other African countries.

11 Staff Training and Retention. Training academic staff is a continuous exercise to ensure consistent improvement in the quality of their output. Training can take place either locally or overseas. Local training within the country is usually cheaper than overseas training but more strenuous because of inadequate facilities, literature and distractions arising from the need to meet essential demands. Overseas training requires a lot of foreign exchange, but the enabling environment exists to achieve success in record time. However, over time, it has been difficult to get the trainees to return to their respective countries after the completing their studies.

12 ICT and digital Integration into the TVET Curriculum. The curriculum of a subject with practical content is generally organized into an average of 67% for theoretical classes and 33% for workshops. The issues surrounding the design of an appropriate curriculum for technical education include preparing students for the shift away from conventional methods to Information Communication and Technology (ICT and digital) paradigms in technology practice. Ojimba (2012) identified six challenging issues associated with the current curricula in Nigeria:

- The curricula are based on foreign models which have evolved under ideal conditions (staff, equipment, infrastructure, training opportunities, etc.) that are not easily duplicated in developing countries.
- There is a basic lack of textbooks in the area, and most of the available textbooks have foreign backgrounds and are often illustrated with examples from outside the local environment.
- There is usually a shortage of highly competent indigenous teaching and support staff with sufficient practical experience of technology.
- The curricula are judged to be too academic and overloaded with intellectual content in pure science and mathematics, at the expense of basic engineering and technology.

- Inadequate provision of humanities, social science, business management concepts and entrepreneurial skills development. Because of students' inadequate preparation for industry, some employers retain graduates to make them productive in their organizations.
- The teaching approach follows the conventional method of knowledge transfer, involving the lecturer reading aloud to the students, who then take notes. The educational system continues to place considerable value on this method of teaching.

13 Apathy of Policymakers/Law-makers. Education generally encompassing technical and vocational education programmes has been grossly neglected in Africa. Technical educators have the greatest challenge of convincing law-makers of why they should give priority attention to the programme in their resource allocation. Many options for obtaining positive results have been advocated in different forums, namely lobbying, participation by technical educators in governance, wooing, etc., yet the government is still adopting a lopsided attitude to the proper development of the TVET programme (Okoye and Arimonu, 2016).

14 Value System. In some African countries, much emphasis is placed on university qualifications, without consideration of whether the holder possesses the required knowledge and skills. But in advanced societies, those with technical degrees are highly regarded. In fact, the value system in those countries depends on the person's skills and knowledge, and not on the stack of academic degrees they have. In the public service, technical education graduates are often discriminated against and their career prospects limited (Okoye and Arimonu, 2016).

15 Deplorable infrastructure and training facilities. The deplorable state of training facilities in TVET institutions results in outdated training content. The quantity and quality of the stock of trained national workforce have consequently been affected. Generally speaking, there is always a short supply of training materials and basic tools by stakeholders. Since technical institutes mostly rely on materials and tools for training, their short supply would negatively affect practical skills acquisition (Kemevor and Kassah, 2015).

Other challenges identified by the study by Kemevor and Kassah (2015) include:

- inadequate financing
- uncoordinated, unregulated and fragmented TVET delivery systems
- low quality gender and economic inequities
- weak monitoring and evaluation mechanisms
- poor management and ill-adapted organizational structures

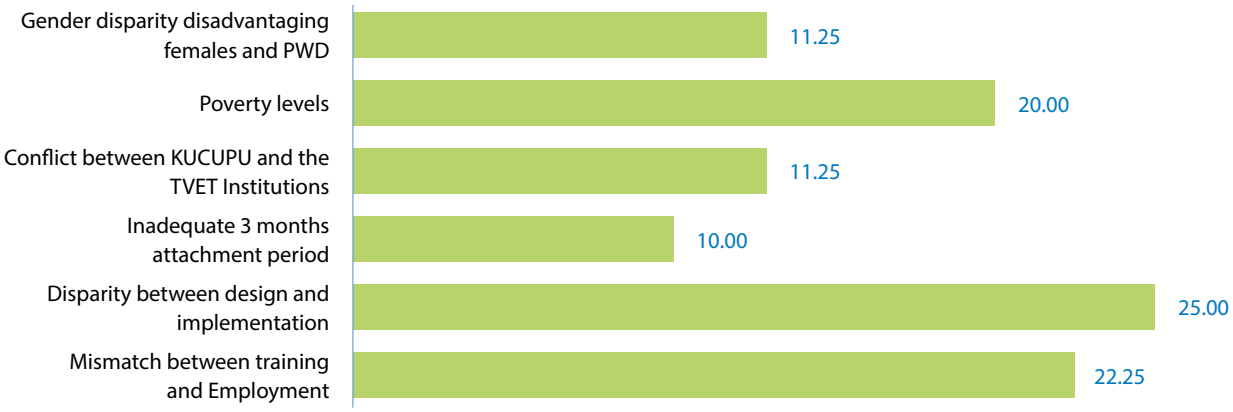


Figure 4: Bar chart of Challenges and Bottlenecks in TVET Training (A case study of TVET Training in Kenya).

Conclusion/Summary

This Unit considered the global challenges of TVET, including the world of work in the twenty-first century, digitalization, access and equity, gender discrimination and stereotyping, the status and attractiveness of TVET, and quality of TVET systems. Furthermore, the Unit discussed specific challenges facing TVET delivery in Africa, including responding to the demands of the market, promoting government priorities, the lesser value placed on TVET, limited TVET resources, poverty, low participation of stakeholders, inadequate industry experience of TVET teachers, deplorable infrastructure and training facilities, among others. However, the potential uses of ICT and digital in TVET can address some of these challenges.

Transformative Reflection

Having completed this section, consider the following transformative reflections:

1 Focus on your assumptions that underlie your beliefs, feelings and actions regarding the different challenges facing TVET in your institution or country.

2 Reflect on the consequences of these challenges on TVET delivery.

3 Consider what you have learned in this module and how it has helped you understand the challenges better, and what should have been done to avert the obstacles.

4 Consider other challenges not discussed that you can point out.

Unit 1.2 Quiz

Self-assessment questions

Multiple choice Circle all the correct answers that apply for each question. There may be more than one correct answer.

1. Challenges of TVET delivery specific to Africa include the following

A. Lesser value placed on TVET

B. Limitless resources

C. Stakeholders' low participation

D. Poverty

2. One global challenge of TVET delivery is:

A. Access and equity

B. Limited resources

C. Quality of TVET systems

D. Professional training

3. The challenges faced by TVET indicate the need for transformations in:

A. Practice

B. Theory

C. Policy

D. Training

4. For TVET to expand students' demography in line with national development goals, the sector needs to be:

A. Quick and eager

B. Reactive and proactive

C. Strong and evolving

D. All these answers are correct

5. Economies and societies can be improved and reshaped through:

A. Transformations

B. Trainings

C. Policies

D. Digitalization

6. A key driver of shareholder value in the knowledge economy is:

A. Intangible assets

B. Tangible assets

C. Social mobility

D. None of the above

7. TVET programmes should be comprehensive and:

A. Inclusive

B. Accessible

C. National

D. All these answers are correct

8. Among the groups that are unable to access TVET are:

A. Foreign states

B. Developing states

C. Small island developing states

D. All these answers are correct

9. A major challenge facing TVET in Africa is:

A. Poor quality of instruction

B. Training mismatches

C. Low income generation

D. Low societal estimation

10. A high-impact strategy for improving educational outcomes in TVET is:

A. Quality Assurance

B. Qualifications

C. Training

D. Certification

11. In some African countries, much emphasis is placed on:

A. University education

B. Certification

C. Entrepreneurship

D. Pink-collar jobs

12. Unacceptable training facilities in TVET institutions result in outdated:

A. Certification

B. Training

C. Qualification

D. Enterprise

13. To ensure consistent improvement in product quality:

A. Continuous product training is needed

B. Continuous staff training is needed

C. Continuous manager training is needed

D. None of the above

14. The movement of TVET teachers needed for socioeconomic and technological development away from one profession to another for better employment conditions is called:

A. Migration

B. Immigration

C. Brain Drain

D. Exodus

15. Young people shy away from TVET due to not having:

A. Jobs

B. Certificates

C. Respect

D. High-paying jobs

16. Strong influences on young peoples' choice of career come from the following:

A. Parents

B. Peers

C. Social media

D. Governors

17. Correcting wrong views about TVET can be achieved through:

A. Meetings

B. Public awareness

C. Fights

D. Visions

18. TVET training system is organized on the basis of:

A. General learning

B. Lifelong learning

C. Specific learning

D. None of the above

19. Gender divisions in TVET programmes encourage:

E. Inequality

F. Bias

G. Bridging

H. Inelasticity

20. A multi-skilled workforce encourages the following:

E. Work flexibility

F. Reduced wages

G. Reduced work output

H. Skill diversity

Practice Questions

1. Based on your reflections, write out five challenges of ICT and digital use in TVET delivery.

2. Write a way forward list for each challenge for TVET administrators in your institution or country.

References

Allen, K. (2013, 20 November). Half of recent UK graduates stuck in non-graduate jobs, says ONS. The Guardian. Retrieved 22 May 2016 from www. theguardian.com/business/2013/nov/19/half-recent-uk-graduates-stuckjobs-ons

Asian Development Bank. (2009). Good practice in technical and vocational education and training. Mandaluyong City, Philippines: Author. Retrieved 22 May 2016 from www.adb.org/sites/default/files/publication/28624/goodpractice-education-training.pdf

Badawi, A. A. (2013). TVET and entrepreneurship skills. In UNESCO-UNEVOC, Revisiting global trends in TVET: Reflections on theory and practice (pp. 275- 308). Bonn: UNESCO-UNEVOC International Centre for Technical and Vocational Education and Training. Retrieved 22 May 2016 from www. unevoc.unesco.org/fileadmin/up/2013_epub_revisiting_global_trends_in_ tvet_chapter8.pdf

Ball, C. (2013, 4 June). Most people in the UK do not go to university — and maybe never will. Higher Education Network, The Guardian [Web log post]. Retrieved 22 May 2016 from www.theguardian.com/higher-educationnetwork/blog/2013/jun/04/higher-education-participation-data-analysis

Baryamureeba , V. (2014). Role of TVET in Building Regional Economies. A keynote Address at the Commonwealth Association of Polytechnics in Africa (CAPA) Conference on "Competency Based Education and Green Skills for Work and Life in Post 2015 Africa. Available at https://web.facebook.com/notes/prof-venansius-baryamureeba-phd/role-of-tvet-in-building-regional-economies/812966742083533/?_rdc=1&_rdr

Bassi, S.Y. (2004); "The Role of the Directorate of Technical Cooperation in Africa (DCTA) in Technology Transfer and Acquisition in Countries" Proceeding 2nd African Regional Conference On Engineering Education; University Of Lagos, 20th-22nd September, Pp 35 -42.

Bennell, P. (2007). Promoting livelihood opportunities for rural youth. Rome: International Fund for Agricultural Development (IFAD). Retrieved 22 May 2016 from www.ifad.org/events/gc/30/roundtable/youth/benell.pdf

Bloom, D. (2006, May). Employment-focused programs for ex-prisoners: What have we learned, what are we learning, and where should we go from here? New York, NY: mdrc. This paper was prepared as background for the meeting "Research on prisoner reentry: What do we know and what do we want to know?" sponsored by the National Poverty Center, Gerald R. Ford School of Public Policy, University of Michigan. Retrieved 22 May 2016 from http://files.eric.ed.gov/fulltext/ED493008.pdf

Bloom, D. E., Canning, D., & Fink, G. (2011, January) Implications of population aging for economic growth. Program on the Global Demography of Aging (Working Paper 64). Retrieved 22 May 2016 from www.hsph.harvard.edu/program-on-the-global-demography-of-aging/WorkingPapers/2011/ PGDA_WP_64.pdf

Bokova, I. (n.d.). Girls' and women's empowerment. Retrieved 22 May 2016 from www.unesco.org/new/en/unesco/about-us/who-we-are/director-general/ my-priorities/girls-and-womens-empowerment

Bortei-Doku Aryeetey, E., Doh, D., & Andoh, P. (2011). From prejudice to prestige: Vocational education and training in Ghana. Accra: Centre for Social Policy Studies, University of Ghana, on behalf of City & Guilds Centre for Skills Development, and the Council for Technical and Vocational Education and Training, Ghana. Retrieved 28 August 2016 from www.unevoc.unesco. org/go.php?q=UNEVOC+Publications&lang=en&akt=id&st=&qs=5866& unevoc=0 21

Calderbank, D. (2009). Towards inclusive education for children with disabilities: A guideline. Bangkok: UNESCO Bangkok. Retrieved 22 May 2016 from www.uis.unesco.org/Library/Documents/disabchild09-en.pdf

Campbell, M. (2015). UNESCO TVET 2016-2012 Strategy. Report of the UNESCOUNEVOC virtual conference 28 September to 03 October 2015. Bonn: UNESCO-UNEVOC. Retrieved 22 May 2016 from www.unevoc.unesco.org/ up/2015eForum_UNESCO_TVET_Strategy.pdf

CEDA. (2015, June). Australia's future workforce? Melbourne, VIC: Author. Retrieved 22 May 2016 from http://adminpanel.ceda.com.au/FOLDERS/Service/Files/Documents/26792~Futureworkforce_June2015.pdf

Chant, S., & Pedwell, C. (2008). Women, gender and the informal economy: An assessment of ILO research and suggested ways forward (Discussion paper). Geneva: International Labour Organization. Retrieved 22 May 2016 from www.cpahq.org/cpahq/cpadocs/wcms091228.pdf

Chavez, R., & Dawe, S. (2007). International research and trends in education and training provision in correctional settings. In S. Dawe (Ed.), Vocational education and training for adult prisoners and offenders in Australia: Research readings. Adelaide, SA: National Centre for Vocational Education Research. Retrieved 22 May 2016 from http://hdl.voced.edu.au/10707/96504

Chigunta, F. (2002). Youth entrepreneurship: Meeting the key challenges. England: Wolfson College, Oxford University.

College America. (2011, 19 October). Who in the world holds a college degree? [Web log post]. Retrieved 22 May 2016 from www.collegeamerica.edu/ blog/who-in-the-world-holds-a-college-degree

Commonwealth of Learning. (2014). Commonwealth of Learning Strategic Plan, 2015–2021: Learning for sustainable development. Vancouver: Author. Retrieved 22 May 2016 from http://oasis.col.org/bitstream/ handle/11599/826/COL%20SYP__96%20dpi_FINAL%20WEB%20 single%20pages.pdf?sequence=5&isAllowed=y

Curtain, R. (2001). "Youth employment and entrepreneurship: A policy perspective." Development Bulletin, 55 (August 2001): 7-11.

DETYA. (2001). Quality assurance guide for assessment. Melbourne: Australian Training Products Ltd (ATP). Retrieved 22 May 2016 from www.det.act.gov. au/__data/assets/pdf_file/0004/456376/Guide-10.pdf

Dyankov , A. (1996) Current Issues and Trends in Technical and Vocational Education. Available at file:///C:/Users/840/Downloads/Current_Issues_and_Trends_in_Technical_a.pdf

East Asia TVET Provider Network. (2012). Operational plan version #7 (Draft report following November 2012 workshop). Sejong-si, Korea: Korea Research Institute for Vocational Education and Training (KRIVET). Retrieved 22 May 2016 from www.tda.edu.au/cb_pages/files/130405_East%20 Asia%20TVET%20 Network%20Operational%20Plan_V7.pdf

Enu-Kwesi, J. and Akanganngang J. A. (2012). Youth Employment znd Entrepreneurial Skills Development in The Ajumakoenyan-Essiam District Of Ghana

Ghana Journal of Development Studies, 9(1), 74- 87.

European Commission. (2011). Attitudes towards vocational education and training: Summary. Brussels: Author. Retrieved 22 May 2016 from http://ec.europa. eu/public_opinion/archives/ebs/ebs_369_sum_en.pdf

Foundation for Young Australians. (2015). The new work order: Ensuring young Australians have skills and experience for the future, not the past. Melbourne, VIC: Author. Retrieved 02 September 2015 from www.fya.org. au/2015/08/23/the-new-work-order-report/#action

References

Ghayur, S. (2015, 4 January). Labour: Productivity and employability. The News Weekly Magazines. Retrieved 22 May 2016 from http://e.thenews.com.pk/ newsmag/mag/detail_article.asp?id=4596 22

Gilmore, H., & Knott, M. (2014, 4 August). Business head calls for fewer uni students. The Sydney Morning Herald. Retrieved 22 May 2016 from www. smh.com.au/federal-politics/political-news/business-head-calls-for-feweruni-students-20140803-zzx27.html

Guthrie, H., & Loveder, P. (2007). The ageing TVET workforce in Australia: Issues and challenges. In T. Karmel & R. Maclean (Eds), Technical and vocational education and training in an ageing society: Experts meeting proceedings (pp. 121-130). Adelaide, SA: National Centre for Vocational Education Research (NCVER).

Heinemann, E., (2011). TVET, Agricultural development and rural poverty reduction. NORRAG NEWS (46), Towards a new global world of skills development? TVET's turn to make its mark, 61-64. Retrieved 22 May 2016 from www.norrag.org/en/publications/norrag-news/online-version/ towards-a-new-global-world-of-skills-development-tvets-turn-to-make-itsmark/detail/tvet-agricultural-development-and-rural-poverty-reduction. html

Hutton, W. (2015). How good we can be: Ending the mercenary society and building a great country. London: Little, Brown Book Group.

ILO. (2010). Gender mainstreaming in local economic development strategies: A guide. Geneva: Author. Retrieved 22 May 2016 from www.ilo.org/wcmsp5/ groups/public/@ed_emp/@emp_ent/@led/ documents/publication/ wcms_141223.pdf

ILO. (2011). A skilled workforce for strong, sustainable and balanced growth: A G20 training strategy. Geneva: Author. Retrieved 22 May 2016 from http:// ilo.org/wcmsp5/groups/public/---dgreports/---integration/documents/ publication/wcms_151966.pdf

ILO. (2014). World of work report 2014: Developing with jobs. Geneva: International Labour Organization Research Department. Retrieved 22 May 2016 from www.ilo.org/wcmsp5/groups/public/---dgreports/---dcomm/documents/ publication/wcms_243961.pdf

Ismail, K., Nopiah, M. and Sattar, M. (2018). Challenges faced by vocational teachers in public skills training institutions: a reality in Malaysia. Journal of Technical Education and Training, 10(2), 13-27. 10.30880/jtet.2018.10.02.002

James, N. (2014). Offender reentry: Correctional statistics, reintegration into the community, and recidivism. Washington, DC: Congressional Research Service. Retrieved 22 May 2016 from https://fas.org/sgp/crs/misc/RL34287. pdf

Karmel, T., & Maclean, R. (2007). Technical and vocational education and training in an ageing society: Experts meeting proceedings. Adelaide, SA: National Centre for Vocational Education Research (NCVER).

Kastrup, J., & Winzier, D. (2014). Greening TVET: Qualifications needs and implementation strategies. Report of the UNESCO-UNEVOC virtual conference, 12 to 26 November 2013. Bonn: UNESCO-UNEVOC International Centre for Technical and Vocational Education and Training. Retrieved 22 May 2016 from www.unevoc.unesco.org/fileadmin/ up/greening_tvet_e-forum_report_2013.pdf

Kelchner, L. (2020). Advantages of Multi-Skilled Labor. https://smallbusiness.chron.com/advantages-multiskilled-labor-18280.html

Kemevor, A. F. and Kassah, J. K. (2015). Challenges of Technical and Vocational Education and Training and Educational Stakeholders in the Volta Region of Ghana. International Journal of Humanities Social Sciences and Education, 2(6), 70-79

Kirchberger, A. (2008). TVET developments in Europe, Africa and Asia. Washington DC: World Bank Institute. Retrieved 22 May 2016 from 23 http://info.worldbank.org/etools/docs/library/243573/b21st%20century%20and%20TVET%20trends.pdf

Konayuma, G. S. (2007, December). Globalisation and TVET in Africa — Challenges and opportunities: implications of globalisation for TVET curriculum design. Paper presented at the Commonwealth Association of Polytechnics in Africa, Johannesburg. Retrieved 22 May 2016 from www.scribd.com/doc/6449990/Implications-of-Globalisation-for-TVET-Curriculum#scribd

Langer, K. (2013, October). Technical and vocational skills development in the informal sector. Contributions to the 4th Bonn Conference on Adult Education and Development (BoCAED). Bonn: DVV International. Retrieved 22 May 2016 from www.dvv-international.de/files/ipe_68_gb_web.pdf

Lousikkian, K. (2015, 13March). Reshape delivery, business tells unis. The Australian, p. 9. Maclean, R., & Wilson, D. (Eds). (2009). International handbook of education for the changing world of work: Bridging academic and vocational learning. Dordrecht, The Netherlands: Springer.

Majumdar, S. (Ed.). (2011). Emerging challenges and trends in TVET in the Asia-Pacific Region. Rotterdam/Boston/Taipei: Sense Publishers. Retrieved 22 May 2016 from www.sensepublishers.com/media/353-emerging-challenges-andtrends-in-tvet-in-the-asia-pacific-region.pdf

Majumdar, S. (2012). Developing a greening TVET framework. Berlin: UNESCOUNEVOC International Centre. Retrieved 22 May 2016 from www.unevoc. unesco.org/fileadmin/user_upload/docs/Greening_TVET_FrameworkBonn-Final_Draft.pdf

Marope, P. T. M., Chakroun, B., & Holmes, K. P. (2015). Unleashing the potential: Transforming technical and vocational education and training. Paris: UNESCO. Retrieved 22 May 2016 from http://unesdoc.unesco.org/images/0023/002330/233030e.pdf

McGrath, S. (2004). The challenge of staff development for skills development. Debates in skills development: Reforming training for countries and agencies. Turin: Working Group for International Cooperation in Skills Development.

McGuinness, W. (2013, 29 January). Half of recent college grads work jobs that don't require a degree: Report. The Huffington Post. Retrieved 22 May 2016 from www.huffingtonpost.com/2013/01/29/underemployedovereducated_n_2568203.html

OECD. (2005). Small and medium sized enterprises (SMEs). In OECD, Glossary of statistical terms. Paris: OECD Publishing. Retrieved 22 May 2016 from https://stats.oecd.org/glossary/detail.asp?ID=3123

OECD. (2013). Skills development and training in SMEs, local economic and employment development (LEED). Paris: OECD Publishing. Retrieved 22 May 2016 from www.skillsforemployment.org/wcmstest4/groups/skills/documents/skpcontent/ddrf/mdu0/~edisp/wcmstest4_054646.pdf

Ojimba, D.P.(2012). "Vocational and Technical Education in Nigeria: Issues, Problems and Prospects" Dimensions. Journal of Education and Social Research Vol. 2(9) November, 2012.

Okoye, R. & Arimonu, M. O. (2016). Technical and Vocational Education in Nigeria: Issues, Challenges and a Way Forward. Journal of Education and Practice. 7(3), 113

Oweh, I. (2013, 20 March). Poor perception hindering technical, vocational education in Nigeria – Rufa'i. Daily Independent. 24 Ratnata, I. W. (2013). Enhancing the image and attractiveness of TVET. TVET@ Asia, 1 (1-13). Retrieved 22 May 2016 from www.tvet-online.asia/issue1/ ratnata_tvet1.pdf

References

Pavlova, M. (2014). TVET as an important factor in country's economic development. Springerplus 3(suppl 1): k3.

Qureshi, M. A. (1996). Current Trends and Issues in Technical and Vocational Education in Asia and the Pacific. Available at https://files.eric.ed.gov/fulltext/ED400419.pdf

Ravallion, R., Chen. S., & Sangraula, P. (2007). New evidence on the urbanisation of global poverty (Background Paper for the World Development Report 2008). New York: World Bank. Retrieved 22 May 2016 from http://siteresources. worldbank.org/INTWDR2008/Resources/2795087-1191427986785/ RavallionMEtAl_UrbanizationOfGlobalPoverty.pdf

Samuel, A. (2016, 25 January). Education and training for adult offenders serving custodial sentences: Overview of the current situation and good practice. Electronic Platform for Adult Learning in Europe (EPALE) [Web log post]. Retrieved 22 May 2016 from https://ec.europa.eu/epale/en/blog/ education-and-training-adult-offenders-serving-custodial-sentencesoverview-current-situation

Shangquan, G. (2000) Economic Globalization: Trends, Risks and Risk Prevention. Available at https://www.un.org/en/development/desa/policy/cdp/cdp_background_papers/bp2000_1.pdf

See, for example, the Convention on the Rights of the Child (1989), Convention on the Rights of Persons with Disabilities (2008), World Declaration for Education for All (1990), UNESCO Salamanca Statement and Framework for Action (1994) and Dakar Framework for Action (2000).

Skoufias, E., Rabassa, M., Olivieri, S., & Brahmbhatt, M. (2011). The poverty impacts of climate change, Economic Premise, No. 51. Retrieved 22 May 2016 from http://siteresources.worldbank.org/EXTPREMNET/ Resources/ EP51_v4.pdf

Turner, A. (2014, 26 March). Wealth, debt, inequality and low interest rates: Four big trends and some implications [Lecture, Cass Business School]. Retrieved 22 May 2016 from www.cass.city.ac.uk/__ data/assets/pdf_file/0014/216311/ RedingNotes_Lord-Turner-Annual-Address-at-Cass-Business-SchoolMarch-26-2014.pdf

UNESCO. (2012a). Transforming technical and vocational education and training: Building skills for work and life. Third International Congress on Technical and Vocational Education and Training. Shanghai, People's Republic of China, 14-16 May 2012. Paris: Author. Retrieved 22 May 2016 from www.unevoc.unesco.org/fileadmin/up/217683e.pdf

UNESCO. (2012b). Youth and skills: Putting education to work. Paris: Author. Retrieved 22 May 2016 from http://unesdoc.unesco.org/images/0021/ 002180/218003e.pdf

UNESCO. (2014). UNESCO priority gender equality action plan: 2014-2021. Paris: Author. Retrieved 22 May 2016 from http://unesdoc.unesco.org/ images/0022/002272/227222e.pdf

UNESCO. (2015a). Preliminary report accompanied by a first draft of the recommendation concerning technical and vocational education and training. Paris: Author. Retrieved 22 May 2016 from http://unesdoc.unesco.org/ images/0022/002296/229649e.pdf

UNESCO. (2015b). Preamble. Qingdao Declaration — International Conference on ICT and digital and Post-2015 Education. Paris: Author. Retrieved 22 May 2016 from www.unesco.org/new/en/education/resources/in-focus-articles/ qingdao-declaration

UNESCO. (2015c). Proposal for the revision of the 2001 revised recommendation concerning technical and vocational education. Paris: Author. Retrieved 22 May 2016 from http://unesdoc.unesco.org/images/0023/002341/ 234137e.pdf 25

UNESCO. (2015d). Promoting skills for sustainable development. Paris: Author. Retrieved 22 May 2016 from http://unesdoc.unesco.org/images/0021/ 002162/216269e.pdf

UNESCO-CEGEP. (2012). UNESCO Chair in Applied Research for Education in Prison. Paris: UNESCO/Quebec: CEGEP Marie-Victorin. Retrieved 22 May 2016 from www.cmv-educare.com/wp-content/uploads/2012/07/ CMV001- 12_presentation_ANG_v3_HiRes.pdf

UNESCO-UNEVOC. (1999). Education, work and the future — International programme for technical and vocational education. Bonn, Germany: UNESCO-UNEVOC International Centre for Technical and Vocational Education and Training.

UNESCO-UNEVOC. (2013). Tackling youth unemployment through TVET. Report of the UNESCO-UNEVOC online conference 25 June to 9 July 2013. Bonn: UNEVOC. Retrieved 22 May 2016 from http://unesdoc. unesco.org/ images/0022/002255/225531e.pdf

UNESCO-UNEVOC. (2014). Global forum skills for work and life post-2015. Bonn: Author. Retrieved 22 May 2016 from www.unevoc.unesco.org/go.php?q =Global+Forum+2014+Roundup UNESCO-UNEVOC &

UNESCO-UIS. (2006). Participation in formal technical and vocational education and training programmes worldwide: An initial statistical study. Bonn: UNESCO-UNEVOC International Centre for Technical and Vocational Education and Training/ UNESCO Institute for Statistics. Retrieved 22 May 2016 from www. unevoc.unesco.org/fileadmin/user_ upload/pubs/UNEVOC_UIS_Report.pdf

United Nations. (2012). Resolution adopted by the General Assembly: 66/288. The future we want. New York: United Nations General Assembly, Retrieved 22 May 2016 from www.se4all.org/sites/default/ files/l/2013/10/Riooutcome-document.pdf

Walther, R. (2011). Building skills in the informal sector (Background paper prepared for the Education for All Global Monitoring Report 2012). Paris: UNESCO. Retrieved 22 May 2016 from http://unesdoc.unesco. org/ images/0021/002178/217864E.pdf

Warmsley, R. (2013). World prison population list (10th ed.). Colchester: International Centre for Prison Studies, University of Essex. Retrieved 22 May 2016 from www.apcca.org/uploads/10th_Edition_2013.pdf

Williams, O. (2014, 17 October). Richard Branson: Too many students were told to go to university, The Guardian. Retrieved 22 May 2016 from www.theguardian.com/media-network/media-academy-blog/2014/oct/16/ richard-branson-too-many-students-were-told-to-go-to-university

Wilson, D. (2010, 18 May). College graduates spur global economic growth: Chart of the day, Bloomberg. Retrieved 22 May 2016 from www.bloomberg.com/ news/articles/2010-05-18/college-graduates-to-make-global-economymore-productive-chart-of-the-day

Winch, C. (2013). The attractiveness of TVET. In UNESCO-UNEVOC, Revisiting global trends in TVET: Reflections on theory and practice (Chapter 3). Bonn: 26 UNESCO-UNEVOC International Centre for Technical and Vocational Education and Training. Retrieved 22 May 2016 from www.unevoc.unesco. org/ fileadmin/up/2013_epub_revisiting_global_trends_in_tvet_chapter3. pdf

World Commission on Environment and Development. (1987). Our common future, chapter 2: Towards sustainable development [Published as Annex to the UN General Assembly document A/43/427]. Oxford: Oxford University Press. Retrieved 22 May 2016 from www.un-documents.net/ocf-02.htm

World Education Forum. (2015). Incheon Declaration. Education 2013: Towards inclusive and equitable quality education and lifelong learning for all. Retrieved 22 May 2016 from www.waam2015.org/sites/ default/files/incheon_ declaration_en.pdf

References

UNESCO (Collaborative research on community engagement in TVET)

Zeus P. Ampuyas (2014). Emerging Trends in TVET

https://sustainabledevelopment.un.org/topics/sustainabledevelopmentgoals

www.unesco.org/new/en/education/themes/leading-the-international-agenda/educationfor-all/the-efa-movement

www.uis.unesco.org/Education/Documents/muscat-agreement-2014.pdf

www.un.org/millennium/declaration/ares552e.pdf

www.un.org/sustainabledevelopment/sustainable-development-goals

www.unevoc.unesco.org/go.php?q=Resources+-+Learning+and+Working

See, for example, http://oten.tafensw.edu.au/students/support-services/disability

www.cqaf-online.eu

www.asqa.gov.au/vet-registration/understand-the-requirements-for-registration/the-vetquality-framework.html

www.unevoc.unesco.org/tvetipedia.0.html?&tx_drwiki_pi1%5Bkeyword%5D=ISO%20 standard

Module 2

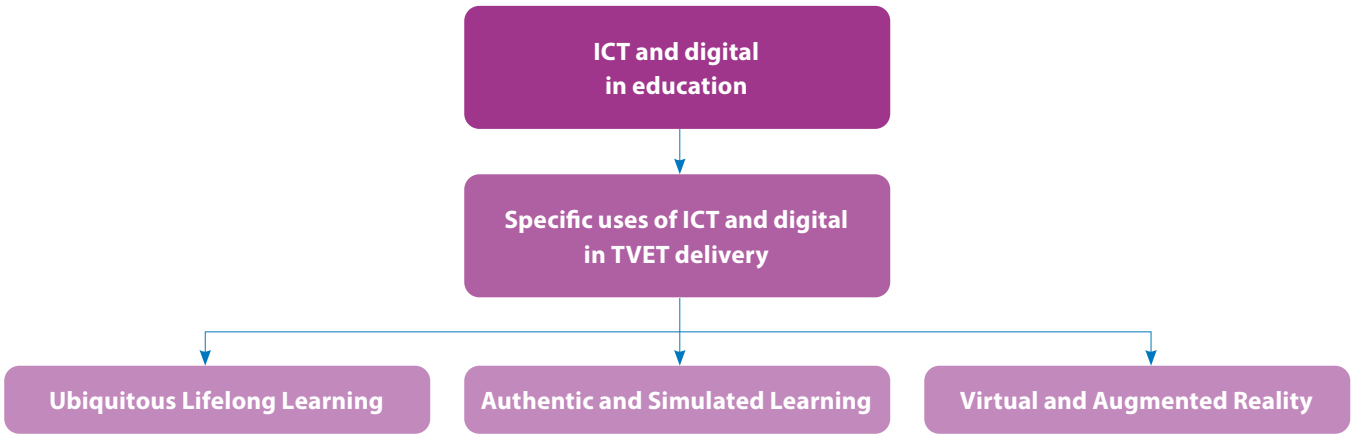
POTENTIAL USES OF ICTS AND DIGITAL IN TVET

Unit 2.1 Uses of ICTs and digital in TVET

Objective 2.1.1

Identify common uses of ICTs and digital in TVET

Can you identify common uses of ICT and digital in your institution or country?



Introduction

UNESCO's vision for information and communication technologies (ICTs) in education is 'A world without boundaries where technologies support education to build inclusive knowledge societies' . The organization has been promoting the use of ICTs both in general and as a way of transforming TVET (UNESCO, 2011). UNESCO-UNEVOC, UNESCO's specialized centre dedicated to developing and improving technical and vocational education through networking and the exchange of information in all States Members worldwide, has placed the use of ICTs at the top of its agenda and fosters their use through workshops, seminars and online communications (UNESCO-UNEVOC 2013a; Online Educa Berlin, 2014). The current head of the UNESCO-UNEVOC International Centre for Technical and Vocational Education and Training, Shyamal Majumdar, believes that ICT has a crucial role in expanding access, improving quality and enhancing the relevance of TVET and states that UNESCO-UNEVOC aims to further explore the potential of technology, including multimedia, online learning, mobile technology, Massive Open Online Courses (MOOCs) and open educational resources (OER) (OEB News Portal, 2016). The Commonwealth of Learning (COL), the intergovernmental organization of the Commonwealth of Nations mandated to promote and develop the use of open and distance learning (ODL) throughout the Commonwealth's 54 member countries, has also been assisting ministries and institutions in Commonwealth countries with the Technical and Vocational Skills Development Initiative , which focuses on policy development, capacity-building and effective uses of new technology to assist in course development and quality improvement in resource-poor contexts.

However, while the application of ICT-based methods in TVET is frequently advocated in reports and policies, they are not yet widely and consistently implemented in the sector. In a world where change is the only certainty, the challenge for TVET is how to transform its teaching and learning environments to achieve access, relevance and quality in a cost-effective way. This chapter examines the ways in which the new technologies and methods can be employed to achieve the desired transformation of TVET.

The Case for Using ICTs

Information and communication technologies (ICT) are defined by (UNESCO 2009) as a diverse set of technological tools and resources used to transmit, store, create, share or exchange information. These technological tools and resources include computers, the Internet (websites, blogs and emails), live broadcasting technologies (radio, television and webcasting), recorded broadcasting technologies (podcasting, audio and video players and storage devices) and telephony (fixed or mobile, satellite, videoconferencing, etc.). ICTs comprise all tools used in data/information capturing, processing, storage and dissemination. They are tools that determine the efficiency (competence) and effectiveness (success rate) with which communication is made. These technologies include the Internet, browsers, wireless networks, mobile devices and other communication media, using transmission and storage device infrastructure.

ICT is a broad term encompassing radio, television, the Internet and the web, satellite and Wi-Fi systems, mobile telephony, computer hardware and software, audio- and videoconferencing, virtual reality, social media, wikis, 3D printers and so on. All of these technologies enable individuals and communities to find, analyse, share and present information, knowledge, skills, ideas and experiences. Such is the potential of this raft of tools that United Nations Secretary-General Ban Ki-moon has advised the world's leaders to 'listen to your people. Information is freer than ever. Information is available to more people than ever. And citizens are using information technology as never before to demand democracy, dignity and opportunities' (ITU News, 2012). Kofi Annan, former UN Secretary-General, declared 'We must ensure that information and communication technologies are used to help unlock the door to education' (UN News Centre, 2005). ICTs can provide education to everyone, everywhere. They are particularly useful in serving the needs of rural, regional, remote and socioeconomically disadvantaged communities, people returning to learning after an absence from study or work and people re-skilling following displacement, redundancy or incarceration. ICTs can be used for educating

people at a distance and improving and enriching classroom or workplace learning. However, they are only tools. The quality and usefulness of ICT-enabled teaching and learning depend upon careful attention to the issues of accessibility and equitability, principles of adult learning and instructional design and the appropriateness of the delivery and support services. Some learners may be quite capable of autonomous learning through wholly online means, but others will need face-to-face or online support and mentoring. There is therefore no reason to fear that the adoption of ICTs will ever eliminate the need for teachers, but teachers' role will need to be redefined from that of instructor to that of constructor and facilitator of learning environments (UNESCO Bangkok, n.d.). Innovative applications of ICTs in TVET, some of which are fostered and supported by UNESCO-UNEVOC and organized jointly with partner organizations, are already under way (UNESCO-UNEVOC, 2013b). These initiatives include the use of low-cost tablets and online and blended learning in remote classrooms in the Philippines, a publicly accessible portal for knowledge-sharing by TVET teachers in Germany, and North-South-South collaboration in online leadership training for TVET involving Germany, Vietnam, Indonesia and Laos. The case studies in this book present further examples of innovative projects by early adopters in the sector. But for all of their merits, these tend to be isolated, one-off, temporarily funded or supported grass-roots initiatives. There is little in the way of systemic application of ICTs across the sector in ways that will achieve the fundamental transformation of education and training that is called for. And it is not only in TVET institutions and courses that ICT-enabled teaching and training needs to be mainstreamed. It is also needed in workplaces. The International Labour Organization (ILO) (2011) observes that there are few, if any, companies where products, processes and services are not subject to constant change, new occupations are not emerging and replacing existing occupations and new skills are not needed for the jobs of tomorrow. Pappas (2013) reports that around 42 per cent of the Fortune 500 companies in the United States now provide ICT-based training to keep their managers and staff up to date, finding that this reduces training costs by 50 per cent, reduces training time by up to 60 per cent and increases information retention rates by up to 60 per cent. BT, the UK's multinational telecommunications services company, was another early adopter of online staff training. Today, it delivers 85 per cent of its formal training online to its more than 100,000 employees. It also encourages its employees to share what they learn and know through internal blogs and wikis, among other means, and its global, enterprise-wide Route2Learn is one of the largest corporate Learning Management Systems (LMSs) in Europe, providing over 3,000 e-learning titles and 1,000 courses on subjects ranging from health and safety to business leadership skills and from engineering to avoiding bribery and corruption (BT Learning Solutions, 2013). Ernst & Young is yet another global leader in online workforce training. To standardize and ensure quality in its assurance, tax, transaction and other systems and services, it has developed a global web-based and classroom learning system for its 130,000 staff in more than 130 countries, which has massively reduced the amount of classroom time needed and cut training costs by 35 per cent while improving consistency and scalability (He, 2008). Dow Chemical, the second-largest chemical manufacturer in the world by revenue, has a similar need to provide regulatory compliance training in six different languages to a workforce of more than 60,000 employees and contractors in 32 countries. Using a mix of outsourced, in-house and off-the-shelf online courseware, the company has been able to dramatically reduce its course delivery costs. An independent audit of this e-learning programme revealed annual savings of $34 million in course development and delivery costs and an average reduction from $95 per student/per course in classroom training to $11 per student/per course through online delivery (Shepherd, 2002). However, most of this ICT-based training is for white-collar workers in large organizations. It still needs to be made more widely available for all of those working at all levels in smaller concerns. Even in those trades and crafts where training has traditionally been hands-on, the interactive and multimedia capacities of ICTs can enhance knowledge and skills development (Daneshgar and Van Toorn, 2009). There is therefore a great need to consider how and when to use ICTs in all forms of TVET workplace-related provision. Training is also hugely important in the informal sector. This sector comprises a wide range of labour market activities, casual, temporary and

Introduction

unpaid jobs as well as the MSMEs which represent up to 95 per cent of the world of work and, in some countries, up to 60 per cent of the gross domestic product (Walther, 2011). Rekkedal (2012) argues that training for MSMEs is paramount because most of the managers and workers in this sector possess only the knowledge and skills they have gained on the job, highlighting high staff turnover and the fact that many of these small businesses fail to be sustainable or to maximize their potential. New workers and existing employees alike need familiarization and constant updating with new products, processes, services and commercial, legal and other requirements if productivity, earnings and profitability are to be increased. As they lack the funds, resources and time for training by conventional means, the training must come to them. There is also a great need to train people in starting up single-person, small groups, family, online or mobile-based microenterprises. This is yet another transformative intervention that TVET must undergo. With the spread of smartphones and other mobile devices, MSME training can be delivered to the furthest corners of the earth. One example of how it can be delivered is the International Finance Corporation and IBM 'SME Toolkit' . This is a free online platform that helps would-be entrepreneurs and MSMEs anywhere in the world to learn sustainable business management practices that will help them increase productivity, efficiency and capacity and improve their access to finance and new markets. The toolkit contains free online business management information, interactive tools, training resources, how-to articles and a global business directory. It also enables multilingual community forums and social networks to be established. As of March 2015, this toolkit was serving 6.7 million users per year and comprised more than 5,000 items of content in 16 languages. Seventy-eight per cent of the users have reported improved business performance as a result of using this training package. Another option for online training for MSMEs is 'Start and Improve Your Own Business (SIYB),' by the International Labour Organization (ILO) . The online SIYB training packages cover such topics as entrepreneurship, women's entrepreneurship development, starting and improving your own business, management skills, accessing markets, value chain development and responsible workplace practice. SIYB uses a train-the-trainer or multiplier strategy. It has trained 200 Master Trainers globally, and they in turn have trained over 17,000 trainers who collaborate with more than 2,500 partner organizations and have served over 6 million trainees in the past 15 years. A global coordination team at the ILO headquarters in Geneva ensures sustainability, innovation and up-to-date knowledge-sharing and provides quality assurance and certification.

Specific Uses of ICT in TVET Delivery

Ubiquitous Lifelong Learning.

This is learning that can take place at any time and place through the use of technologies to implement learning processes derived from solving several tasks assigned to the students. It is a type of learning that utilizes the capabilities of mobile and wireless technologies to support seamless and connected learning. The ubiquitous learning approach allows the user to access and learn certain content from any location, on any device, at the time the user deems appropriate; it is learning that can be accessed from a variety of environments and contexts. Ubiquitous learning can provide more context awareness to enable adaptive learning for the learner. This learning approach equally promotes lifelong learning. The potential of ICT in lifelong learning is considered evidence of the efficacy of ICT use in the delivery of TVET. For TVET frameworks to be efficient, there should therefore be a connection to Lifelong Learning to enable effective interaction among learners, modern inventors, educators and scientific information makers (Raihan and Han, 2011). An example of ubiquitous learning is the use of computers and the Internet to distribute online courses and distance learning. One major advantage is that learners can access it from anywhere and are not tied to a certain location.

Characteristics of Ubiquitous Learning

- Permanence: course material and material produced by students is never deleted on purpose; the only time material is deleted is in unforeseen circumstances. Furthermore, students' performance and course materials are continuously being updated.
- Accessibility: because learning data like coursework, assignments and lectures are permanent, students should always have access to the material. Because this material is accessible, students can be much more self-directed and more independent than previously.
- Immediacy: students should be able to get information whenever they want. The information students request may be local, stored on their device or not local, the data is most likely stored on a server somewhere and is accessed by the learner over the Internet.
- Interactivity: Learners should be able to interact with other people in their 'educational network.' These people can include the teacher of the course, classmates or even experts in the field. Interactivity can be synchronous, requiring participants to be present at the same time (such as a video conversation or instant messaging chat room), or asynchronous (such as an uploaded video to YouTube or a forum).
- Situating instructional activities: the problems and knowledge gained from learning activities are presented in a natural way or in a way that would mimic a real-world situation.
- Adaptability: technology should be able to adapt to students' changing lives.

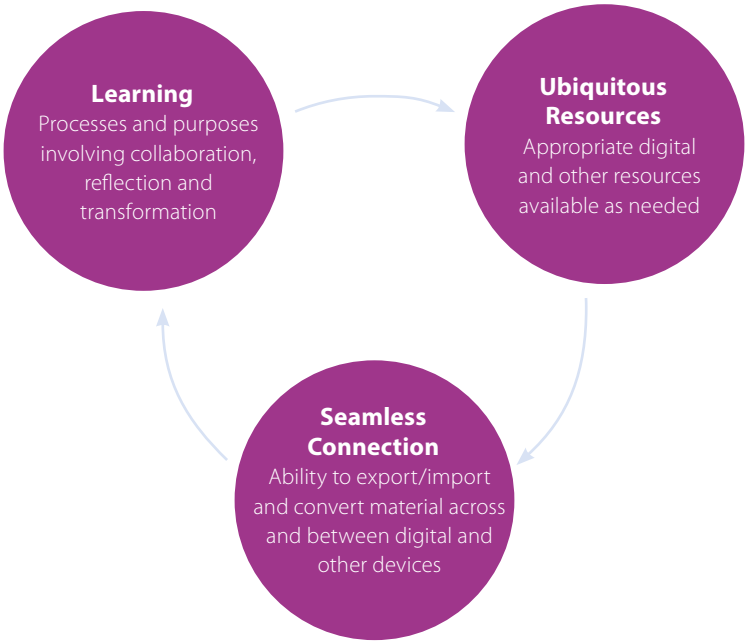


Figure 5: The key elements of Ubiquitous learning.
Source: Nicholas and Ng (2015)

Authentic and Simulated Learning:

Authentic Learning describes learning activities that are either carried out in real-world contexts or have high transfer to a real-world setting. According to Ormrod (2008), authentic activities are activities described as tasks identical or similar to those that will be eventually encountered in the outside world. The different exercises prepare learners for activities that resemble a real-life activity that they will encounter at some point in the future. When these different activities are incorporated into the school curriculum, students are sometimes able to form a mental connection between the information they have received in the classroom and the real-life activity (Ormrod, 2008). These are interactive activities that help students prepare for something they may encounter when in the workforce. Within an authentic learning context, the activities undertaken by students in the classroom should be similar to those undertaken by real-world professionals in that field of study, and instructors may also strive to craft lesson plans that resonate with the students' 'situated (lived) experiences' (Stein et al., 2004).

Simulation is one of the techniques used in authentic learning to replace and amplify real experiences, often immersive in nature, to replicate substantial aspects of the real-world activity in a fully interactive fashion. One instance is the use of simulation-based learning to develop health professionals' knowledge, skills and attitudes while protecting patients from unnecessary risks. Simulation has the potential to be a transformational learning experience that permanently changes participants' view of the situation. The use of simulations demands that learners apply their subject mastery in the context of a realistic, unpredictable situation. Learners see and feel the consequences of their actions, as well as their inaction, without compromising safety rules (Galindo, 2014).

Green (2012) suggests answering the following questions before running an authentic and simulated learning programme:

- Is the activity authentic?
- Does it require learners to work collaboratively and use their experiences as a starting point?
- Are the learners allowed to learn from their mistakes?
- Does the activity have value beyond the learning setting?
- Does the activity build skills that can be used beyond the life of the course?
- Do learners have a way to implement their outcomes in a meaningful way?

Characteristics of Authentic Activities (Green, 2012)

→ The activity has real-world relevance to the students.

→ With these activities, students must define the activities and all other tasks that are also needed to complete the task.

→ The activities present complex tasks that ensure the students to use critical thinking skills.

→ The activities allow the student to look at the task from several different perspectives.

→ The activities allow for the student to be able to collaborate with others.

→ The activities allow for the student to be able to reflect back on the task and the choices they made.

→ The activities can be used in a diverse range of fields or areas.

→ The activities can be integrated into the real world.

→ The activities allow the student to create a product individually.

→ The activities allow the student to find a solution to a task and see the outcome that comes with it.

Virtual and Augmented Reality:

Current vocational higher education in engineering requires a laboratory that can be easily accessed by students as a practice tool that aims to provide skills knowledge directly through practical work. Vocational training is all about the balance between gaining knowledge and building experience – learning through practice. The ability to go back through scenarios again and again at no additional expense or inconvenience is a great advantage. Augmented reality is particularly powerful in this context. An augmented reality

system allows real and virtual objects to be combined in a real environment, interactively and in real time (Ismail et al., 2019). Augmented Reality technology can help overcome difficulties in providing training facilities in the field of engineering, namely by integrating multimedia graphics for three-dimensional virtual laboratories. Augmented Reality can interact with the physical environment through three-dimensional multimedia visualization directly and provide an interactive experience with the real-world environment through markers scanned by the camera (Dede et al., 2019).

Advantages of Using Augmented Reality (AR) in Education (Khan, Johnston, and Ophoff, 2019).

- AR provides new ways of interacting with the real world and can create experiences that would not be possible in either a completely real or completely virtual world.
- AR has the unique ability to create immersive hybrid learning environments that combine real and virtual objects.
- AR technologies enable users to experience scientific phenomena that are not possible in the real world, such as certain chemical reactions, making inaccessible subject matter accessible to students.
- The manipulation of virtual objects and observation of phenomena that are difficult to observe in the real world can be facilitated through AR.
- This type of learning experience can encourage thinking skills and increase conceptual understanding of phenomena that are either invisible or difficult to observe, as well as correcting any misconceptions.
- AR addresses learning difficulties that are often encountered when visualizing unobservable phenomena.
- The skills and knowledge that students develop through technology-enhanced learning environments may be developed more effectively through AR technology.
- The cognitive workload may be reduced by integrating multiple sources of information.
- The immersion and interaction features offered by AR may encourage students to engage in learning activities and may improve student motivation to learn.
- AR provides highly interactive experiences and can generate authentic learner activity, interactivity and a high level of realism.
- Interaction with the world is important in the learning process and, apart from reality, AR is one of the best ways of facilitating this interaction.

Conclusion/Summary

This Unit X-rayed the roles of ICTs and digital in TVET, the benefits of ICTs and digital, specific uses of ICTs and digital in TVET delivery including ubiquitous lifelong learning, authentic and simulated learning and virtual and augmented reality. ICTs and digital can also be used to support programmes.

Transformative Reflection

Having completed this section, consider the following transformative reflections:

1. Focus on the assumptions underlying your beliefs, feelings and actions regarding the integration and use of ICT and digital into TVET in your institution or country.
2. Reflect on the different uses of ICTs and digital in TVET delivery in your institution/country.
3. Consider what you have learned in this module and how you think ICTs and digital should be better used for TVET delivery in your institution/country.
4. Consider possible inhibitions to the use of ICTs and digital in your institution/country.

Unit 2.1
Quiz

Self-assessment questions

Multiple choice: Circle all the correct answers that apply for each question. There may be more than one correct answer.

1. In expanding access to, improving the quality and enhancing the relevance of TVET, the following play a crucial role:

A. TVET

B. ICT and digital

C. Bandwidth

D. Data

2. Potential technologies UNESCO-UNEVOC aims to further explore include the following:

A. Multimedia

B. Online learning

C. Mobile technology

D. Open educational records (OER)

3. A challenge to the application of ICT and digital-based methods in TVET is:

A. Inadequately wide and consistent implementation in the TVET sector

B. Inconsistent leadership

C. Inadequate TVET population

D. All these answers are correct

4. All tools used in data/information capturing, processing, storage and dissemination are classified as:

A. Technologies

B. Tools

C. ICTs and digital

D. None of the above

5. The major roles played by ICTs and digital in communication are:

A. Speed and accuracy

B. Consistency and strength

C. Speed and flow

D. Efficiency and effectiveness

6. The quality and usefulness of ICT and digital-enabled teaching and learning depend upon:

A. Careful attention to the issues of accessibility and equitability.

B. Principles of adult learning and instructional design.

C. Appropriateness of the delivery and support services.

D. All these answers are correct.

7. Knowledge and skills development can be enhanced in trades and crafts where training has traditionally been hands-on through ICTs and digital:

A. Speed and versatility

B. Interactivity and multimedia

C. Accuracy and modernism

D. Technical capabilities

8. MSME training can be delivered to the farthest corners of the earth through:

A. Skype

B. WhatsApp

C. Mobile apps

D. Facebook

9. Characteristics of lifelong learning include the following:

A. Using Solar power

B. Environmental transitions

C. Enabling environment

D. Energy efficiency

10. A technology that can help overcome difficulties in providing training facilities in the field of engineering, by integrating multimedia graphics for three-dimensional virtual laboratories, is:

A. Virtual Reality

B. Augmented Reality

C. Ubiquitous learning

D. Simulation

Practice Questions

1. Based on your reflections, make a draft of possible policies that should be put in place for effective use of ICTs and digital for TVET delivery in your institution/country

2. Ask a group of TVET stakeholders to review the policies

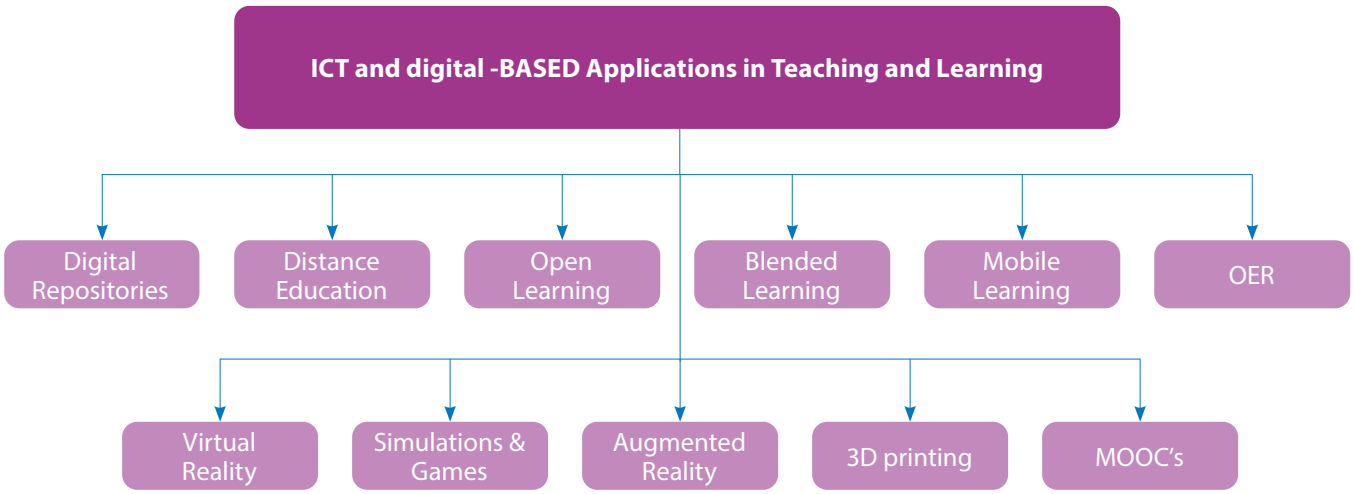
POTENTIAL USES OF ICTs AND DIGITAL IN TVET

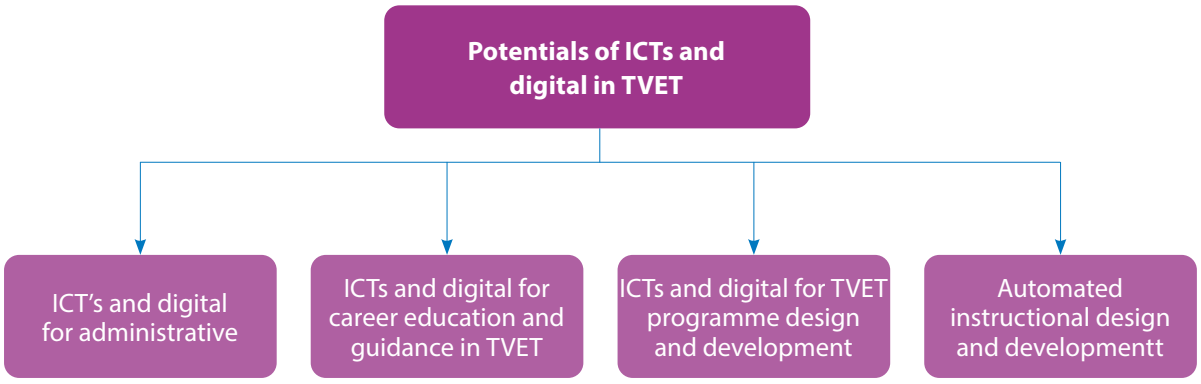
Unit 2.2 ICTs and digital for Programme Support

Objective 2.2.1

Identify common uses of ICTs and digital can be used to support TVET programmes

Does your organization use ICTs and digital for programme support in TVET?





ICT and digital-based Applications in Teaching and Learning

The range of ICT and digital applications available for teaching and learning is well established and well informed by extensive research and evaluation. A brief overview of the various practices and the key lessons learned from using these may be useful for readers less familiar with the field.

Distance Education

Distance education is widely used, particularly in higher education, to provide quality and trustworthy education for students who are unable to attend a campus for reasons of work, family, geography or other circumstances. In its earliest form, distance education was correspondence- and print-based, with the occasional use of radio, television or audio-conferencing. With the exponential rise in access to the Internet, the web, computers, handheld devices and social media, distance education is now virtually synonymous with e-learning or online learning (see below). These ICTs and digital have enormous storage, retrieval, transmission and processing capacity. Their multimedia, motivational and presentational capacities are superior to those of more traditional media. They offer rich virtual environments, and their interactive capacities enable learner-teacher and learner-learner interaction and collaborative learning. The theory of social constructivism – that people learn most effectively when interacting with others – has also led to the use of such collaborative learning tools as blogs, wikis and podcasts, chat rooms and online forums.

Photo Caption: CC BY-NC-SA 3.0 IGO:copyright: UNESCO-UNEVOC/Momin Abdul

Open Learning

Open learning employs the methods and technologies of distance education, but embodies the belief that open access to knowledge is critical for a free and open society. Open universities such as the UK's Open University and open schooling systems such as India's National Institute of Open Schooling (NIOS) operate according to a 'quality out' rather than a 'quality in' model. Rather than requiring entrants to fulfil certain academic admission requirements, they allow anyone to enrol and then, if they show themselves capable of meeting the required standards in the assignments and examinations, grant them a certificate, diploma or degree.

Blended Learning

To gain maximum advantage from both face-to-face and mediated teaching and learning, courses may be delivered via blended learning. These combine face-to-face teaching or activity-based learning in classroom, outdoor, community and workplace settings and computer-based or online learning. The digital means and resources are used to supplement or revise face-to-face learning or, in the case of 'flipped learning', are studied prior to and in preparation for on-site teaching, tutoring or small group sessions.

Flexible Learning

Flexible learning places the learners in primary control. It offers them choices on where, when, how, for how long and by what means of study, according to their needs and circumstances. They can study by face-to-face, online, blended, full-time, part-time and via accelerated or decelerated means. Flexible learning is useful for serving a wide and diverse range of students and achieving a competitive advantage for training organizations and employers by delivering training in international, national, regional and remote areas via formats and methods that best suit the learners' styles, needs, work schedules and circumstances.

Mobile Learning

More than 6 billion people worldwide now have access to a connected mobile device, and for every one person accessing the Internet from a computer, two people do so from a mobile device. Just as mobile technology is changing the way people live, it is also changing the ways in which people learn. Thanks to handheld computers, MP3 players, notebooks, mobile phones and tablets, learning can now be delivered from virtually anywhere to any location where a mobile signal is available. Such mobile learning can involve the sharing of multimedia learning materials, web searching and teacher-learner and learner-learner interaction. According to recent studies, 30 per cent of the world's web traffic now occurs over mobile devices rather than desktop machines, leading to predictions that mobile Internet use will eventually overtake desktop use.

Open Educational Resources and Open Courseware

The open education movement has also led to the use of OER and open courseware (OCW). These are teaching and learning materials, course modules and entire courses in digital formats that are placed in the public domain or online and openly licensed . Teachers and learners can legally and freely copy, use, adapt and share these resources for their own purposes. OER and OCW can foster pedagogical innovation, avoid unnecessary duplication, reduce the costs of producing and distributing course material, expand access and be particularly beneficial to learners in the developing world.

Massive Open Online Courses

A more recent development in OER and OCW has been the development and distribution of MOOCs, which are freely accessible via the web and designed for unlimited participation by learners worldwide. Some MOOCs are simply video-recorded lectures with associated reading material, which critics such as Bates (2012) claim are inferior to on-campus study and fail to acknowledge everything that has ever been learned about open and distance learning. Haber (2014), however, argues that if they are well designed, MOOCs can be more engaging and instructional than their equivalent classroom courses because rather than being 'sage-on-the-stage' presentations, they can enable learners to learn from a range of experts, video clips, animations, online forums and self-assessed and externally assessed assignments. MOOCs enable learners without academic credits or transfers in mind to learn more about subjects that are of personal interest or needed for their work. They can also serve as 'tasters' or 'samples' of further study opportunities and provide stepping stones or learning pathways to accredited study for those wishing to improve their qualifications or advance their careers.

Digital Repositories

Digital repositories provide a convenient means of storing, managing, reusing and curating digital materials for the purpose of education, research and administration. They are often used for storing OER, OCW and MOOCs and can be subject-focused or institutionally focused, stand-alone, networked or federated.

Virtual Reality

Virtual Reality (VR) enables learning from accurate and realistic 3D models of machines, equipment, planetary systems and other phenomena in safe, more convenient and better controlled environments. In its simplest form, it can be a 3D image that is explored by manipulating the keys or mouse in a computer. More sophisticated VR systems enable learners to see, feel and manipulate the displayed images while wearing special helmets with internal screens and gloves fitted with sensors. Such technologies provide multi-sensory learning experiences and enable learners to explore otherwise inaccessible real-world phenomena.

Simulations, Games and Role Plays

ICT and digital-based simulations, games and role plays can be used to model certain situations and enable learners to learn by trial and error and conduct experiments, rather than simply being passive learners. They involve learners in imaginary or real-world situations that require them to call upon their knowledge, apply and integrate various aspects of their studies and problem solve. They can be useful for helping learners understand different roles and responsibilities and for providing learners experiencing difficulty with high levels of abstraction with concrete examples of the theories they are learning about. Some of these games and role plays are competitive, encouraging the learners to outperform other students or achieve the highest possible ratings according to criteria set by the simulation.

Augmented Reality

AR involves implanting objects with bar codes that open web pages on learners' tablets and smartphones to overlay these objects with digital information. This technology could have great potential in distance, self-directed and collaborative learning in dangerous and complex work environments and in subjects such as chemistry, mathematics, biology, physics and astronomy where objects, books and so on can be augmented to reveal hidden facts, processes, etc., that are central to understanding the topics. Pokémon GO, the free-to-play location-based, mobile game developed by Niantic for iOS and Android released in July 2016, is credited with popularizing augmented reality.

3D Printing

As 3D printing technology becomes more readily available and less expensive, this is yet another technology that could be used to

Photo Caption: https://pixabay.com/users/yohoprashant
Source: pixabay.com

support learning in the STEM subjects and art and design. It enables learners to download 3D designs and print them on desktop 3D printers or to create designs, print them out and remake them if necessary.

Adopting New ICT and digital-based Applications

All these answers are correct ICT and digital-based applications have the following advantages for TVET contexts:

- By transcending time, distance, social barriers and the need for teachers and learners to be in the same location at the same time, unlimited numbers of geographically dispersed learners can be provided with asynchronous or synchronous 24/7 access to quality learning experiences that would otherwise be unavailable or far too costly.
- Courses and courseware can be developed and delivered by experts or, better still, teams of experts, who are highly knowledgeable and experienced in specialized areas, with the result that the programmes can be far more authoritative, up to date and relevant than anything that can be provided locally with the limited means at the disposal of individual institutions.
- These modes empower learners and make learning more attractive and meaningful because they:

→ are learner-centred

→ combine the advantages of text, sound, graphics, animations and video in manageable chunks of information

→ provide links that enable learners to navigate; learn from various sources and by various means; have surrogate and virtual experiences with situations, equipment and materials; and use and apply knowledge in ways best suited to learners' personal needs and circumstances.

Many teachers still hold that the online environment cannot replicate the excitement of lively personal presentation and in-class discussion. They claim that when they are teaching face-to-face, they can watch their classes for signs of lack of focus, lack of comprehension or lack of motivation and deal with these on the spot. However, the question of which works better – ICT and digital-mediated or face-to-face teaching and learning – is rapidly becoming redundant, because whether through choice or necessity, increasing numbers of teachers are using both methods, both on campus and off campus and more and more students are opting for flexible scheduling and online and offline study. For those interested in learning more about these various modes, there are many useful online books, manuals, guides and toolkits, including by the Commonwealth of Learning and Asian Development Bank (1999), Moore et al. (2002), Modesto and Tau (2006), McGreal (2013) and Ally (2014). While there is broad agreement within the TVET sector that these new forms of provision need to be adopted and mainstreamed, there are also concerns that need to be addressed.

Training TVET Managers and Staff

In many countries there is a shortage of appropriately trained and qualified TVET staff. Furthermore, as Billett (2009) shows, the roles of the managers and teachers in a TVET environment are quite different from those in other educational sectors. They have to provide education and training in a wide range of occupations, as part of lifelong learning, at secondary, post-secondary and tertiary levels and in collaboration with industry and other employer groups. If they have received any formal teacher training, it may not have prepared them for all of these roles or have included the principles of adult learning. Majumdar (2012) argues that there is a need to set appropriate standards for entry and practice in TVET teaching, attracting the best teachers, improving their remuneration and career prospects and empowering them to develop leadership and management skills. Furthermore, many TVET managers and teachers are unfamiliar with the new technologies and methodologies and so require special training in how to apply these in their subject areas and in the various classroom, workplace and online settings. There is, therefore, a great need to find ways of providing more pre-service and in-service professional development. Providing such training to the extent needed is clearly beyond the scope of 'bricks and mortar' approaches. However, Danaher and Umar (2010) show that by using open and distance education, it is possible to broaden and streamline access and ensure quality in teacher education in ways that traditional delivery modes can never achieve. In so doing, the first-hand experience of interactive, collaborative online staff development in itself can encourage new ways of thinking about the design, management and implementation of more flexible, innovative, learner-centred teaching and learning. The Ohio State University Centre of Education and Training for Employment provides an example of how this

might be achieved using ICT and digital-based means. After observing and conducting extensive interviews with TVET teachers and conducting rigorous field-testing to determine which teaching and training methods really did improve learning outcomes, the centre created a set of digital course materials entitled 'Preparing Better Teachers for Tomorrow – Online'. These performance-based teacher education modules, which were written by teacher education consultants and the centre's staff, were designed to be used for pre- or in-service teacher training and by business, industry and workplace trainers. The online resources were self-contained and self-paced, the courseware integrated theory with practice and the instructional design provided frequent and immediate feedback to the learners. The teachers' reactions to the modules were positive, and requests from overseas resulted in their being used in the UK, Singapore and Australia by staff development specialists, business-industry trainers and government and organization trainers (Norton, 2013). In some cases, there will be a need for entirely new, especially focused online materials for particular forms of TVET teacher training, but there is already a wide range of online resources that can be used to inform, extend and improve TVET teaching and learning. COL offers 12 free online in-service TVET professional development modules covering language and communication, administration and management, instructional techniques, learning resources, educational theory and practice, distance education, workshop organization and management, safety, entrepreneurship, applied computer science, practical teaching and action research . COL also provides a guide for workshop activities (Romiszowski, 2013) and UNESCO-UNEVOC has produced a number of short training videos. Teachers can also learn from each other, sharing their ideas and experiences through wikis and blogs. For example, the UNESCO/COL Guidelines for OER in Higher Education (UNESCO and Commonwealth of Learning, 2011, 2015) was the result of practitioners, researchers, policymakers, teachers and learners across the globe contributing their knowledge and experience in producing and using OER, a useful reminder that the best forms of pre- and in-service training for TVET staff are those that derive from the advice and experience of those working within the profession.

The Needs of Distance Learners

A commonly expressed concern is that the distance or online learner has no or only limited contact with the teachers and other learners. While it is true that distance and online learners must assume greater responsibility for their learning, the distribution channels of education have changed dramatically with the advent of the Internet, which affords many means of online guidance and support in enrolling in or changing courses, studying and dealing with personal as well as academic matters. Many learners already make extensive use of networking sites like Facebook and Twitter for their own personal purposes and many e-learning platforms now incorporate software that gives learners the chance to interact and collaborate with their fellow learners, even over great distances. And the learners can also create content by using wikis, joining virtual communities and using blogs, folksonomies, video-sharing sites, hosted services, mashups and so on. In many cases it may be found that they are actually using digital media more often and in more sophisticated ways than many of those who teach them. There will always be some learners who, for reasons of habit, history and culture, prefer face-to-face or blended teaching and learning. But across the globe people are becoming increasingly used to the idea that they can learn whatever they want, whenever they want it and in whatever forms they want it by downloading short snippets of informal learning, do-it-yourself advice, courses, programmes, OER and MOOCs from Google, YouTube and so on onto their computers or handheld devices. They are also familiar with uploading text, photographs and videos, and some are even uploading educational content they have created onto the web pages of online providers such as the Peer2Peer University (P2PU) and virtual University of the Third Age (U3A) . By so doing, they are learning about the true nature of learning and their own potential for learning. So it is vital that TVET providers develop the knowledge, skills and experience to meet these learners' changing and differing needs, expectations and circumstances. Teachers need to see themselves as designers and managers of student-centred learning rather than instructors, and to recognize that learners now expect these new forms of provision in their courses and programmes. Achieving the best educational outcomes for these learners will still depend upon the teachers' dedication and skills and the quality of the content, instructional design, tutoring, assessment and feedback they provide.

Bridging the Digital Divide

The increasing use of online delivery presents the threat

of yet another set of 'haves and have-nots'. Exclusion from the benefits of ICT and digital-based TVET provision due to location, social circumstances, age, education or income levels will only reinforce, exacerbate and add to existing socioeconomic inequalities. Care must therefore be taken to ensure that the most vulnerable, most marginalized and most in need of education and training are not left behind in the digital revolution. Not all countries, or regions within countries, have ready access to an affordable and reliable broadband connection, and while the costs of computers, tablets and smartphones are continually dropping, the purchase and usage costs may still be beyond the reach of many, and keeping such hardware in good working order can be as costly as, or even more expensive than, its initial purchase. In some developing countries, the climate and environment can be hostile to the technology. High humidity, extremes of temperature, dust and strong sunlight, for example, can degrade the performance and durability of hardware and software. Balancing the need for access to equipment and ensuring the security of facilities can also be an issue in some settings. Nevertheless, the digital revolution is unstoppable, and with the ever-growing penetration of the Internet, Wi-Fi and mobile telephony, the digital divide is continually shrinking. A poll of more than 27,000 adults across 26 countries undertaken by the BBC World Service (BBC News, 2010) found that almost four in five people on both sides of the digital divide strongly believed that access to the Internet was a fundamental human right. The younger generation now consider online and mobile media their most important sources of information, so TVET needs to increase its digital presence in order to appeal to school leavers, employees and employers, boost efficiency and provide seamless education and training to all of those who require it (Ratnata, 2013; Winch, 2013). ICT and digital has expanded to include many different types of devices and pathways for

Figure 6: Potential uses of ICTs and digital in TVET
Source: Chinien, C. (2005)

introducing technology into school programmes, with positive results. USAID suggests 10 key principles when conceptualizing, designing and implementing ICT and digital in education systems:

1. Use ICT and digital to achieve education and development goals
2. Use ICT and digital to enhance student knowledge and skills
3. Use ICT and digital to support data-driven decision-making
4. Include all short- and longer-term costs in budget planning
5. Explore technology alternatives to find appropriate solutions
6. Focus on teacher development, training and ongoing support
7. Explore and coordinate involvement from many different stakeholders
8. Develop a supportive policy environment
9. Integrate monitoring and evaluation into project planning
10. 'It takes capacity to build capacity' – System strengthening precedes system transformation

In TVET, ICTs and digital are used to a great extent in running different activities. This section considers a number of them.

ICTs and digital for Administrative Purposes:

ICT and digital plays an important role in enhancing educational administration. Developed countries are harnessing the full benefits in ICT and digital in Higher Education Institutes' (HEI) administration, and developing countries have also now started adopting technological resources for the betterment of administrative affairs (Qureshi, and Abro, 2016). Despite the ICT and digital innovation in school administration, the administrative process still faces a number of problems, indicating possible ineffective use of ICT and digital. Information Communication Technology (ICT and digital) plays an important role in enhancing the quality of education. Administration and management applications of ICT and digital are currently popular in schools due to its capabilities in facilitating administration activities from data storage to knowledge management and decision-making.

Photo Caption: CC BYNC-SA 3.0 IGO
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Table 1: Administrative information

S/NO.	CONSTRUCT	CONTENT CATEGORIES
1	**Student Administration**	Usage of electronic media by students to apply for admissions
		Usage of computers for student registration / enrolment
		Availability of timetables / class schedules in electronic format
		Use of computers for maintenance of students' attendance
		Communication of academic details of students to their parents/guardians through e-media
		Use of e-media for notifications regarding hostel accommodation
		Use of e-media for notifications regarding transportation
2	**Staff Administration**	Use of computers for recruitment and staff work allocation in the institution
		Automation of attendance and leave management of staff members in the institution
		Use of electronic media for performance appraisal
		Communication with staff using e-media
		e-circulars from the institution regarding official matters
		e-kiosks are available in the institution
3	**General Administration**	Use of e-media for scheduling / allocation of halls for examinations
		Dissemination of information in the institution through e-kiosks
		Use of e-media by students to apply for university examinations
		Use of e-media for the processing and display of students' results
		Facility for students to make fee payments electronically

Source: Bethany Christian College of Teacher's Education (2020)

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Other ICT and digital uses in administrative activities include:

Research:
ICTs and digital are used in research for creativity and originality. Research-related tasks that ICTs and digital are involved in include:

- Identifying appropriate information sources
- Critical analysis of information
- Information management
- Communication of knowledge across subject fields
- Search and linking to databases and electronic resources

Applications of ICTs and digital in research can be classified into:

ICTs and digital in Data Analysis:
involving literature searches, content searches, literature tracking and data collection. This can be in two forms:

Quantitative Data Analysis:
including Exploratory Data Analysis (EFA), multiple regression, t-test, and Analysis of Variance (ANOVA). Applications that can be used are Statistical Package for the Social Sciences (SPSS), MATLAB, Microsoft Excel, Statistical Analysis Software (SAS), Graphed Prism, Minitab etc.

Qualitative Data Analysis:
using packages like NVivo, ATLAS.ti, MAXQDA, SPSS Text Analytics, Transana (for video transcribing) etc.

ICT and digital in Post Data Analysis:
involving references and bibliography compilation (using applications like EndNote, Zotero and Mendeley), Article and Thesis/Dissertation Discussion (making reference to Academia.edu and Research Gate); Plagiarism Detection (using Grammarly, Article Checker, Turnitin, Duplichecker etc.); Journal Manuscript Submission (using manuscript submission platforms like Elsevier, Scholarone, Wiley, Sage etc.).

Scheduling of the school calendar, timetables (teaching, examinations, etc.), meetings, etc.
The following are some timetable generating software.

1. **FET:** Free evolutionary timetabling for the Linux platform can be downloaded from Ubuntu software centre
2. **Automatictimetable.com:** Asc timetable is a fully automatic school timetable
3. **Scheduling software:** http://www.automatictimetable.com/aSctimetables.com which comes under proprietary software and whose trial version for windows and Mac is now free
4. **Google Calendar:** Google Calendar is an Internet-based time and task-management online application gives access to calendars via web browsers.

Communication with Stakeholders: the role of stakeholders in school administration cannot be overemphasized. There needs be an effective line of communication between administrators and stakeholders. Tools and technologies for connecting with stakeholders include: email, websites or blogs, online surveys, Virtual Learning Environments, media sharing, social networks, online groups and forums, SMS and Instant Messaging, Google chrome extensions and apps.

Specific School Management Applications Include the Following:

- FeKara website: http://fekara.com/
- SchoolTime website: https://school-time.co/#
- TS School website: http://www.ts-school.com/
- Fedena website: http://www.projectfedena.org/
- Ascend SMS website: http://www.ascendsms.com/
- School Tool website: http://schooltool.org/ (Can be downloaded from Ubuntu software centre)
- Open Admin for Schools website: http://richtech.ca/openadmin/index.html

Payroll and Financial Accounting
– budgeting, purchasing, grants administration, cash flow, accounts receivable, accounts payable, audits.

Library System
– electronic management of books, both soft and hard copies.

Record Keeping and Inventory Management
– for administrative efficiency and easy retrieval

Advertising
– promoting programmes and courses offered through the Internet and social media

ICTs and digital for Career Education and Guidance in TVET

Career education and guidance is a comprehensive, developmental programme designed to assist individuals in making and implementing informed educational and occupational choices. A career guidance and counselling programme develops an individual's competencies in self-knowledge, educational and occupational exploration and career planning.

ICTs and digital are transforming career information and guidance services, just as they are transforming service delivery in other sectors. According to Watts (2001), ICTs and digital provide individuals with the following:

→ **Resources concerned with self-awareness**
– to help users to assess themselves and to develop a profile in terms which can be related to learning and work opportunities. These resources range from simple-self-assessment questionnaires to psychometric tests.

→ **Resources concerned with opportunity awareness**
– including databases of learning and/or work opportunities, with a menu of search criteria which enable users to find data relevant to their needs. The databases may cover education/training institutions or courses; occupations, employers or job vacancies; voluntary work opportunities; and information on how to become self-employed. Some include relevant labour market information on supply and demand. There are also some examples of work simulations which enable users to explore particular occupational areas in an experiential way.

→ **Resources concerned with decision learning**
– including matching systems which enable users to relate their personal profiles to relevant learning or work opportunities. The outcome is a list of the opportunities which most closely match the profile.

→ **Resources designed to help users to explore options in a systematic way**
– balancing the desirability of particular options against the perceived probability of achieving them.

→ **Resources concerned with transition learning**
– concerned with helping users to implement their decisions. These may include support in developing action plans, preparing curricula vitae, completing application forms and preparing for selection interviews; it may also include help in securing funding for learning opportunities or for becoming self-employed.

Three global drivers are responsible for the increase in ICT and digital-related jobs worldwide:

- Greater connectivity
  – more than 120 countries now have mobile phone market penetration of over 80 per cent
- Digitization of more aspects of work
  – today, telecommuting and outsourcing have become standard business practices globally
- More globalized skills
  – India and the Philippines have become major outsourcing hubs thanks to their English language skills, and other countries are targeting the sector for future growth.

ICTs and digital are providing new avenues for job creation that could help tackle global unemployment. ICTs and digital also support innovation that has created new, more flexible forms of employment and work:

- Online contracting uses ICT and digital to increase access to work opportunities worldwide, mainly for smaller employers. Popular services include oDesk and Elance. In 2012, about 2.5 million jobs were posted on these services, for tasks ranging from writing to customer service and software development.
- Microwork platforms break down large business processes into smaller discrete tasks – such as data entry and verification, copywriting or graphic design – and distribute them to workers across geographical boundaries. These

platforms include CloudFactory, MobileWorks and Samasource. Analysts suggest the market size is about US$1 billion today and could grow to about US$5 billion by 2018.

To maximize the positive impact of ICTs and digital on employment, a World Bank (2013) press release, recommended that policymakers pay attention to five enabling systems, adapting the mix to the country context as needed:

- Human capital systems: a labour pool with appropriate ICT and digital skills, and the awareness and soft skills that give competitive advantage in the labour market.
- Infrastructure systems: ubiquitous connectivity to ICT and digital; access to electricity and transport; infrastructure to support innovation and adoption of technology by SMEs.
- Social systems: networks of trust and recognition for workers and employers, social safety nets and measures to minimize any negative outcomes of ICT and digital-enabled employment.
- Financial systems: efficient and accountable systems to ensure timely payments; and access to finance to support innovation and entrepreneurship.
- Regulatory systems: an enabling environment that creates employment opportunities and increases labour market flexibility while protecting the rights of workers.

Many guidance services offer online databases of guidance information, including but not limited to:

- → Job market information
- → Job market opportunities
- → Educational system information
- → Course offerings
- → Occupations/professions databases
- → Qualifications databases

ICTs and digital for TVET Programme Design and Development

A systems approach is usually used to design and develop efficient vocational education programmes. This approach consists of job analysis, occupational analysis, curriculum design and development, and instructional system design and development. These are very complex, time-consuming and laborious processes. This section provides a discussion on the use of ICTs and digital to automate some of these processes and to facilitate the decision-making process during TVET programme design and development.

ICTs and digital in Occupational Analysis

An occupational analysis is a formal process of analysing occupations to determine the appropriate skills, knowledge and abilities for those who practise them. An automated version of occupational analysis is the Occupational Information Network (O*NETTM) (Technical Executive Summary – American Institutes for Research, 1997). O*NETTM is an electronic database of information, rather than a book. In it, the information about each occupation has been greatly expanded while the number of occupations included in the system has been considerably reduced. O*NET™ is divided into three sections – a description of the components of the content model, a general statement regarding prototype evaluation, and a brief presentation of the electronic database and sample screens.

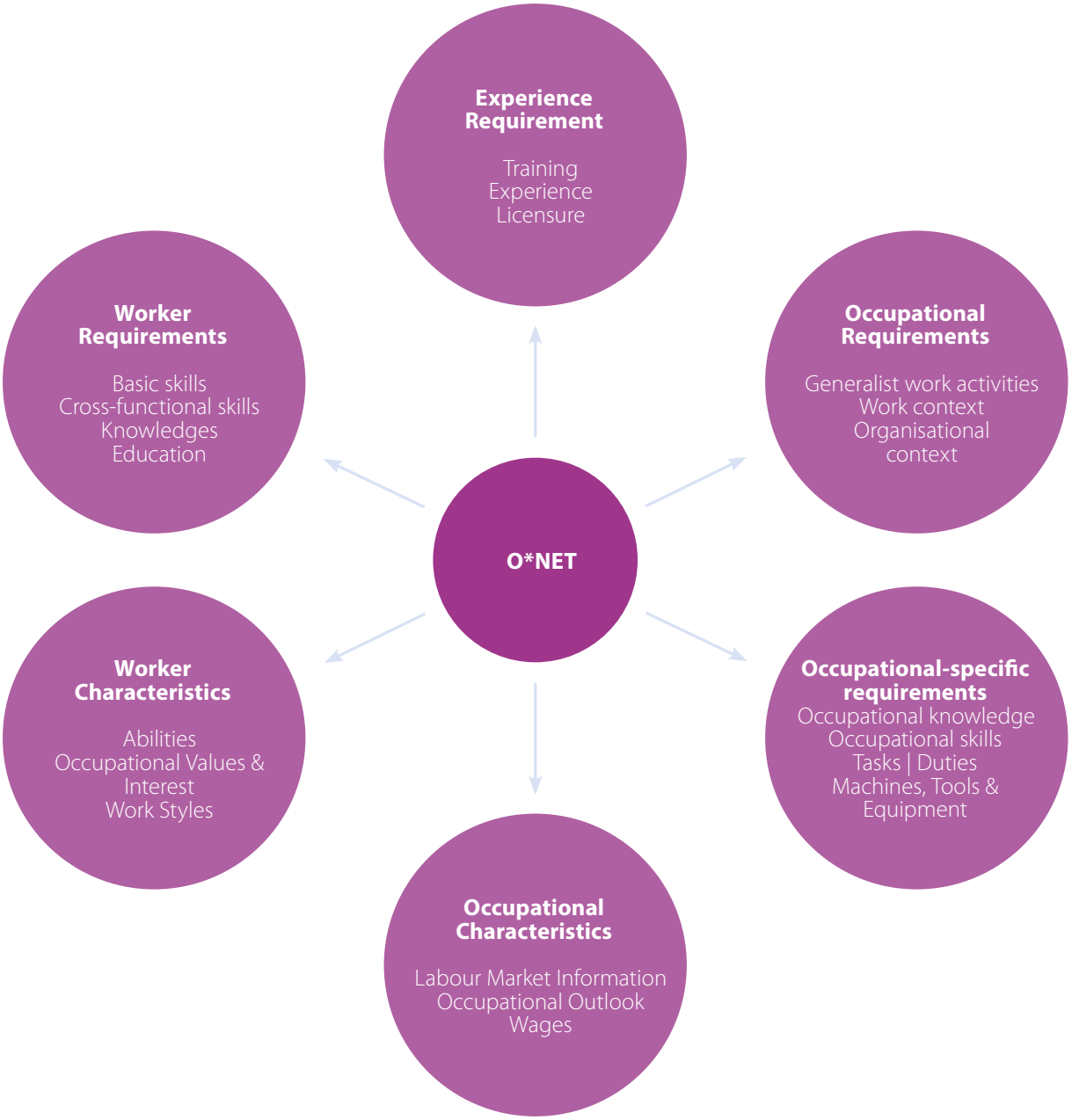


Figure 7: Descriptive domains of the O*NET™ content model.

Automated Instructional Design and Development

As technologies and knowledge have advanced, the tasks of scientists, engineers and managers have become considerably more complex. Not surprisingly, there has been a tendency to apply computer technologies to the more complex and challenging tasks encountered by the user. Instructional Design (ID) represents a collection of complex and challenging tasks. Kasowitz (1998) outlined the following types of automated ID tools and systems:

1 Advisory/Critiquing Systems: this system is designed to provide an ID team with a critique of a prototype or instructional solution given a set of desired outcomes and system goals.

2 Expert Systems: expert ID systems focus on specific tasks, such as generating partially complete programming problems in an intelligent tutoring system.

3 Information Management Systems: these systems largely depend on the capabilities and components of other systems within the domain of ID, integrating and making them interoperable.

4 Electronic Performance Support System: these systems are embedded within a larger application (e.g. an aeroplane) and provide targeted support to humans performing tasks on those larger systems (e.g. aircraft maintenance technicians).

5 Authoring Tools: authoring tools enable instructors and instructional developers to create computer and web-based learning environments

Conclusion/Summary

This Unit discussed the ways ICTs and digital are used to support TVET programmes including for administrative purposes, career education and guidance, TVET programme delivery and development. Identifying specialized uses of ICTs and digital in TVET may be necessary, as will be discussed in the next unit.

Transformative Reflection

Having completed this section, consider the following transformative reflections:

1 Focus on the assumptions underlying your beliefs, feelings and actions regarding the integration and use of ICT and digital in TVET for programme support in your institution or country.

2 Reflect on the different uses of ICTs and digital in TVET for programme support in your institution/country.

3 Consider what you have learned in this module and how you think ICTs and digital should be better used for TVET for programme support in your institution/country.

4 Consider possible inhibitions to the use of ICTs and digital in TVET for programme support in your institution/country.

Unit 2.2
Quiz

Self-assessment questions

Multiple choice: Circle all the correct answers that apply for each question. There may be more than one correct answer.

1. ICT and digital-based Applications in Teaching and Learning include:

A. Distance Learning

B. Blended Learning

C. Mobile Learning

D. All these answers are correct

2. An ICT and digital-based application designed for the unlimited participation of learners worldwide is referred to as:

A. Open Educational Resources

B. Open Courseware

C. Massive Open Online Courses

D. All these answers are correct

3. A convenient means of storing, managing, reusing and curating digital materials for the purpose of education, research and administration is:

A. Digital Repositories

B. Digital Storage

C. Digital Records

D. Digital Warehouse

4. A technology that enables the learning of phenomena in a safe, more convenient and better controlled environment is:

A. Virtual Reality

B. Augmented Reality

C. Ubiquitous learning

D. Simulation and games

5. A technology that could be used to support learning in STEM subjects and art and design is:

A. Virtual Reality

B. Augmented Reality

C. 3D Printing

D. Simulation and games

6. Concerns that need to be addressed in adopting ICT and digital in TVET include the following:

A. Training TVET managers and staff

B. The needs of distance learners

C. Bridging the digital divide

D. Training schools

7. Potential uses of ICTs and digital in TVET include:

A. ICTs and digital for administrative purposes

B. ICTs and digital for career education and guidance in TVET

C. ICTs and digital for TVET programme design and development

D. All these answers are correct

8. Automated Instructional Design and Development involve all of the following:

A. Advisory/critiquing systems

B. Expert systems

C. Student administration

D. Electronic performance support system

E. Authoring tools

9. Learning that considers where, when, how, for how long and by what means of study is:

A. Blended learning

B. Flexible learning

C. Mobile learning

D. None of the above

10. Education can be provided for students who are unable to attend a campus for reasons of work, family, geography or other circumstances through:

A. Online learning

B. Web-based learning

C. Distance learning

D. Social learning

Practice Questions

1. Based on your reflections, make a draft of possible policies that should be put in place for effective ICT and digital use of ICTs and digital in TVET for programme support in your institution/country.use of ICTs and digital in TVET for programme support in your institution/country.

2. Ask a group of TVET stakeholders to review the policies.

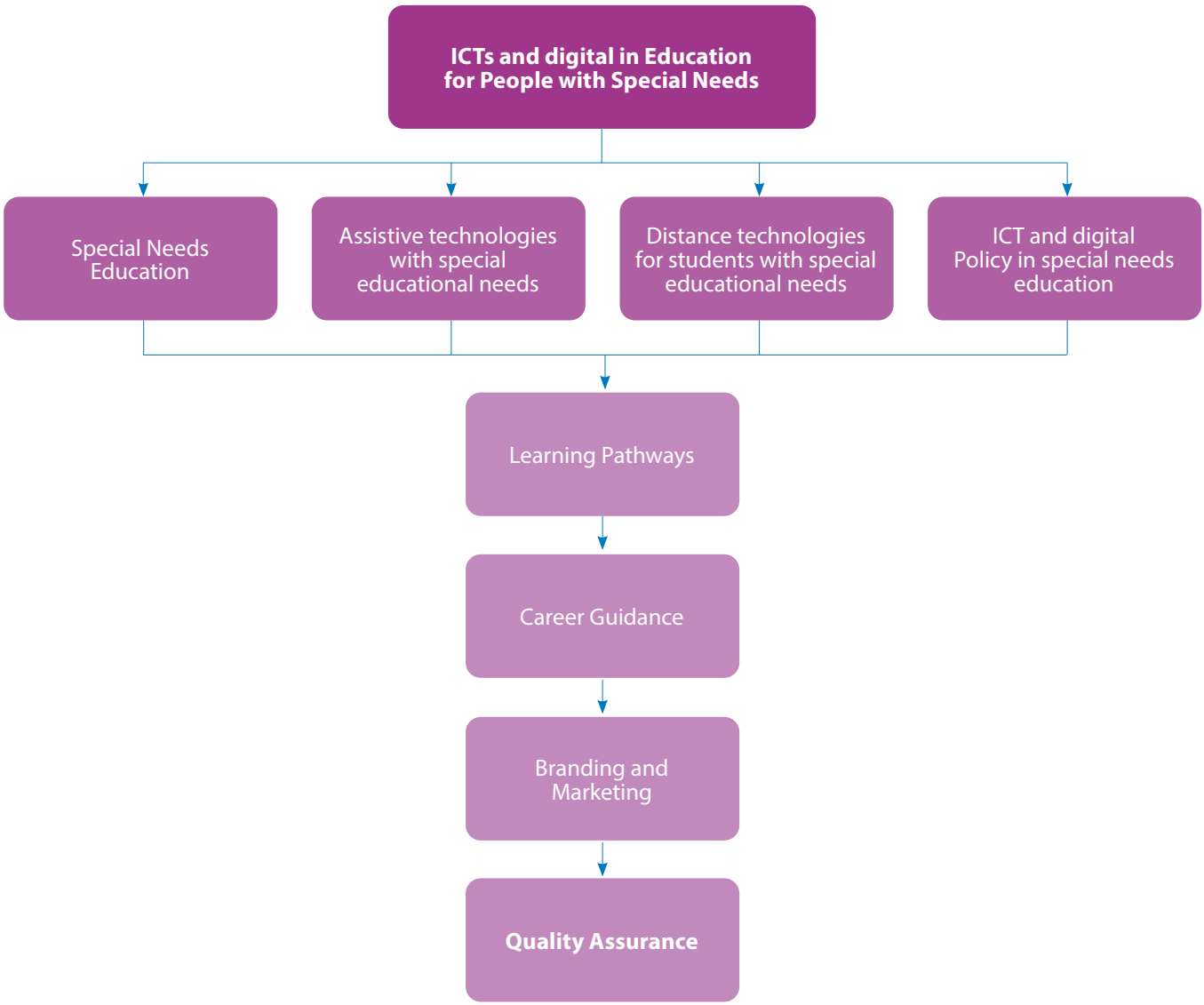
POTENTIAL USES OF ICTs AND DIGITAL IN TVET

Unit 2.3 Specialized use of ICTs and digital

Objective 2.3.1

Identify and develop an understanding of the specialized uses of ICTs and digital in TVET

Have you identified specialized uses of ICTs and digital in TVET in your institution or country?



UNESCO is among the most active international organizations supporting modern approaches to education. Such approaches relate primarily to application of new technologies to solve a wide range of problems and process a vast number of information sources. UNESCO maintains a capacity to advise national governments on the use of technology for educational purposes and, in particular, on the optimal balance (given local circumstances) between ICTs and digital and traditional educational technologies.

Furthermore, UNESCO can assist countries in developing educational software and materials that reflect their national and regional cultures in support of the strategy to achieve the goal of 'Education for All'. In order to contribute to resolving these issues, within the framework of its training programme the UNESCO Institute for Information Technologies in Education (IITE) has dealt with ICT and digital application in the field of educating people with special educational needs (SEN) since 1999. As part of this work, the institute held a number of international expert meetings and workshops in partnership with well-known experts from 13 countries, including Australia, Japan, the Netherlands, the United Kingdom and the USA. Recommendations from international experts provide the basis for the development of information materials and analytical surveys, which show the current status, prospects and main trends of ICT and digital application in special needs education (SNE). The published materials were forwarded to National Commissions for UNESCO in 190 States Members and other relevant organizations.

The specialized training course on ICTs and digital in education for people with special needs consists of four parts:

1 Special Needs Education in the Information Age. This covers the impact of the Information Age on the life of people with special needs, to explain the necessity of ICT and digital implementation into SEN, thus helping to build a more inclusive society. Issues of equal opportunities in education and information access to be provided for each and every member of a society, primarily for people with special needs, are covered. Particular emphasis is placed on a social drive towards inclusion in education, with a special focus on SNE organization principles and its main characteristics.

2 Assistive Technologies for Students with Special Educational Needs. This programme is primarily designed to provide a short but comprehensive understanding of assistive technologies (AT), their theory and a description of their application areas. It addresses the issues of choosing the right AT solutions for educational purposes, to meet the needs of five main groups of impairments: physical, visual, hearing, speech and language, cognitive and learning.

3 Distance Technologies for Students with Special Educational Needs. Module – this section introduces the core features of distance education (DE) vital for education of students with SEN. Issues discovered include: the evolution of DE and the main qualities of ICT and digital-based DE, a description of key technologies used in DE and their benefits for students with SEN, accessibility barriers to educational resources and ways to overcome them.

4 ICT and digital Policy in Special Needs Education. This part provides a broad overview of ICT and digital policy in SNE: objectives, principles and means. Elements explained include best international practice examples with respect to legislation affecting ICT and digital policy in SNE, the key activities of ICT and digital policy implementation in SNE, including promoting ICT and digital infrastructure for SNE, the integration of ICTs and digital into the SNE curriculum, the training and retraining of ICT and digital specialists in SNE. Emphasis is placed on the basic aspects of monitoring of ICT and digital usage in SNE, including the necessary and sufficient conditions for SNE quality improvement using ICTs and digital.

Learning Pathways

There are calls for TVET to create more learning pathways linking informal, non-formal and formal (secondary and tertiary) education. The term learning pathways refers to the linking of specific learning experiences, courses and academic programmes provided by government, non-governmental, not-for-profit or private sector organizations that enable individual students to progress in their education and training, earn academic credits and ultimately satisfy graduation requirements. Learning pathways embody the concept of learning as a system within which all forms and levels of education are complementary and mutually reinforcing elements of a lifelong learning process, rather than a series of disconnected events. They are systems that circumvent existing silos in education and enable learners to access information and tools by which they can construct personalized transitions to the courses, qualifications and career paths they desire. Innovative online means of publishing these pathways can open the eyes of those who had never previously thought of formal study, or had struggled with or failed in their earlier studies.

Informal learning has been described as being like an iceberg – 'immense in its mostly submerged informal aspects' (Livingstone, 2000). Much successful community learning takes the form of informal learning, and Halliday-Wynes and Beddie (2009) suggest that vocational trainers and adult educators should consider where it is advantageous to encourage learners to transition to non-formal courses of study where they can learn at their own pace without fear of testing and use these courses of study as building blocks for further learning and formal study. Coffield (2000) argues that informal learning is indispensable, as it is the main means of acquiring the everyday knowledge and practices, values and cultural norms required to live in society. Eraut (2000) suggests that there are three levels of informal learning:

- Incidental learning, where new facts, ideas and behaviours are acquired without any conscious intent in work-related, social or family contexts.
- Reactive or opportunistic learning, where new facts, ideas and opinions are assimilated more intentionally but spontaneously.
- Deliberate learning, where specific goals are set and time is allocated for the learning.

It has been estimated that 70–90 per cent of people's daily learning and sharing of knowledge falls into this category, and nowadays a great deal of this informal learning comes from the Internet and social and mass media. People are now well used to manuals for everyday equipment such as digital cameras and printers being online rather than in print, and are quite familiar with using YouTube to see how to perform a task or process.

The mass media also play an important role in informal learning. Katz, Blumler and Gurevitch (1974) observe that listeners, viewers and readers do not use radio, TV, books, magazines and newspapers simply for entertainment and relaxation, but also for informally acquiring information about what is happening in the world, learning about and identifying with behavioural models and gaining a sense of integration by learning about other people's circumstances. Baba (2015) suggests that people use mass media for the purposes of cognition, diversion, social utility and withdrawal. Cognition is the act of coming to know something, satisfying curiosity. Media make people want to learn more about things and give them ideas. Diversion takes two forms: relaxation (escape from pressures and problems and emotional release of pent-up emotions and energy) and stimulation (seeking relief from boredom or routine activities). Social utility concerns individuals' need to affiliate with others (sharing things they have read, seen or heard). In the case of withdrawal, people use media to create a buffer zone between themselves and others by burying their heads in books, magazines or newspapers or using earphones to tune everybody out. It is important to consider the capacity of digital and mass media to develop new interests, skills and options for learning. In one UK study, 79 per cent of the adults interviewed reported that they spent an average of 8½ hours a week on some form of technology-enabled informal learning

(Hague and Logan, 2009), at a time when there has been an enormous rise in the use of social media, such as Twitter, Facebook, LinkedIn, Google +, YouTube and other technologies for informal learning.

Non-formal learning occurs in educational activities that are specifically designed to meet certain learning objectives and the needs of particular interest groups. It is provided by educational institutions, clubs, societies, professional associations, galleries, museums, workplaces and many other providers and can be promoted or provided by online or broadcast means.

Informal and non-formal learning not only increase knowledge and skills but also provide emotional rewards, increase interest in certain subjects and foster a desire to engage in further learning, including formal study. ICTs and digital have a great capacity to help people to discover and follow up on their particular interests in this way. The **Australian Open Training Institute's Open2Study**[21] provides an example of how a TVET provider can capitalise on the concept of an ICT and digital-based informal–non-formal–formal learning continuum. Since its launch in 2013, Open2Study has attracted 500,000 students worldwide. It currently offers 49 free online introductory courses on arts and humanities, finance, business, management, marketing and advertising, education and training, health and medicine and science and technology. These courses are provided by more than 20 universities, polytechnics, TVET institutions and businesses. They run for four weeks, are repeated every five weeks and include videos, readings, assessments, quizzes, transcripts and opportunities to chat with online classmates. The learners enrol using Facebook, Twitter or LinkedIn accounts. Upon completing their courses, they receive grades and achievement certificates. They can take as many courses as they wish and any mix of courses.

Learners wishing to progress to higher levels of online study can gain nationally accredited certificates and diplomas in such subjects as human resources, project management, business administration and marketing, which are also available through the Open Training Institute[22].The Open Training Institute is a nationwide online TVET provider that was established in response to demands for flexibility in TVET provision. It is backed by, and draws upon the 20 years' experience of, Open Universities Australia (OUA)[23], a private company owned by seven leading Australian public universities and Australia's largest online higher education provider. OUA offers first-level units of courses provided by its shareholder universities and other institutions that are equivalent to their on-campus courses but in many cases free of any entry requirements. Learners can progressively amass credits to gain entry to undergraduate study on campus or via distance learning at any of the participating universities.

TVET could follow the example of the UK Open University's OpenLearn . This is a repository that allows informal learners to freely download hundreds of bespoke or repurposed multimedia OER from iTunesU and YouTube. These cover a wide range of subjects and include videos, reading materials and assignments for self-assessment. The learners can also receive online help in creating personal learning environments (PLEs). These PLEs help learners set their own goals; manage their own learning; access, aggregate, configure and manipulate the online content they need, and share these resources with other learners through open services on the cloud (Mikroyannidis and Connolly, 2012). In its first five years, the OpenLearn website had more than 20 million unique visitors, and every month 1,000 informal learners sign up for formal study (Lane, 2012).

TVET could also consider the merits of the collaborative provision of courses, as in the case of the Open Training Institute mentioned above, or FutureLearn 16. FutureLearn is an international MOOC learning platform offering hundreds of free online courses provided by the UK Open University in partnership with 83 top universities and specialist educational providers all over the world. The courses last from two to six weeks, are delivered one step at a time, can be accessed on mobile phones, tablets, laptops and desktops, and enable learners to fit learning around their lives. When enrolling, the learners fill in a profile

page so that other learners can find out more about them. They then learn by watching videos, listening to audio recordings, reading articles and taking short quizzes. Every video, audio segment and part of an article provides a space for the learners to comment, ask questions, discuss topics with other students and seek guidance from the tutors. At critical points they take tests which are scored and count towards their overall mark. Some courses also offer opportunities for undertaking assignment work. Most courses offer the option of purchasing a Certificate of Participation, while others offer opportunities to take invigilated examinations at local test centres and receive a Certificate of Attainment. The first FutureLearn courses were launched in September 2013. By February 2016, 3 million people had signed up to over 6 million courses and 24 per cent of those who started these courses had completed their studies in them. People of all ages use FutureLearn in almost every country in the world. Around 66 per cent of the learners are female, 27 per cent of the learners do not have a degree and 38 per cent of visits to FutureLearn are on a mobile phone or tablet.

In another example, TAFE NSW , Australia's largest TVET provider in New South Wales, operates a seamless learning pathway from school to TVET and from diploma and advanced diploma courses to Associate Degree of Accounting and Applied Engineering (Renewable Energy Technologies) and Bachelor Degrees in 3D Art and Animation, Applied Finance (Financial Planning), Design (Interior Design), Early Childhood Education and Care (Birth to 5), Fashion Design and Information Technology (Network Security), plus a Graduate Certificate in Leadership. TAFE NSW developed this system because it found that its advanced diplomas were going out of fashion and students were seeking internationally recognized qualifications. Within four years of these degrees being first offered, enrolments had increased more than fortyfold (Ross, 2015).

A fragmented TVET landscape with multiple qualification systems and non-uniform curriculum standards will lack quality and national consistency. Various national skills authorities, qualifications frameworks or sectoral education and training authorities are now being established in both developed and developing countries to ensure that learners, training providers and employers can easily comprehend the broad equivalence of qualifications and parity of esteem in vocational and academic qualifications, learning pathways and the provision of continuing, demand-driven and quality-based TVET. Allais (2010) concludes that there is no single correct model for national qualifications frameworks, but policymaking and communications can certainly benefit from the use of well-designed ICT and digital-based information systems.

Careers Guidance

Sultana (2012) suggests that TVET can be made more attractive for students by improving its career information, career guidance and employment counselling systems. These systems help reduce the mismatch between demand and supply, address skills shortages and bottlenecks and assist labour adaptability and geographical and occupational mobility. Watts (2013) observed that career guidance generally tends to be weaker and more often absent in the TVET sector than in other sectors. In Australia, for example, a review of career development services in post-secondary institutions concluded that students in TVET institutions had fewer career guidance opportunities than their counterparts at universities, due to a lack of career services units with institution-wide responsibility for helping students or graduates. He suggested that students of all ages and at any point in their studies need:

- Careers information covering information on courses, occupations, career paths and labour markets.
- Careers counselling conducted on a one-to-one or small group basis.
- Careers education to help individuals and groups develop the competencies they need to manage their career development.

Here again, online means can be employed to provide up-to-date, reliable and user-friendly information, self-assessment tools and advice and support for individuals and groups, as well as guidebooks, posters, promotional videos and open days to attract greater numbers of better informed and better motivated students to the TVET sector – and retain them.

Branding and Marketing

There is a worldwide need to counter low public acceptance of TVET. There are plenty of private providers and other newcomers ready to step in and meet learners' needs through alternative means. TVET must therefore show that it is ready to use new technology to provide courses of the highest national and international quality and promote its benefits through high visibility branding and marketing. The basic framework for marketing is as follows:

- Define customers' needs and perceptions.
- Show why the product or service is better than everyone else's.
- Fit into customers' routine and deliver the products and services when and where they need them.
- Let the customers try the product or service for free or at an attractive discount.
- Ensure that the product or service works as well as possible first time out and every time thereafter.

Improving the image of TVET needs to start with studies of the stakeholders' attitudes – i.e. the learners, graduates, employers, trainers, parents and policymakers. When the UK's City & Guilds Centre for Skills for Development and the Council for Technical and Vocational Education and Training in Ghana collaborated in countering the poor regard for and negative stereotyping of the Ghanaian TVET system, their starting point was researching the challenges and misrepresentations which, if left unaddressed, would severely constrain the sector's development and stakeholders' insights into the sector's positive elements.

These findings informed the following recommendations for the sector (BorteiDoku Aryeetey, Do and Andoh, 2011):

- TVET, along with the Department of Information and its allied agencies, should conduct a promotional campaign to improve perceptions of TVET, but any such campaign should coincide with programmes to improve the quality of training provision and funding for the sector.
- The campaign should promote vocational pathways as viable options alongside higher education, and target those trades that were socially stigmatized but had the potential to absorb high numbers of young people.
- Develop a careers guidance framework and improve transferability between different learning pathways.
- Train the teachers to communicate the careers and training options open to young people, opportunities within the labour market and employers' workplace expectations.
- Expand and align TVET policies with other policies, such as small business development funding for the informal sector and support for young graduates aiming for self-employment.
- Introduce capacity training for master craftspeople so that they can provide consistent quality training with relevant curricula and improved pedagogy.
- Conduct research into good practice to develop a training system for informal trainers.
- Improve the links between industry and training to match the supply of skills with the demands of industry and identify potential growth areas.

ICTs and digital can be a useful means of acquiring stakeholders' views and information about market demands; collating, analysing and evaluating these data; and presenting the findings and recommendations in different formats to the different stakeholders. Loi (2008) and Leong (2011) describe how the Institute of Technical Education (ITE) in Singapore set out to counter widespread unfavourable impressions of

and misconceptions about vocational education and training, and to reposition itself in the market. Collaborating with its key stakeholders, ITE redefined its products (creating new market-relevant programmes and pedagogical models infused with life skills and technology), determined where these courses needed to be available, and devised various means of promotion to convince the authorities, the corporate sector, prospective students, parents and the general public of the benefits of the transformed system and that it was a global leader. ITE marketed itself intensively to all of these groups, using every means at its disposal: online platforms, advertising on the sides of buses, local and popular media, school visits, open days, road shows, seminars, presentations and online 'tasters' of the courses on offer. It also developed new eTutor and eStudent systems providing online self-paced learning, self-testing and student support services everywhere and anywhere (Law, 2007). Aware of prospective students', parents' and teachers' preference for a more 'academic' education, ITE also overhauled its certification system and created some niche diploma programmes. The outcomes of this major rebranding exercise were increased enrolments, improved success rates, higher graduate employment rates and a rise in ITE's brand equity index. ITE's claim to be a global leader was subsequently confirmed by it winning the 2007 Harvard-IBM Innovations Award in Transforming Government (Business Wire, 2007).

With regard to the last point, it is critical that claims made in marketing and branding TVET can be substantiated. The website of Australia's largest online TVET provider, OTEN (see Chapter 4), claims, 'You'll receive outstanding student support as you work towards your career-relevant, accredited qualification'. OTEN backs this statement up with the provision of its 24/7 Online Learning Support system. The website also states: 'OTEN is committed to providing high-quality service and support to people with disability', and then sets out all the special support services that it makes available for students with disabilities.

Quality Assurance

Concerns are also expressed about the lack of QA in TVET (UNESCO-UNEVOC, 2013c). Governments, non-governmental organizations, international organizations, donors, the private sector and the public at large will expect accountability and proof that the transformations and use of ICT and digital-based methods are more effective, cost-effective and cost-efficient than their predecessors. New QA standards, measures and performance indicators will need to be set and met, new systems developed to improve the quality of policymaking, provision and practice, and new sets of findings disseminated online and through the media to reassure stakeholders of the benefits of the systems, processes and outcomes.

Traditionally, QA systems in the tertiary sector have applied an 'inputs' model. That is to say, they have used the levels of funding and resourcing, numbers and qualifications of staff and so on as indicators of quality. These inputs are easy to identify, measure and compare, but they do not necessarily correlate with educational success. Nowadays, governments and other funding agencies are far more interested in public disclosure of the outputs, outcomes and impact of the educational provision. Results-based QA systems are therefore essential, especially when transformations and innovative uses of ICTs and digital are involved. As management guru Peter Drucker once observed, 'Quality in a service or product is not what you put into it. It is what the client or customer gets out of it' (Kohl, 2012).

One of the major challenges in assuring quality in open, distance and blended learning is what Daniel, Kanwar and Uvalić-Trumbić (2009) refer to as the 'iron triangle' – that is, achieving the correct balance between access, cost and quality. Improving any one of these three factors may compromise the other two. Increasing the number of students by online means may reduce teaching costs but may also endanger the quality of the learning and incur greater costs in providing learner support. Improving the quality of the courses, courseware and learner support may restrict access and cause costs to rise. Furthermore, cutting costs may well

endanger both access and quality. In adopting these new digital technologies and methods, it is therefore critical to develop strategic and business plans and determine goals and priorities regarding access, cost and quality and to then develop the criteria, measures and performance indicators needed to evidence the quality of the outputs, outcomes and impact and then consider the inputs required to achieve these results.

There are a number of publications and toolkits on QA in open, distance and blended learning, including Clarke-Okah and Coomaraswamy (2009), Jung and Latchem (Eds) (2012), Latchem (2012) and the QAQE Special Interest Group (2011). UNESCO-UNEVOC (2013b) argues that standards of quality assurance and quality control should be applied to TVET by seeking certification from a standardization organization or by adopting a quality assurance management mechanism to ensure quality of training. It refers readers to:

- The European Common Quality Assurance Framework (CQAF) in TVET, which has been developed to increase transparency and consistency between the EU Member States and provide them with a set of tools to improve, monitor and evaluate their QA policies and practices.
- The European Quality Assurance for Vocational Education and Training (EQAVET), which is designed to help countries in the EU promote and monitor continuous improvement in their TVET systems in accordance with agreed standards.
- The ISO Standard Quality assurance systems, whose use is gaining momentum in the sector.

When it comes to QA and e-learning, a number of resources may be referred to. The VET E-standards for Training (Australian Government Department of Industry, 2015) are a national set of technical standards recommended for all e-learning content and systems in the vocational education and training sector which are reviewed and ratified annually by the E-standards Expert Group for the sector. These E-standards are intended to:

- Remove barriers to e-learning.
- Ensure maximum interoperability of VET systems and content.
- Maximize the viability, integrity and portability of e-learning resources.

They refer to accessibility, content formats, content packaging, intellectual property management, metadata and vocabularies, platforms, repositories and web services. These E-standards recommendations are based on more than 2.3 million visits to Australian national and state-based, high-volume, VET-specific websites in use in 2014, and data analysed over four three-month periods to identify trends in the uptake of technology. The Australasian Council on Open, Distance and e-learning (ACODE, 2014) benchmarks may also be useful in helping institutions to judge the quality of the technology-enhanced learning experiences (e-learning, online or flexible learning, blended learning, etc.) that they provide for students and staff. There are eight benchmarks, each of which can be used as a stand-alone indicator, or used collectively to provide a whole institution perspective. These benchmarks become even more powerful when they are used in association with other institutions, as part of a collaborative benchmarking exercise. This is where one or more institutions are willing to share their practice and journey in technology-enhanced learning with others, based on the outcomes of their own internal benchmarking activity. These benchmarks have recently undergone a major review to ensure they are now both current and forward-looking.

They cover the following eight topic areas:

- Institution-wide policy and governance for technology-enhanced learning.
- Planning for institution-wide quality improvement of technology-enhanced learning.

- Information technology systems, services and support for technology-enhanced learning.
- The application of technology-enhanced learning services.
- Staff professional development for the effective use of technology-enhanced learning.
- Staff support for the use of technology-enhanced learning.
- Student training for the effective use of technology-enhanced learning.
- Student support for the use of technology-enhanced learning.

Each of the above benchmarks includes a Scoping Statement, a Good Practice Statement, a set of Performance Indicators (PIs) and an area in which to make recommendations on what may need to be improved on following the assessment.

Jisc's (2004) Effective Practice with e-learning may also yield some useful ideas for selecting criteria for judging the fitness for purpose of ICT and digital-based teaching and learning. Kawachi (2013) also offers quality assurance guidelines for creating or evaluating OER. After reviewing the criteria for quality assurance in related fields, from the research literature and from OER workshops and individual OER experts around the world, he suggests using a TIPS framework, 'wherein the TIPS acronym stands for the Teaching and learning process, the Information and material content, the Presentation, product and format and System, technical and technology' (p. 5). More than 200 criteria have also been collated for the use of those developing or assessing OER.

In 2013, the Flexible Learning Advisory Group (FLAG) in Australia partnered with the National VET Equity Advisory Council (NVEAC) to develop guidelines for good practice in e-learning for disadvantaged learners in vocational education and training, based on a literature review of strategies adopted by national and international providers. In this study, the researchers used the NVEAC definition of disadvantaged learners: people from socioeconomically disadvantaged backgrounds; indigenous Australians; women; people from culturally and linguistically diverse backgrounds; new arrivals to Australia, refugees and emerging communities; people with a disability; and people from rural, regional or remote locations or communities with high levels of disadvantage.

Four sets of factors were found to be critical:

- A learner-centred approach.
- Support strategies.
- Blended delivery models.
- Accessibility.

The resultant Good E-Practice Guidelines take the form of checklists designed to help providers identify the expectations and factors potentially impacting upon learning experiences and outcomes when providing e-learning for disadvantaged learners (Hensley and Goldsmith, 2013).

Earlier mention was made of the fact that the use of ISO certification is gaining momentum in TVET. ISO is an international standard-setting body composed of representatives from various national standards organizations. It is an independent, non-governmental organization whose members are the standards organizations of 163 member countries. It facilitates world trade by providing common standards between nations and has set nearly 20,000 standards covering everything from manufactured products and technology to food safety, agriculture and health care; ensuring that products and services are safe, reliable and of good quality; increasing productivity; and minimizing errors and waste. By enabling products from different markets to be directly compared, the standards not only help companies to enter new markets but also assist in the development of global trade on a fair basis. The standards also serve to safeguard consumers and the

end users of products and services by ensuring that certified products conform to the minimum standards set internationally.

The International Council for Open and Distance Education (ICDE) sees considerable advantage in tertiary institutions gaining certification in the ISO 21001 standard (Educational Organization Management Systems) , observing that this is likely to become the de facto reference point for QA in ICT and digital-based teaching and learning around the globe (Ossiannilsson, Williams, Camilleri and Brown, 2015).

ISO itself claims that the potential benefits for educational providers of using this international standard are:

- → better alignment of educational mission, vision, objectives and action plans
- → inclusive and equitable quality education for all
- → promotion of self-learning and lifelong learning opportunities
- → more personalized learning and effective response to special educational needs
- → consistent processes and evaluation tools to demonstrate and increase effectiveness and efficiency
- → f) increased credibility of the educational organization
- → recognized means to enable organizations to demonstrate commitment to education management practices in the most effective manner
- → a model for improvement
- → harmonization of national standards within an international framework
- → widened participation of interested parties
- → stimulation of excellence and innovation (ISO, 2015, p. 4)

The Internet is an invaluable tool for sharing and adopting QA policies, practices, resources and ideas by policymakers, managers, practitioners and researchers and developing inter-sector, regional and international QA systems for ICT and digital-based applications in TVET.

Conclusion/Summary

This Unit identifies some specialized uses of ICTs and digital such as Special Needs Education in the Information Age, AT for Students with Special Educational Needs, Distance Technologies for Students with Special Educational Needs, and ICT and digital Policy in Special Needs Education. Furthermore, the module demonstrated the many ways in which ICTs and digital can be used to help TVET transform its operations, raise its profile, improve the quality of its courses and services and collaborate to create a training ecosystem wherein, as in natural ecosystems, all the different stakeholders in the internal and external organizational ecosystem share and exchange information, resources and sources to each other's benefit. The opportunities for making the best use of these media and modes range from opening up TVET learning opportunities to remote, disadvantaged and minority communities, to meeting the demand from overseas students attracted to the opportunity to study global online programmes with proven high standards. The challenges of harnessing technology and achieving access, connectivity, content development, localization and customization to maximize capacity development are waiting to be taken up. The case studies in the following section of this book demonstrate some of the ways in which nations, states, institutions and NGOs are using these technologies and methods to increase the reach, equitability and impact of TVET, improve learning outcomes and services to students and establish new paradigms and environments for developing the knowledge and skills required for tomorrow's world of work. It is important for institutions and agencies to learn how to evaluate their readiness in different usage dimensions in TVET programmes. This is addressed in module 3.

Transformative Reflection

Having completed this section, consider the following transformative reflections:

1 Focus on the assumptions underlying your beliefs, feelings and actions regarding the potential specialized uses of ICTs and digital in TVET.

2 Examine and assess the consequences of these assumptions on your beliefs, feelings and actions in relationship to the uses of ICTs and digital in TVET.

3 Consider your learning experiences while completing this segment of instruction. Conduct a critical reflection regarding the extent to which this instruction has helped you identify and explore alternative sets of assumptions or reinforced your initial assumptions regarding the potential uses of ICTs and digital in TVET.

4 If this instruction has helped you consider alternative sets of assumptions, test the validity of these assumptions by participating in a reflective dialogue with a critical friend or by engaging in self-reflection.

Unit 2.3
Quiz

Self-assessment questions

Multiple choice: Circle all the correct answers that apply for each question. There may be more than one correct answer.

1. The arms of the specialized training course ICTs and digital in Education for People with Special Needs included the following:

A. Special Needs Education in the Information Age

B. AT for Students with Special Educational Needs

C. Distance Technologies for Students with Special Educational Needs

D. Technology for Special Needs Education

2. The three levels of informal learning include the following:

A. Incidental learning

B. Reactive or opportunistic learning

C. Emotional Learning

D. Deliberate learning

3. One technology that plays an important role in informal learning is:

A. Mass Media

B. Social Media

C. Mobile Media

D. Handheld media

4. Mismatch between demand and supply of TVET graduates can be reduced through the provision of:

A. Demand information

B. Career Information

C. Supply Information

D. None of the above

5. One of the major challenges in assuring quality in open, distance and blended learning is:

A. The Quality Triangle

B. The Iron Triangle

C. The Assurance Triangle

D. All these answers are correct

6. E-standards in quality assurance are intended to address the following:

A. Removing barriers to e-learning.

B. Ensuring maximum interoperability of TVET systems and content.

C. Removing misunderstandings in the TVET system

D. Maximizing the viability, integrity and portability of e-learning resources.

7. An invaluable tool for sharing and adopting quality assurance policies is:

A. The computer

B. The handset

C. The smart board

D. The Internet

8. The Iron Triangle entails:

A. The correct balance between access, cost and quality

B. The correct balance between access, process and quality

C. The correct balance between product, cost and quality

D. The correct balance between access, price and quality

9. A useful means of acquiring stakeholders' views and information about market demands is through:

A. ICTs and digital

B. Mass Media

C. Multimedia

D. Podcasts

10. Some certifications for quality assurance in TVET include the following:

A. CQAF

B. IMF

C. EQAVET

D. The ISO Standard

Practice Questions

1. Using your transformative reflection experience, develop an institutional toolkit for the use of ICTs and digital in TVET.

2. Ask a group of key stakeholders in TVET to review the toolkit.

References

ACODE. (2014). Benchmarks for technology enhanced learning. Canberra: Author. Retrieved 22 May 2016 from www.acode.edu.au/pluginfile.php/550/mod_ resource/content/7/TEL_Benchmarks.pdf

Allais, S. (2010). The implementation and impact of national qualifications frameworks: Report of a study in 16 countries. Geneva: International Labour Office. Retrieved 22 May 2016 from http://ilo.int/wcmsp5/groups/public/@ed_emp/@ifp_skills/documents/meetingdocument/wcms_126589.pdf

Ally, M. (2014). Knowledge series: Increasing access to education for all through mobile learning. Vancouver: Commonwealth of Learning. Retrieved 26 July 2015, from http://oasis.col.org/bitstream/handle/11599/703/KS14_ MobileLearning.pdf?sequence=1&isAllowed=y

Australian Government Department of Industry. (2015). VET E-standards for training. Canberra: Author. Retrieved 22 May 2016 from www.unevoc.unesco.org/go.php?q=UNEVOC+Publications&lang=en&akt=au&st=adv&qs=Australian+Government+Department+of+Industry

Automating instructional design: approaches and limitations j. Michael Spector and Celestia Ohrazda. https://members.aect.org/edtech/26.pdf

Baba, J. P. J. (2015, 26 February). How people use the mass media? [Web log post]. Retrieved 22 May 2016 from http://wecommunication.blogspot.com. au/2015/02/how-people-use-mass-media.html

Bates, T. (2012, 5 August). What's right and what's wrong about Coursera-style MOOCs [Web log post]. Retrieved 22 May 2016 from www.tonybates. ca/2012/08/05/whats-right-and-whats-wrong-about-coursera-stylemoocs/#sthash.Ykl8vi0s.dpuf

Bethany Christian College of Teacher's Education (2020). ICT and digital for educational administration and management. https://sites.google.com/site/bethanycollegeofteacheredn/unit-3-ICT and digital-for-educational-administration-and-management

BBC News. (2010, 8 March). Internet access is "a fundamental right." Retrieved 22 May 2016 from http://news.bbc.co.uk/2/hi/8548190.stm 48

Billett, S. (Ed.). (2009). Section 11 – The TVET professional. In R. McLean & D. Wilson (Eds), International handbook on education for the world of work. Dordrecht, The Netherlands: Springer.

Bin, R. and Hussaini, A. B. (2018). Application of ICT and digital as Teaching Tool in Electrical Installation in Nigerian TVET Institutions. Sumerianz Journal of Education, Linguistics and Literature, 1(1), 24-28

Bortei-Doku Aryeetey, E., Doh, D., & P. Andoh, P. (2011). From prejudice to prestige: Vocational education and training in Ghana. Centre for Social Policy Studies, University of Ghana, City & Guilds Centre for Skills Development and the Council for Technical and Vocational Education and Training, Ghana. Retrieved 22 May 2016 from https://issuu.com/skillsdev/docs/vocationaleducation-and-training-in-ghana/3

BT Learning Solutions. (2013). Employee learning – the next generation. London, UK: British Telecommunications plc. Retrieved 22 May 2016 from https://webcache.googleusercontent.com/search?q=cache:unxk9k4sBMJ:https://www.globalservices.bt.com/static/assets/pdf/ products/learning_solutions/BT_Learning_Solutions_datasheet. pdf+&cd=1&hl=en&ct=clnk&gl=ca

Business Wire. (2007). Singapore's Institute of Technical Education announced as winner of IBM Innovations Award in Transforming Government. San Francisco/ New York: Business Wire. Retrieved 22 May 2016 from www.businesswire. com/news/home/20070925005069/en/Singapores-Institute-TechnicalEducation-Announced-Winner-IBM#.VNGN0p2Udh4

Clarke-Okah, W., & Coomaraswamy, U. (2009). Quality assurance toolkit for distance higher education institutions and programmes. Vancouver: Commonwealth of Learning. Retrieved 22 May 2016 from http://oasis.col.org/bitstream/handle/11599/105/pub_HE_QA_Toolkit_web. pdf?sequence=1&isAllowed=y

Coffield, F. (2000). The necessity of informal learning. Bristol: The Policy Press.

Commonwealth of Learning & Asian Development Bank. (1999). Designing materials for open and distance learning: Training toolkit. Vancouver: Commonwealth of Learning/Manila: Asian Development Bank. Retrieved 26 July 2015, from http://oasis.col.org/bitstream/handle/11599/46/ Designing_ Materials_02.pdf?sequence=1&isAllowed=y

Danaher, P. A., & Umar, A. (Eds). (2010). Perspectives on distance education: Teacher education through open and distance learning. Vancouver: Commonwealth of Learning. Retrieved 22 May 2016 from http://oasis.col.org/bitstream/ handle/11599/115/pub_PS_TeacherEd_web.pdf?sequence=1&isAllowed=y

Daneshgar, F., & Van Toorn, C. (2009). eLearning in the workplace versus eLearning in higher education. Australian Educational Computing, 24(1), 16-22. Retrieved 22 May 2016 from http://acce.edu.au/sites/acce.edu. au/files/pj/journal/AEC%20Vol%2024%20No%201%202009%20 elearning%20in%20the%20workplace%20versus%20elear.pdf

Daniel, J., Kanwar, A., & Uvalic´-Trumbic´, S. (2009). Breaking higher education's iron triangle: Access, cost, and quality. Change: The Magazine of Higher Learning, 41(2), 30-35. Retrieved 22 May 2016 from www.changemag.org/ archives/back%20issues/march-april%202009/full-iron-triangle.html 49

Dede, D., Abdullah, A G, Mulyanti, B. and Rohendi, D. (2019). Review TVET learning innovation: Augmented reality technology for virtual 3D laboratory. Journal of Physics: Conference Series 1402 doi:10.1088/1742-6596/1402/7/077062

Enakrire, R. T. (2019). ICT and digital-related training and support Programmes for information professionals. Education and Information Technologies 24, 3269–3287

Eraut, M. (2000). Non-formal learning, implicit learning and tacit knowledge in professional work. In F. Coffield (Ed.), The necessity of informal learning. Bristol: The Policy Press. Haber, J. (2014, 13 August). When MOOCs are better than college classes, Inside Higher Ed [Web log post]. Retrieved 22 May 2016 from https://www. insidehighered.com/blogs/higher-ed-beta/when-moocs-are-better-collegeclasses

Galindo, J. H. (2014). Authentic Learning (Simulations, Lab, Field). https://ablconnect.harvard.edu/authentic-learning

Green, T. (2012). Elements of Authentic Activities http://authenticactivitiespsychologyoflearn.blogspot.com/2012/04/elements-of-authentic-activites.html

References

Ghavifekr, S. Afshari, M. Siraj, S. & Seger, K. (2013). ICT and digital Application for Administration and Management: A Conceptual Review. Procedia - Social and Behavioral Sciences, 103(26), 1344-1351 https://doi.org/10.1016/j.sbspro.2013.10.70

Hague, C., & Logan, A. (2009). A review of the current landscape of adult informal learning using digital technologies. Bristol: Futurelab. Retrieved 22 May 2016 from http://preview.futurelab.org.uk/resources/documents/project_reports/becta/Adult_Informal_Learning_educators_report.pdf

Halliday-Wynes, S., & Beddie, F. (2009). Informal learning at a glance. Adelaide, SA: National Centre for Vocational Education Research (NCVER). Retrieved 22 May 2016 from https://www.ala.asn.au/wp-content/uploads/research/ Informal_learning-At_a_glance.pdf

He, W. (2008). Ernst & Young's practice of designing global e-learning program: A review from the ISD perspectives [Web log post]. Retrieved 29 July 2015 from www.richardhe.com/2008/ernst-young-practice-of-designingglobal-e-learning-program-a-review-from-the-isd-perspectives

Hensley, D., & Goldsmith, C. (2013). Good E-practice guidelines for disadvantaged learners in VET. Melbourne, Australia: The Flexible Learning Advisory Group (FLAG) and the National VET Equity Advisory Council (NVEAC). Retrieved 22 May 2016 from www.voced.edu.au/content/ngv%3A58190

ILO. (2011). A skilled workforce for strong, sustainable and balanced growth: A G20 training strategy. Geneva: Author. Retrieved 22 May 2016 from http:// ilo.org/wcmsp5/groups/public/---dgreports/---integration/documents/ publication/wcms_151966.pdf

Ismail, M. E., Faziehan, A., Ismail, I. M. and Othman, H. (2019). Design and Development of Augmented Reality Teaching Kit: In TVET Learning Contex. International Journal of Engineering and Technology 8(1.1):129-134. DOI: 10.14419/ijet.v8i1.1.24792

ISO. (2008). Educational organization management systems (Briefing Note: ISO 21001). Retrieved 25 August 2016 from www.iso.org/iso/iso21001_ briefing_note.pdf

ITU News. (2012). United Nations Secretary-General Ban Ki-moon shares his thoughts with ITU staff. ITU News, No. 4. Retrieved 22 May 2016 from https://itunews.itu.int/en/2595-United-Nations-Secretary-General-BanKi8209moon-shares-his-thoughts-with-ITU-staff-.note.aspx

Jisc. (2004). Effective practice with e-Learning. Bristol, UK: Author. Retrieved 22 May 2016 from www.webarchive.org.uk/wayback/archive/20140615094804/ http://www.jisc.ac.uk/media/documents/publications/ effectivepracticeelearning.pdf

Jung, I., & Latchem, C. (Eds). (2012). Quality assurance and accreditation in distance education and e-learning. London & New York: Routledge.

Katz, E., Blumler, J. G., & Gurevitch, M. (1974). Uses and gratifications research. The Public Opinion Quarterly, 37(4), 509-523. Retrieved 22 May 2016 from www.jstor.org/discover/10.2307/2747854?uid=3737536&uid=2&uid=4&s id=21102381303957 50

Kawachi, P. (2013). Quality assurance guidelines for open educational resources: TIPS Framework Version 1.0. New Delhi: The Commonwealth Educational Media Centre for Asia (CEMCA). Retrieved 22 May 2016 from http://cemca.org. in/ckfinder/userfiles/files/OERQ_TIPS_978-81-88770-07-6.pdf

Kasowitz, A. (1998, August). Tools for automating instructional design. ERIC Digest [On-line], EDO-IR-1998-1. Available: http://www.ericit. org/digests/EDO-IR-1998-01.shtml.

Khan, T., Johnston, K. and Ophoff, J. (2019). The Impact of an Augmented Reality Application on Learning Motivation of Students. Advances in Human Computer Interaction. https://doi.org/10.1155/2019/7208494

Kohl, T. A. S. (2012, 18 March). Quality in a service or product is not what you put into it [Web log post]. Retrieved 22 May 2016 from http://consulting. resourceassociatescorp.com/blog/bid/129006/Quality-in-a-service-orproduct-is-not-what-you-put-into-it

Lane, A. (2012). How OER support lifelong learning. In R. McGreal, W. Kinuthia, S. Marshall, & T. McNamara (Eds), Perspectives on open and distance learning: Open educational resources: Innovation, research and practice (pp. 141-152). Vancouver: Commonwealth of Learning. Retrieved 22 May 2016 from https:// oerknowledgecloud.org/sites/oerknowledgecloud.org/files/pub_ PS_OER-IRP_web.pdf

Latchem, C. (2012). Quality assurance toolkit for open and distance non-formal education. Vancouver: Commonwealth of Learning. Retrieved 22 May 2016 from https://oerknowledgecloud.org/sites/ oerknowledgecloud.org/files/ QA%20NFE_150.pdf

Law, S. S. (2007). Vocational technical education and economic development — the Singapore experience (ITE Paper No 9). Retrieved 22 May 2016 from http:// docplayer.net/7980817-Vocational-technical-education-and-economicdevelopment-the-singapore-experience.html

Leong, P. C. (2011, August). Key reforms in revitalising Technical and Vocational Education and Training (TVET) in Malaysia. Presentation at Regional Conference on Human Resource Development through TVET as a Development Strategy in Asia, Colombo, Sri Lanka. Retrieved 22 May 2016 from www.tvec.gov.lk/ HRDAsiaConf/document/presentation_day_01/ key_reforms_in_revitalizing_TVET_Malayisa.pdf

Livingstone, D. W. (2000). Exploring the icebergs of adult learning (Findings of the First Canadian Survey of Informal Learning Practices). Toronto: Ontario Institute for Studies in Education University of Toronto Retrieved 22 May 2016 from http://webspace.oise.utoronto.ca/~living13/icebergs/index. html

Loi, S. (2008, January). Leading change: Branding & marketing of TVET. PowerPoint presentation at Leaders in Education and Training for Sustained Growth in Africa Conference. Retrieved 22 May 2016 from http://siteresources.worldbank.org/INTAFRREGTOPEDUCATION/ Resources/444659-1204656846740/4734984-1204742235836/Session52- SabrinaLoi-Branding&MarketingofTVET.pdf

Majumdar, S. (2012). Foreword. In Strengthening TVET teacher education: Report of the UNESCO-UNEVOC online conference 25 July to July 6. Bonn: UNESCOUNEVOC International Centre for Technical and Vocational Education and Training. Retrieved 22 May 2016 from www.unevoc.unesco.org/ fileadmin/ user_upload/docs/Synthesis_report_eForumTVET_Teachers.pdf

McGreal, R. (2013). Knowledge series: Creating, using and sharing open educational resources. Vancouver: Commonwealth of Learning. Retrieved 22 May 51 2016 from http://oasis.col.org/bitstream/ handle/11599/44/acq-accredi. pdf?sequence=1&isAllowed=y

Meyers, N. M. & Nulty, D. D. (2009). How to use (five) curriculum design principles to align authentic learning environments, assessment, students' approaches to thinking and learning outcomes. Assessment & Evaluation in Higher Education, 34(5), 565-577.

References

Naiker, V. and Makgato, M. (2018). The Integration of ICT and digital in TVET College Classrooms: A Case in Automotive Repair and Maintenance Teaching. Int J Edu Sci, 20(1-3): 25-32 (2018) DOI: 10.1080/09751122.2017.1391477

Mikroyannidis, A., & Connolly, T. (2012). Introducing personal learning environments to informal learners: Lessons learned from the OpenLearn case study. In PLE Conference 2012, 11-13 July 2012, Aveiro, Portugal. Retrieved 22 May 2016 from http://oro.open.ac.uk/34501/1/OpenLearn-PLEConf-final.pdf

Modesto, S. T., & Tau, D. R. (2006). Introducing distance education. The Virtual University for the Small States of the Commonwealth/Botswana College of Distance and Open Learning. Retrieved 22 May 2016 from http://oasis. col.org/bitstream/handle/11599/424/Introducing_Distance_Education. pdf?sequence=1&isAllowed=y

Moore, M. G., Mackintosh, W., Black, L., Mushi, H., Shimhopilemi, R. K., Sa, … Norrie, J. (2002). Information and communication technologies in distance education: Specialized training course. Paris: UNESCO. Retrieved 22 May 2016 from http://iite.unesco.org/img/upload/Distance_Education.pdf

Nicholas, H. and Ng, W. (2015) Mobile Seamless Learning and Its Pedagogy Seamless Learning in the Age of Mobile Connectivity 261-280

Norton, R. E. (2013, August). Preparing future TVET teachers online. Presentation at the VET network Australia & the International Vocational Education & Training Association 2013 International Conference, Melbourne, Australia. Retrieved 22 May 2016 from www.unevoc.unesco.org/go.php?q =Online+library&lang=en&akt=id&st=&qs=5868&unevoc=0 OEB

News Portal. (2016). ICT and digital at the top of the TVET agenda. Retrieved 22 May 2016 from www. online-educa.com/OEB_

Newsportal/univo-vocational-training Online Educa Berlin. (2014, 27 November). ICT and digital at the top of the TVET agenda. Retrieved 22 May 2016 from www.online-educa.com/OEB_Newsportal/ univo-vocational-training

Ormrod, J.E. (2008). Human learning (5th ed.). Upper Saddle River, NJ: Pearson Prentice Hall.

Ossiannilsson, E., Williams, K., Camilleri, A. F., & Brown. M. (2015). Quality models in online and open education around the globe: State of the art and recommendations. Oslo, Norway: International Council for Open and Distance Education. Retrieved 22 May 2016 from www.icde.org/assets/ WHAT_WE_DO/ icdequalitymodels22.pdf

Pappas, C. (2013, 1 December). Top 10 e-learning statistics for 2014 you need to know. Learning Industry. Retrieved 22 May 2016 from http:// elearningindustry.com/top-10-e-learning-statistics-for-2014-you-need-toknow

Pellegrini, et al (2013). New technologies for career guidance and mobility Handbook for practitioners. Industria Grafica Pistolesi, Siena

PRESS RELEASE (2013). ICTs and digital are creating new jobs and making labor markets more innovative, inclusive, and global – World Bank study September 10, 2013. https://www.worldbank.org/en/news/press-release/2013/09/10/ICTs and digital-are-creating-new-jobs-and-making-labor-markets-more-innovative-inclusive-and-global-world-bank-study

QAQE Special Interest Group. (2011). A toolkit for harnessing quality assurance processes for technology enhanced learning. N.p.: QA-QE SIG. Retrieved 26 July 2015 from http://qaqe-sig.net/wp-content/uploads/2011/03/ Toolkit_version_2011_9_3.pdf

Qureshi, Z. H. and Abro, M., M., Q. (2016). Efficient Use of ICT and digital in Administration: A Case from Mehran University of Engineering and Technology, Jamshoro" Pakistan. International Journal of Economics, Commerce and Management, IV(10), 540

Raihan, M. A. and Han, S. L. (2011). Gateways Lifelong Learning in TVET for a Viable Future of Bangladesh. Journal of Lifelong Learning Society, 7(2), 1738. DOI: 10.26857/JLLS.2011.08.7.2.119

Ratnata, I. W. (2013). Enhancing the image and attractiveness of TVET. TVET@ Asia, 1, 1-13. Retrieved 22 May 2016 from www.tvet-online.asia/issue/1/ ratnata_tvet1

Rekkedal, T. (2012). Quality assurance in e-learning for European small-tomedium enterprises. In I. Jung & C. Latchem (Eds), Quality assurance and accreditation in distance education and E-learning (pp. 208-218). London & New York: Routledge. 52

Romiszowski, A. (2013). Design, implementation and management of eLearning for TVET: Institutional perspective (Workshop – Outline and Working Paper). Vancouver: Commonwealth of learning. Retrieved 29 July 2015 from http://dspace.col.org/bitstream/handle/11599/1783/2013_Romiszowski_ DesignTVET.pdf?sequence=1&isAllowed=y

Ross, J. (2015, 27 January). TAFE's aim for a higher degree of success. The Australian: Higher Education, p. 27. Shepherd, C. (2002). Making the case for content. Brighton, UK: Fastrak Consulting. Retrieved 29 July 2015 from www.fastrak-consulting.co.uk/tactix/Features/ lcms.htm

Stein, S. J., Isaacs, G. & Andrews, T. (2004). Incorporating authentic learning experiences within a university course. Studies in Higher Education, 29(2), 239-258.

Virtual & Augmented Reality for Vocational Courses. Applying new skills in safety https://www.classvr.com/virtual-reality-in-education/virtual-augmented-reality-for-vocational-courses/

Sultana, R. G. (2012, May). The push and pull of TVET: Can career guidance make a difference? PowerPoint presentation at 3rd UNESCO International TVET Conference Shanghai. Retrieved 22 May 2016 from www.unesco.org/ education/TVET2012/parallel-sessions-day2/1/R-Sultana.pdf

UNESCO. (2011). ICTs and digital in TVET [Policy Brief]. Paris: Author. Retrieved 22 May 2016 from http://iite.unesco.org/pics/publications/en/files/3214697.pdf UNESCO Bangkok. (n.d.). Teachers' role and needs in the ICT and digital environment. Retrieved 22 May 2016 from www.unescobkk.org/education/ICT and digital/themes/ training-of-teachers/guidelines/teachers-role-and-needs

UNESCO & Commonwealth of Learning. (2011, 2015). Guidelines for open educational resources (OER) in higher education. Paris: UNESCO; Vancouver: Commonwealth of Learning. Retrieved 22 May 2016 from http://unesdoc.unesco.org/images/0021/002136/213605e.pdf

UNESCO-UNEVOC. (2013a, May). ICTs and digital for TVET: Report of the UNESCO-UNEVOC Online Conference. Bonn: UNESCO-UNEVOC International Centre for Technical and Vocational Education and Training. Retrieved 22 May 2016 from www.unevoc.unesco.org/fileadmin/up/2013eForum_virtual%20conferenceICTs%20for%20TVET.pdf UNESCO-UNEVOC. (2013b).

References

UNEVOC Network Members present innovative uses of ICT and digital in TVET. Bonn: UNESCO-UNEVOC International Centre for Technical and Vocational Education and Training. Retrieved 22 May 2016 from www.unevoc.unesco.org/go.php?q=WorldSkills%20Leipzig%202013:%20 UNEVOC%20Network%20 members%20presenting%20innovative%20 uses%20of%20ICT%20in%20TVET

UNESCO-UNEVOC. (2013c). Promoting learning for the world of work. Bonn, Germany: UNESCO-UNEVOC International Centre for Technical and Vocational Education and Training. Retrieved 22 May 2016 from www. unevoc.unesco.org/go.php?q=Quality+assurance+in+TVET&context=

UN News Centre. (2005, 13 April). Information technology must be used to promote development, Annan tells UN forum. Retrieved 22 May 2016 from www.un.org/apps/news/story.asp?NewsID=13961&Cr=information &Cr1=technology

Walther, R. (2011). Building skills in the informal sector (Background Paper prepared for the Education for All Global Monitoring Report 2012). Paris: 53 UNESCO. Retrieved 22 May 2016 from www.unesco.org/new/fileadmin/ MULTIMEDIA/HQ/ED/pdf/gmr2012-ED-EFA-MRT-PI-08.pdf

Watts, A. G. (2013). Career guidance and orientation. In UNESCO-UNEVOC, Revisiting global trends in TVET: Reflections on theory and practice (pp. 239- 274). Bonn: Author. Retrieved 22 May 2016 from www.unevoc.unesco.org/ fileadmin/up/2013_epub_revisiting_global_trends_in_tvet_chapter7.pdf

Watts, A.G. (2001). The Role of Information and Communication Technologies in an Integrated

Career Information and Guidance System. National Institute for Careers Education and Counselling, United Kingdom A paper prepared for an OECD review of policies for information, guidance and counselling services Commissioned jointly by the European Commission and the OECD

Winch, C. (2013). The attractiveness of TVET. In UNSECO-UNEVOC, Revisiting global trends in TVET: Reflections on theory and practice (pp. 86-122), Bonn: UNESCO-UNEVOC International Centre for Technical and Vocational Education and Training. Retrieved 22 May 2016 from www.unevoc. unesco.org/fileadmin/up/2013_epub_revisiting_global_trends_in_ tvet_chapter3.pdf

https://educationaltechnologytoday.com/ubiquitous-learning/

https://www2.ed.gov/about/offices/list/ovae/pi/cte/cgcp.html

https://www.edu-links.org/learning/10-principles-developing-ICT and digital-education-programs

Module 3

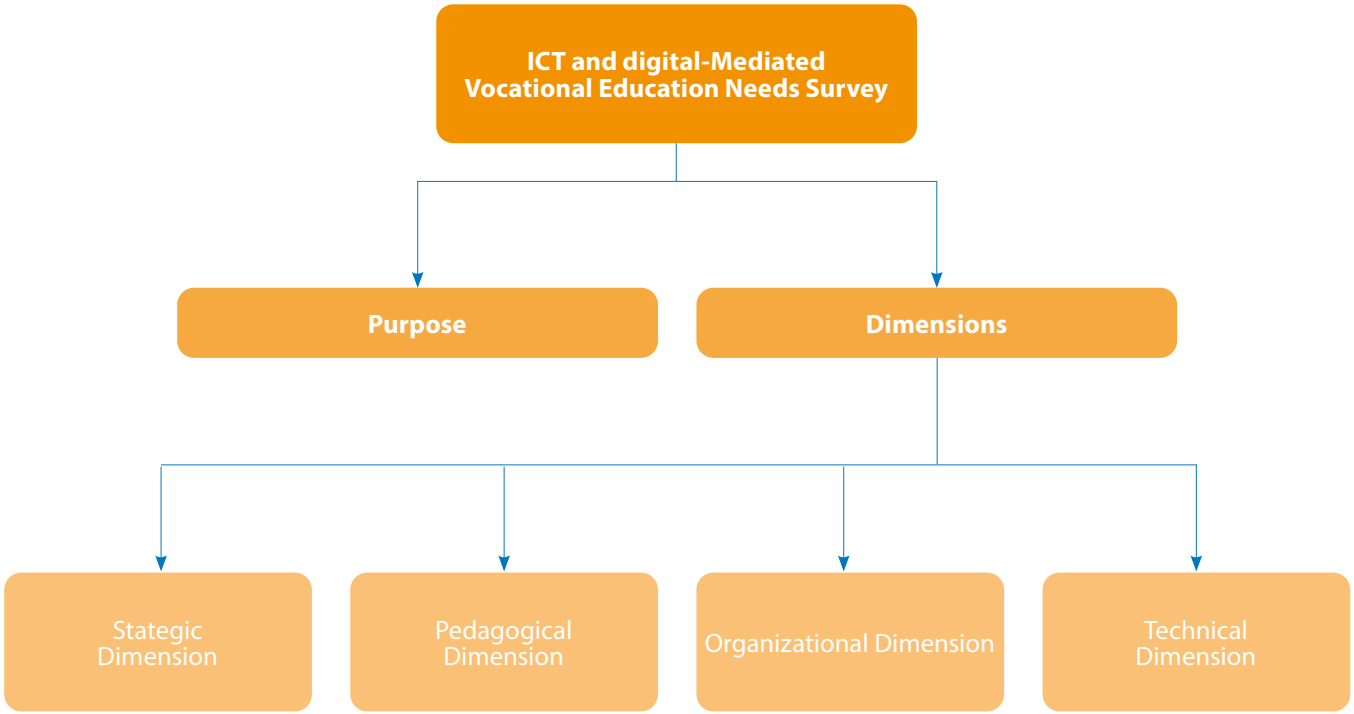
EVALUATION OF READINESS AND LEVEL OF ICT AND DIGITAL INTEGRATION IN THE TVET EDUCATION SYSTEM

Unit 3.1 Dimensions for the evaluation of readiness and level of ICT and digital integration in the TVET education system

Objective 3.1.1

Identify dimensions for assessing ICT and digital integration readiness

Have you identified specialized uses of ICTs and digital in TVET in your institution or country?



Now that you have completed your journey through this educational material, we invite you to use the knowledge and skills acquired to assess the e-learning readiness of your organization, using the following Quick Scan: SPOT! questionnaire. E-LEARNING READINESS QUICK SCAN: SPOT! (Developed by Baalen and Moratis, revised by Chinien, Kotsik, 2004). The e-learning Readiness Quick Scan: SPOT! is designed to be used during the planning and implementation stages of e-learning initiatives. The questionnaire was used for the IITE Workshop 'ICTs and digital in TVET' in Sofia, Bulgaria, on 3 April 2004 held as part of the IITE subregional project 'South-East Europe ICTs and digital for the Development of Education and the Construction of a Knowledge Society'.

ICT and digital-mediated vocational education needs survey:

Purpose

SPOT!

The ICT and digital-Mediated Vocational Education Needs Survey is designed to be used during the planning and implementation stages of ICT and digital-Mediated Education initiative.

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Dimensions

Strategic Dimension

The strategic dimension is concerned with creating a strategic plan for the ICT and digital-Mediated Vocational Education initiative. This involves establishing and communicating a vision, a strategy and objectives. This is recognized by assessing the strengths and weaknesses of an ICT and digital-Mediated Education initiative in a particular country.

Pedagogical Dimension

The pedagogical dimension is concerned with the fit between the ICT and digital-Mediated Vocational Education initiative and the learning approach currently employed.

Organizational Dimension

The organizational dimension focuses on the initiative's culture and impact on human capital, and the resulting management implications.

Technical Dimension

The technical dimension is concerned with awareness surrounding internal technical capabilities and learning technologies available in the market.

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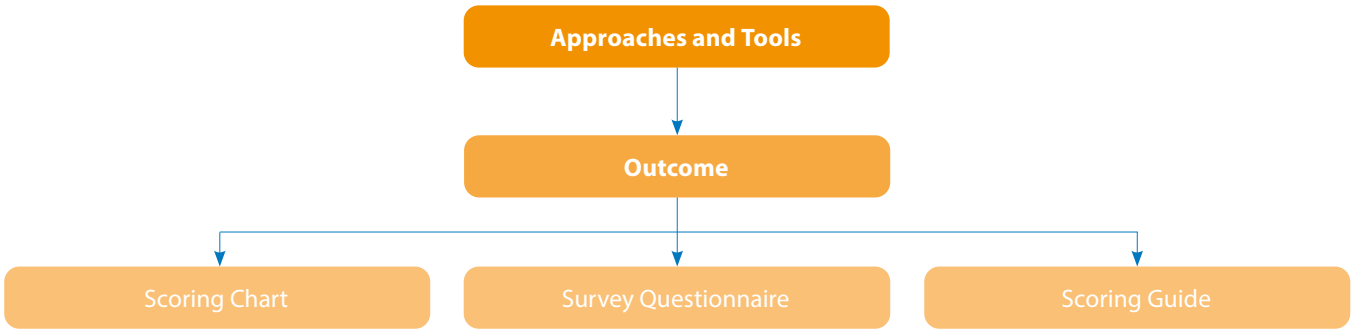
EVALUATION OF READINESS AND LEVEL OF ICT AND DIGITAL INTEGRATION IN THE TVET EDUCATION SYSTEM

Unit 3.2 Approaches and tools for assessing readiness and level of ICT and digital integration

Objective 3.2.1

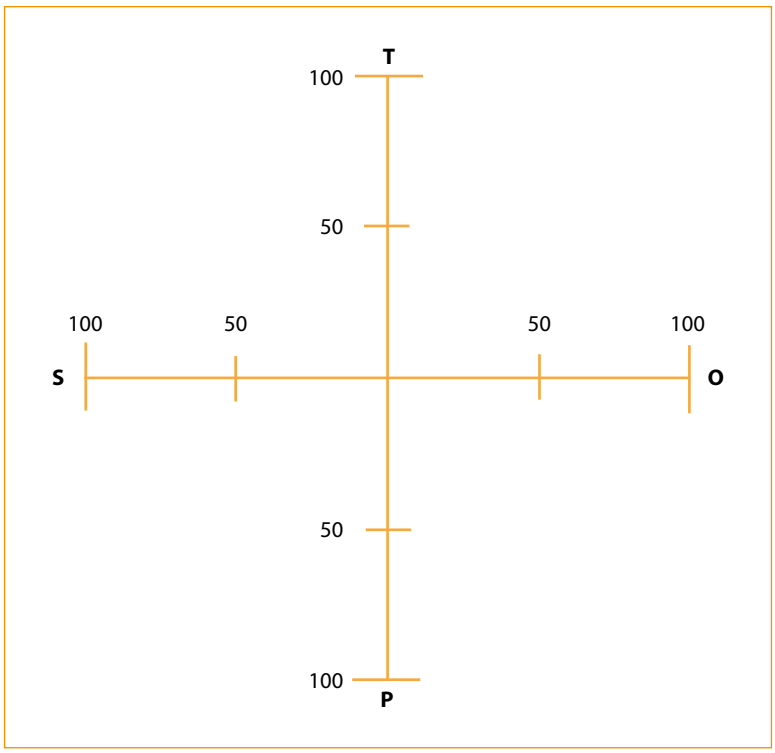
Identify approaches and tools for assessing readiness and level of ICT and digital integration in the TVET Education system



Outcomes

Each individual dimension score is converted to a percentage and represented on the following status graph. This is done for ease of comparison between the dimensions and to visualize the country's overall stages of implementing ICT and digital-Mediated Education in TVET. The graph makes it easier to identify areas in need of attention or improvement.

Scoring Card



Degree of Importance		Skill level	
5	Very high importance	5	Highly skilled
4	High importance	4	Very skilled
3	Important	3	Skilled
2	Low importance	2	Low skilled
1	Very low importance	1	Very low skilled
0	Not important at all	0	Not skilled at all

Survey Questions

STRATEGIC DIMENSION				
	Question		**Answer (yes/no)**	**Point value**
1	Has your country established the following for your ICT and digital-Mediated Education initiative?		Strategy	yes = 0 no = 4
			Vision	
			Objectives	
			Financial viability of the project	
2	Has your country communicated the following to all stakeholders?		ICT and digital-Mediated Education strategy	yes = 0 no = 4
			ICT and digital-Mediated Education vision	
			ICT and digital-Mediated Education objectives	
3	Has your country created or reviewed and appropriately modified legislation to facilitate the use of ICTs and digital in TVET?		Reviewed and appropriately modified legislation to facilitate the use of ICTs and digital in TVET.	0
			No, our country has not created, reviewed and appropriately modified legislation to facilitate the use of ICTs and digital in TVET.	
4	Has benchmarking been conducted against other countries?		No, we have not benchmarked against other countries.	4
			We have informally benchmarked against other countries.	2
			Yes, we have benchmarked against other countries.	0
5	What is the purpose of the ICT and digital-Mediated Education initiative with respect to your current learning approach?		The purpose of the ICT and digital-Mediated Education initiative is to make as much of the programme virtual as possible.	4
			The purpose of the ICT and digital-Mediated Education initiative is to complement the current programme components with ICT and digital-Mediated Education technologies.	0
			We haven't defined a relationship between ICT and digital-Mediated Education and our current learning approach.	4
			TOTAL	

PEDAGOGICAL DIMENSION				
	Question		**Answer (yes/no)**	**Point value**
1	Has your country assessed the compatibility of educational technology with your institutions' learning approach?		We have performed an assessment and found them to be compatible.	0
			In our assessment we found them to be incompatible.	4
			We have not performed an assessment.	4
2	Has your country surveyed the opportunities to include ICT and digital-Mediated Education technologies in your curriculum?		We have surveyed the prospects and	0
			found several opportunities.	4
			We have surveyed the prospects but have found minimal opportunities to include the technology.	4
3	Have you surveyed the prospects to identify opportunities to include the technology?		Yes, and their capabilities are sufficient for ICT and digital-Mediated Education.	0
			Yes, and we have identified a need to develop their technological proficiency before implementing ICT and digital-Mediated Education.	2
			No, we have not assessed their technological proficiency.	2
4	Have you ensured that your ICT and digital-Mediated Education initiative fulfils (prospective) students' educational needs and meets their expectations of modern learning environments?		Yes, we have ensured that our initiative fulfils student's educational needs and meets their expectations of modern learning environments.	0
			No, we have not ensured that our initiative fulfils student's educational needs and meets their expectations of modern learning environments.	2
5	Are the knowledge, skills and abilities of your educators sufficient enough to ensure effective student instruction by means of ICT and digital-Mediated Education?		Our educators will need development/training to ensure the success of this initiative.	4
			We will need to hire additional educators or consult experts to ensure the success of this initiative	4
			Our human capital is sufficient for the success of this initiative.	0
			Our human capital exceeds the requirements of this initiative.	0
			TOTAL	

Degree of Importance		Skill level	
5	Very high importance	5	Highly skilled
4	High importance	4	Very skilled
3	Important	3	Skilled
2	Low importance	2	Low skilled
1	Very low importance	1	Very low skilled
0	Not important at all	0	Not skilled at all

Survey Questions

ORGANIZATIONAL DIMENSION				
	Question		**Answer (yes/no)**	**Point value**
1	How well does the culture of your educational institutions deal with change?		Well. Our educational institutions are very familiar with change.	0
			Somewhat well. Our educational institutions do not incur a lot of change.	2
			Not well. We have encountered problems implementing changes.	4
			Our educational institutions prefer the status quo. They do not look for reasons to change.	4
2	Does your country's teaching staff support the ICT and digital-Mediated Education initiative?		No. They have expressed resistance to the initiative.	4
			I do not believe they have a clear understanding of the initiative.	4
			Part of our teaching staff support this initiative.	2
			Yes, the majority support this initiative.	0
3	Has your country identified leader(s) capable of championing and rallying support for this initiative?		Yes, we have identified a champion for this initiative.	0
			No, we have not identified a champion for this initiative.	2
4	Have you identified a champion for this initiative?		We have established support systems and their existence has been communicated throughout the organization.	0
			We have established support systems and their existence has been communicated to key organizational players.	1
			We have established support systems but only persons who enquire know of their existence.	2
			We have established support systems, but their existence has not been communicated.	3
			We have not established support systems.	4
5	Have you completed or established the following for your teaching staff?		Needs Assessment	yes = 0 no = 2
			IT Comfort Levels	
			Training Plan	
			Minimum Training Standard	
			Mechanism to monitor training results.	
			TOTAL	

TECHNICAL DIMENSION				
	Question		**Answer (yes/no)**	**Point value**
1	Do you have an overview of available learning technologies?		Yes, we have researched available technologies.	0
			No, we do not have an overview of available learning technologies.	4
2	Has benchmarking been conducted against learning technologies available in the marketplace?		No, we have not compared our current capabilities to market norms.	4
			We have informally benchmarked against available learning technologies.	2
			Yes, we have formally benchmarked against learning technologies available in the marketplace.	0
3	What is the current state of the country's technological infrastructure when compared to ICT and digital-Mediated Education initiative requirements?		The country has more than adequate infrastructure for this initiative.	0
			The country has adequate infrastructure to meet this initiative's requirements.	0
			The country's infrastructure is not currently advanced enough to support this initiative.	2
			The organization has no technology infrastructure.	4
4	Has your country created a technology application/ infrastructure implementation plan?		Yes, we have created a technology implementation plan.	0
			We have implementation ideas, but nothing concrete	2
			No, we do not have a technology implementation plan.	4
			No, because we currently have (more than) adequate technology for this initiative.	0
5	Has your country established and communicated the existence of technological support systems?		We have established support systems and their existence has been communicated throughout the country.	0
			We have established support systems and their existence has been communicated to key players.	1
			We have established support systems but only persons who enquire know of their existence.	2
			We have established support systems but their existence has not been communicated.	3
			We have not established support systems.	4
			TOTAL	

Scoring Dimension

Strategic dimension

0 – 12
Your country is strategically ready to implement ICT and digital-Mediated Education. You have taken the time to assess your country's strengths. You have established key strategic guidelines for your project, taking important elements into consideration. Congratulations!

13 – 26
While you have made valiant steps towards the strategic dimension, there are a few things that you may have overlooked in your strategic planning stage. Whether it's communicating the initiative's objectives or establishing policy, strategy is a key element to the success of any initiative. Review the identified problem areas to ensure that you are strategically ready for this initiative.

27 – 42
Your country is not strategically ready to implement ICT and digital-Mediated Education. The success of a project is contingent on its strategy. Your country needs to complete an assessment. This will provide the appropriate foundation to establish strategy. Another key component of the strategic dimension is achieving stakeholder buy-in, this can be achieved by communicating the initiative's strategy to the key stakeholders.

Pedagogical Dimension

0 – 5
Your country is pedagogically ready to implement ICT and digital-Mediated Education. You have taken the time to ensure your ICT and digital-Mediated Education initiative's compatibility with your country's orientation and have identified opportunities to include ICT and digital-Mediated Education in your curriculum. You have a comprehensive understanding of your student's technological capacities and educational requirements and are prepared to fulfil their expectations.

6 – 10
While you have considered several pedagogical facets integral to implementing your ICT and digital-Mediated Education initiative, there are a few areas that require a little more attention. Have you ensured that you have an accurate profile of your prospective students, including technological proficiencies and requirements and expectations of an ICT and digital-Mediated Education programme? Have you examined your current orientation and curriculum to ensure that ICT and digital-Mediated Education is concurrent with their pedagogy? Have you assessed the skills, knowledge and abilities of your teaching staff and ensured that they are sufficient for this initiative?

11 – 16
You do not have a pedagogical dimension that is sufficient to support the implementation of ICT and digital-Mediated Education. Ensuring a fit between your organization's orientation and your initiative is critical to its success in the long-term and should not be overlooked. Understanding your target audiences' strengths and limitations regarding technology will help you tailor your product to maximize learning, as will understanding their educational needs and learning environment expectations.

Organizational Dimension

0 – 8
Congratulations! The appropriate elements of an organizational dimension have been met. In preparation for your initiative, your organization has appropriately reviewed the capabilities of your staff and the organizational culture. An initiative champion has been identified, and the appropriate support systems have been established and communicated.

9 – 16
Your country still has a few things to undertake to ensure organizational dimension. Having a clear understanding of the knowledge, skills and abilities of your teaching staff is key to successfully implementing ICT and digital-Mediated Education. Evaluating the organizational culture can minimize potential resistance problems. Your employees are stakeholders in this initiative. Understanding their needs and developing the appropriate support systems will ensure this initiative's success.

17 – 24
Your country dimension is not sufficient to support ICT and digital-Mediated Education. Having a complete understanding of your staff's present and required knowledge, skills and abilities will facilitate the successful implementation of ICT and digital-Mediated Education. Establishing and communicating support systems will ease the implementation process for your teaching staff. An ICT and digital-Mediated Education champion can increase stakeholder buy-in, something that is imperative in initiatives such as this.

Technological Dimension

0 – 6
Your country is technologically ready to implement ICT and digital-Mediated Education. You have a solid understanding of your own capabilities as well as the learning technologies available in the marketplace. You have established an implementation plan and have established and communicated the appropriate technological support systems. It is obvious that you understand how key the technological dimension is to ICT and digital-Mediated Education implementation. You should encounter only minor problems.

7 – 14
Your country is not quite ready to implement ICT and digital-Mediated Education. Perhaps you have not explored all options of ICT and digital-Mediated Education, or perhaps your learning technology is not quite advanced enough to support this initiative. Whatever it may be, take the time to explore your technology options and create the appropriate implementation plans and support systems. Dealing with these issues now will minimize future problems. Remember, the choices that you make now will affect your organization's future technological capabilities.

15 – 20
Your country is not technologically ready to implement ICT and digital-Mediated Education. The success of an ICT and digital-Mediated Education initiative is dependent on an organization's present and future technological capabilities. Understanding your organization's technological infrastructure, benchmarking against available learning technologies, and being able to create an implementation plan are all key components of the technological dimension. Additionally, setting up support systems will ensure efficiency and facilitate adoption. Consider these factors when reviewing your organization's technological state.

Conclusion/Summary

This unit discussed the evaluation of the level of ICT and digital integration in the TVET education system. Specifically, readiness evaluation approaches discussed included strategic and organizational readiness, pedagogical readiness, learner readiness and technical readiness.

Transformative Reflection

Now that you have completed this segment of instruction, please engage in the following transformative reflection activities:

1 Focus on the assumptions that underlie your beliefs, feelings and actions in evaluating the level of ICT and digital Integration.

2 Examine and assess the consequences of these assumptions on your beliefs, feelings and actions in evaluating the level of ICT and digital Integration.

3 Consider your learning experiences while completing this segment of instruction. Conduct a critical reflection of how this instruction has enabled you to identify and explore alternative assumptions or reinforced your existing assumptions when evaluating the level of ICT and digital Integration.

4 If this reflection has enabled you to consider alternative assumptions, test the validity of these assumptions by participating in a reflective dialogue with a critical friend or by engaging in self-reflection.

Unit 3.1
Quiz

Self-assessment questions

Multiple choice: Circle all the correct answers that apply for each question. There may be more than one correct answer.

1. A tool that can be used to assess the e-learning readiness of an organization is:

A. E-Learning Readiness Quick Scan: SPOT!

B. E-Learning Readiness Quick Scan: SPAT!

C. E-Learning Readiness Quick Scan: SPART!

D. E-Learning Readiness Quick Scan: SMART!

2. The ICT and digital-Mediated Vocational Education Needs Survey is designed to be used during:

A. The initiative and developmental stages of the ICT and digital-Mediated Education initiative.

B. The planning and implementation stages of the ICT and digital-Mediated Education initiative.

C. The design and accreditation stages of the ICT and digital-Mediated Education initiative.

D. All these answers are correct

3. The dimension concerned with the fit between the ICT and digital-Mediated Vocational Education initiative and the learning approach employed is:

A. The Strategic Dimension

B. The Organizational Dimension

C. The Pedagogical Dimension

D. The Technical Dimension

4. The dimension concerned with creating a strategic plan for the ICT and digital-Mediated Vocational Education initiative is:

A. The Strategic Dimension

B. The Organizational Dimension

C. The Pedagogical Dimension

D. The Technical Dimension

5. The dimension which focuses on the initiative's culture and impact on human capital, and the resulting management implications, is:

A. The Strategic Dimension

B. The Organizational Dimension

C. The Pedagogical Dimension

D. The Technical Dimension

6. The dimension concerned with awareness surrounding internal technical capabilities and learning technologies available in the market is:

A. The Strategic Dimension

B. The Organizational Dimension

C. The Pedagogical Dimension

D. The Technical Dimension

7. Each individual dimension score is converted to a percentage and represented on a:

A. Status graph

B. Gradient graph

C. Vector graph

D. Station graph

8. At what range is an organization strategically ready to implement ICT and digital-Mediated Education?

A. 13 – 26

B. 0 – 12

C. 27 – 42

D. 0 – 5

9. At what range does an organization not have a sufficient pedagogical dimension to support the implementation of ICT and digital-Mediated Education?:

A. 0 – 5

B. 6 – 10

C. 11 – 16

D. 17 – 20

10. At what range is an organization not quite technologically ready to implement ICT and digital Mediated Education?

A. 0 – 6

B. 7 – 14

C. 15 – 20

D. 21 – 25

Practice Questions

1. Using your Transformative Reflection experience, develop a specific approach to evaluate levels of ICT and digital Integration. The level of readiness will enable an organization to plan the ICT and digital integration into TVET that is discussed in module 4.

Module 4

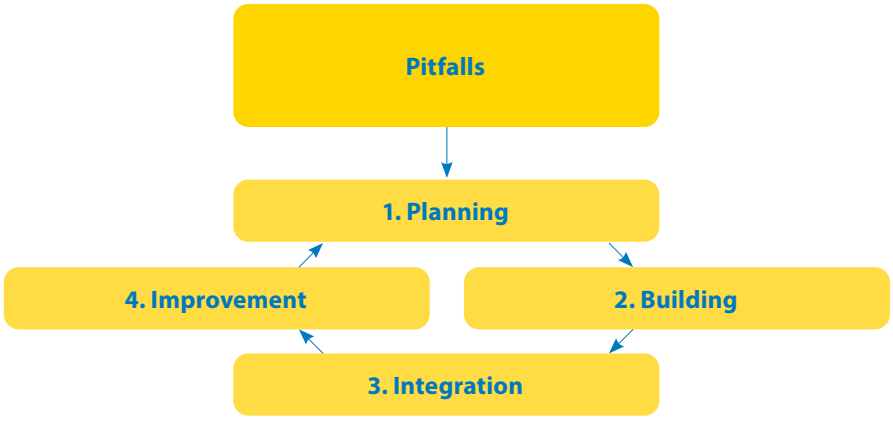
PLANNING MODEL FOR INTEGRATING ICTs AND DIGITAL INTO TVET AT NATIONAL AND INSTITUTIONAL LEVELS

Unit 4.1 Planning Model for integrating ICTs AND DIGITAL into TVET

Objective 4.1.1

Develop a Planning Model for the integration of ICTs AND DIGITAL into TVET

Has your organization developed a planning model for the integration of ICTs and digital into TVET?



The successful integration of ICTs and digital requires careful planning, since there are many pitfalls to avoid, such as:

- Allowing decisions to be driven by technology;
- Jumping on the 'everybody's doing it' bandwagon;
- Overlooking existing educational and ICT and digital systems;
- Underestimating front-end and ongoing funding requirements;
- Unclear statements of objectives to be achieved;
- Raising unrealistic expectations;
- Failing to keep stakeholders briefed and involved in the decision process (Farrell, 2001, p. 152).

The Conference Board of Canada (2001) developed a comprehensive planning model for the integration of e-learning into workforce development that addresses these pitfalls. This model (Figure 8) includes four distinct phases: Planning, Building, Improvement and Integration. Each of these phases is briefly reviewed in this section.

Planning

The planning phase involves a needs assessment of the organization and learners in relation to the capacity of the teaching and learning technologies. The planning phase includes the following steps:

1 Develop a team: bring all key stakeholders together to ensure buy-in and sound decision-making.

2 Assess organizational needs: assess previous e-learning experience, assess support for e-learning and determine benefits.

3 Define learners' needs and expectations: establish benchmarks regarding computer literacy, language skills, access to ICTs and digital and learning needs.

4 Understand how e-learning is different: analyse the differences between e-learning and other traditional delivery approaches such as classroom-based, instructor-led training.

5 Define the work processes involved in e-learning: determine the work processes, programmes, or courses within which e-learning will be integrated, and how technology will be used.

6 Assess and leverage existing ICTs and digital: assess existing infrastructure, equipment, courseware, e-learning experience and trainers and employees' ICT and digital literacy.

7 Define the budget: assess all costs and determine where the money will come from.

8 Get a seat at the information technology system table: build rapport and working relationships with IT colleagues.

9 Build or buy? Define your e-learning model: determine whether you are going to buy services, content, and technology externally, or develop them internally, or apply some combination of these two options:

Phase 1: Planning

- Develop a team.
- Assess organizational needs.
- Define learners needs and expectations.
- Understands how e-learning is different.
- Define the work processes to be involved in e-learning.
- Assess and leverage existing ICTs.
- Define the budget.
- Get a seat at IT system table.
- Define e-learning module.

Phase 2: Building

- Assess vendors and products.
- Research options by content, technology and service.
- Develop measures.
- Involve employees in content development.
- Repurpose content with caution.
- Leverage equipment supplier training.
- Partner with other organizations.
- Do not bite off more than you can chew.

Phase 4: Improvement

- Check and evaluate.
- Determine improvements.
- Assess/Integrate new technologies.
- Scale up or out.

Phase 3: Integration

- Integrate, do not implement.
- Develop e-literacy.
- Provide adequate ICTs.
- Train the trainers.
- Track, link and measure.
- Provide time to learn.
- Develop mechanism for content management and updating.
- Communicate.
- Build communities.

Figure 8: Planning model to integrate ICTs and digital into TVET
Source: The Conference Board of Canada as cited in Murray (2001, p. 26)

Naud and Bremner (2002, p. 5) described an Action Plan drawn up by the Province of Saskatchewan in Canada to implement e-learning into TVET. The Action Plan consists of six elements that define roles, responsibilities, and interrelationships based on the following principles:

- Equity: enhanced access to educational opportunity.
- Quality: content and instructional strategies that meet academic, pedagogical, and industry standards.
- Choice: increased choice through flexible, responsive, relevant and timely programmes and services.
- Coherence: increased opportunity and mobility for learners through a coherent and integrated delivery and programme array.
- Sustainability: long-term support by organizations and predictable funding.
- Partnership: working together on the basis of complementary and/or mutual interests.

Building

The purpose of the building phase is to develop an e-learning model complete with external vendors, suppliers and outcome measures to assess programme success as described in the following steps:

1. Assess the vendor market and products: develop criteria for assessing vendors of e-learning products.
2. Research e-learning options by content, technology, and service: assess proposals by content providers, technology providers and service providers; examine programme requirements to determine whether content should be developed internally or externally.
3. Develop measures: identify key success factors and develop an evaluation plan.
4. Involve employees in content development: engage employees in the content development – they can be provided with a template that they can populate with their knowledge.
5. Repurpose content with caution: assess existing instructional materials that can be used and packaged so they can fully benefit from the interactive possibilities of e-learning delivery.
6. Leverage equipment supplier training: develop partnerships with equipment suppliers to gain access to existing e-learning packages.
7. Partner with other organizations: develop partnerships with other institutions/organizations to gain access to existing e-learning packages.
8. Don't bite off more than you can chew: begin with a small-scale project that can demonstrate the success of e-learning.

Integration

This phase is designed to promote e-learning to administrators, instructors, and learners, providing professional development as required and collecting data as the process evolves.

- Integrate, do not implement: implementation is a top-down approach, integration is a more collaborative approach that can assist in building a successful e-learning community.
- Develop e-literacy: develop an e-literacy programme to assist learners in becoming familiar with ICTs and digital.
- Provide adequate ICTs and digital: ensure the availability and accessibility of ICTs and digital in sufficient quantities.
- Train the trainers: integrating e-learning requires a unique skill set, to provide adequate training to instructors.
- Track, link, and measure: use all data collected to monitor the success of e-learning.
- Provide time to learn: time is a barrier to e-learning, it is imperative to provide adequate time to all.
- Develop mechanisms for content management and upgrading: establish a system to manage and update content.
- Communicate: communicate the importance of e-learning to all stakeholders.
- Build communities: build e-learning communities on the basis of specific knowledge or content areas to solve problems, learn together and construct and share knowledge.

Improvement

This phase of the e-learning integration process focuses on improvement by researching new technologies, approaches, strategies and techniques.

1. Check and evaluate: analyse all data collected to identify strengths, weaknesses, successes and failures.
2. Determine improvements: identify areas of e-learning needing improvement.
3. Assess and integrate new technologies: keep abreast of technological development in e-learning and integrate technologies that facilitate and enhance learning.
4. Scale up or out: successful organizations or institutions can at this point develop external partnerships to sell their training programmes in order to recover their e-learning investments.

Case Study

The following case study briefly describes the effort of the Saskatchewan Institute of Applied Science and Technology (SIAST) in Canada to accelerate the pace of faculty development and the smooth integration of technology into TVET. The success of this model is based on a solid project plan, sound instructional design, high-quality interactive instruction and rigorous evaluation strategies. In a period of 18 months, SIAST has gained recognition as a leader in the online delivery of technical training through its impressive array of online programmes and services. This systematic approach offers worldwide application and could assist developing institutions in achieving their goals more quickly with only a modest investment in resources (Naud and Bremner, 2002).

The key to success in building a technology-literate organization is to engage faculty early, develop a cooperative network through technology-enhanced learning, and capitalize on early successes to advance institutional goals. This experience at SIAST clearly demonstrates how an entrepreneurial approach to collaboration and partnerships can be leveraged in accelerating the pace of faculty development and the smooth integration of technology.

Given Saskatchewan's relatively small population, which is dispersed over a large geographical area, the establishment of a technological infrastructure and the development of a province-wide plan were deemed critical as springboards for action in technology-enhanced learning. Faced with these challenges, a consortium of universities, colleges, aboriginal institutions, SIAST, and the provincial government's Department of Learning was formed to develop a technology-enhanced learning plan for the province. The consortium created the following vision 'The Saskatchewan post-secondary education and training sectors work collaboratively to make appropriate use of technology to serve the learning needs of all residents of the province by enhancing the quality of programmes and extending access'. The action plan defined roles, responsibilities and interrelationships based on the principles of equity, quality, choice, coherence, sustainability and partnership.'The Saskatchewan post-secondary education and training sectors work collaboratively to make appropriate use of technology to serve the learning needs of all residents of the province by enhancing the quality of programmes and extending access'. The action plan defined roles, responsibilities and interrelationships based on the principles of equity, quality, choice, coherence, sustainability and partnership.

Achieving a critical mass of champions was essential for institute-wide faculty orientation. SIAST used a collaborative model of skills transfer within the community of peers and a network of learning labs to familiarize faculty with technology, instructional resources and techniques. SIAST recognized early in the process that the use of technology itself as a medium for teaching was changing the role of faculty and their interaction with students. Consequently, faculty participation was critical in creating an environment that would facilitate change in the use of technology in teaching and learning. That level of involvement occurred at the grass-roots level and promoted a sense of community, teamwork and collaboration. In the first year of operation, 47% of employees took advantage of the training.

SIAST also worked closely with partner institutions to build a technology-enhanced learning network that featured a common policy framework and quality standards for content development, design, interactive instruction and a consistent look and feel. Partnerships with industry and the Apprenticeship Commission demonstrated proof of concept for delivering applied and skills-based training across the province. The outcomes of these initiatives were articulated in a five-year business plan and the establishment of the virtual campus. This step was important in communicating to internal and external stakeholders that senior management fully endorsed this project, while ensuring that appropriate timelines and resources were in place.

In 18 months, SIAST has become a leader in the online delivery of technical training by developing an impressive array of online programmes and services. This systematic approach offers worldwide application and can assist the developing institutions in achieving their goals faster with a modest investment in resources.

Conclusion/Summary

In summary, this Unit looked at a planning model for the integration of ICTs and digital into TVET. The model phases include planning, building, integration and improvement. During these phases, the planners are expected to assess the organization and learners, to develop and promote e-learning to stakeholders, and finally to consider areas for improvement by researching new technologies, approaches, strategies and techniques including policy options. The Unit concluded with a case study of SIAST in Canada that accelerated the pace of faculty development and smooth integration of technology into TVET. Appropriate planning demands that adequate policy be put in place to govern the integration process as discussed in 4.2.

Transformative Reflection

Now that you have completed this segment of instruction, please engage in the following transformative reflection activities:

1 Focus on the assumptions underlying your beliefs, feelings and actions regarding the Planning Model for Integrating ICTs and digital in TVET.

2 Examine and assess the consequences of these assumptions on your beliefs, feelings and actions in relationship to visioning and strategic planning for the implementation of ICT and digital-mediated education.

3 If this instruction has helped you consider alternative sets of assumptions, test the validity of these assumptions by participating in a reflective dialogue with a critical friend or by engaging in self-reflection.

Unit 4.1
Quiz

Self-assessment questions

Multiple choice: Circle all the correct answers that apply for each question. There may be more than one correct answer.

1. Below are some drawbacks of successful planning for ICT and digital integration into TVET:

A. Choices to be determined by technology

B. Overlooking current teaching and ICT and digital arrangements

C. Underestimating front-end and current funding requirements

D. Decisive statements of objectives to be achieved

2. The first stage of the planning model for ICT and digital integration into TVET is:

A. A needs assessment of the organization

B. Developing an ICT and digital model with external suppliers and outcome measures to assess programme success

C. Professional development and collecting data

D. Research on new technologies, approaches and strategies

3. The success story of SIAST in Canada is based all of the following:

A. A solid project plan

B. A thorough instructional design

C. First-class coaching

D. Demanding appraisal approaches

4. To promote e-learning to learners, providing professional development and collecting data during the planning process involves:

A. Developing partnerships with other institutions

B. Identifying key success factors

C. Establishing a system to manage and update content

D. Developing an evaluation plan

5. The Province of Saskatchewan Action Plan for implementing e-learning into TVET consists of any of two the elements:

A. Partnership and collaboration

B. Roles and responsibilities

C. Equality and coherence

D. Equity and unity

6. Ensuring quality in implementing the e-learning plan includes:

A. Content and industry standards

B. Effective teaching and collaboration

C. Responsibilities and instructional strategy

D. Content and e-learning standards

7. Good choices for implementing e-learning into TVET can only be achieved in the following order:

A. Flexible, responsive, relevant and timely services.

B. Flexible, relevant, responsive and timely services.

C. Flexible, responsive, timely and relevant services.

D. Flexible, relevant, responsive and timely services.

8. The planning phase includes the following steps:

A. Assessing organizational needs

B. Defining learners' needs and expectations

C. Determining the work processes

D. Identifying key success factors

9. The building phase involves one of the following steps:

A. Ensuring the availability and accessibility of ICTs and digital

B. Assessing proposals by content providers

C. Providing adequate time to all to learn

D. Developing an e-literacy programme to assist learners

10. Researching new technologies, approaches, strategies and techniques includes: A - Checking and evaluating; B - Scaling up or out; C - Assessing and integrating new technologies; D - Determining improvements

A. A & C

B. B & C

C. A, B & C

D. All these answers are correct

Practice Questions

1. Using your transformative reflection experience, develop a planning model for the integration of ICTs and digital into TVET
2. If your organization has already developed a planning model for your TVET programme, review and revise this plan as necessary.
3. Ask a group of key stakeholders in TVET to review the plan.

PLANNING MODEL FOR INTEGRATING ICTs AND DIGITAL INTO TVET AT NATIONAL AND INSTITUTIONAL LEVELS

Unit 4.2 Policy governing the integration of ICTs AND DIGITAL into TVET

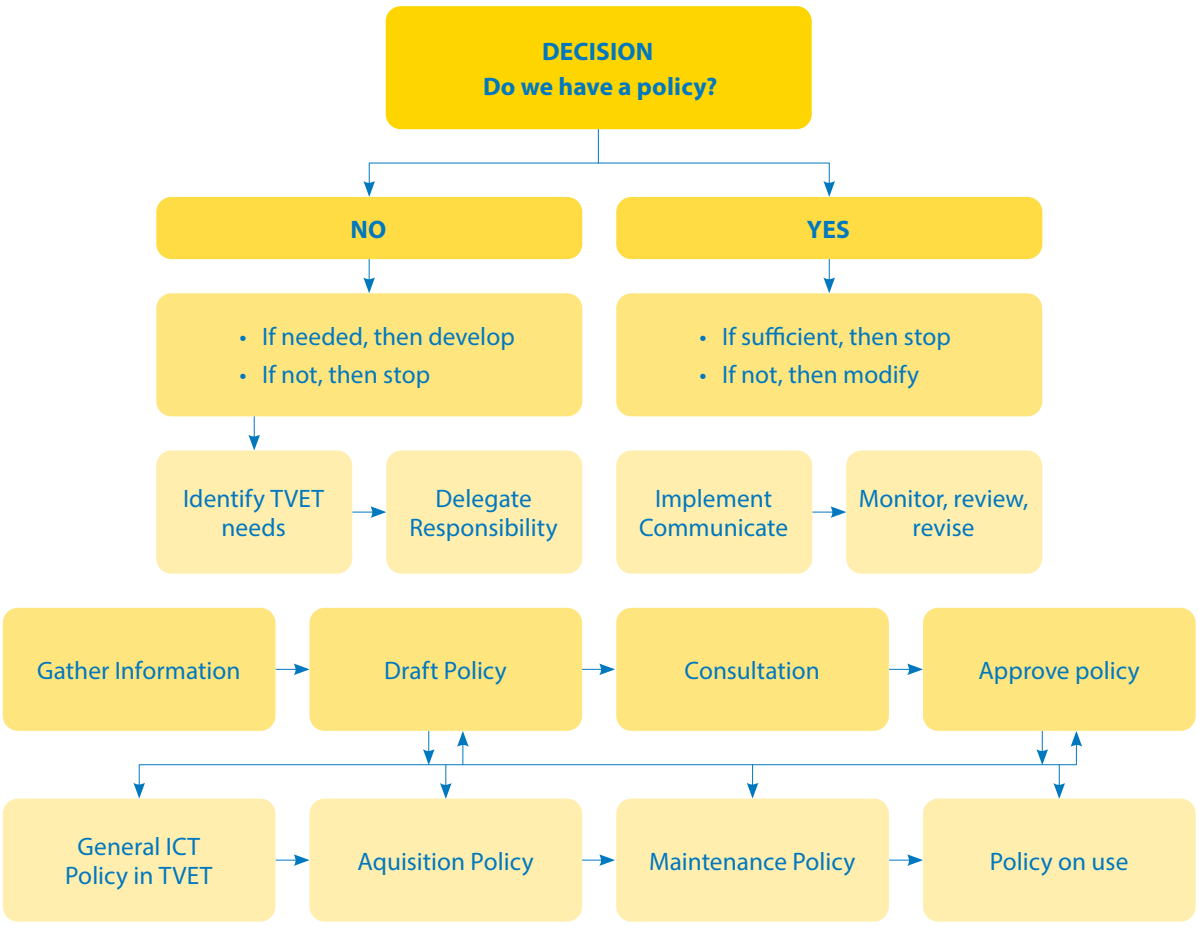
Objective 4.2.1

Develop specific policies for the integration of ICTs AND DIGITAL into TVET

Has your organization developed a policy for the acquisition of ICTs and digital in TVET?

Has your organization developed policy for the maintenance of ICTs and digital in TVET?

Has your organization developed a policy governing the use of ICTs and digital in



Stages in Policy Development

The following steps summarize the key stages involved in developing policies:

1 Identify TVET institutional needs: The TVET institution needs to constantly assess its activities, responsibilities and the external environment in order to identify the need for policies and procedures.

2 Identify who will take lead responsibility: Delegate responsibility to an individual, working group, subcommittee or to staff members according to the expertise required.

3 Gather information: Do you have any legal responsibilities in this area? Is your understanding accurate and up to date? Have other TVET institutions tackled the same issue? Are there existing templates or examples that you could draw on? Where will you go for guidance?

4 Draft policy: Ensure that the wording and length or complexity of the policy are appropriate to those who will be expected to implement it.

5 Consult TVET stakeholders: Policies are most effective if those affected are consulted, are supportive and have the opportunity to consider and discuss the potential implications of the policy.

6 Finalize / approve policy: Who will approve the policy? Is this a strategic issue that should be approved by the TVET Management Committee or is the Committee confident that this can be dealt with effectively by TVET staff? Bear in mind that the Management Committee is ultimately responsible for all policies and procedures within the institution.

7 Implement and communicate: How will the policy be communicated and to whom? Is training required to support implementation among TVET staff and volunteers? Should the institution produce a press release (for external policy positions)?

8 Monitor, review, revise: What monitoring and reporting systems are in place to ensure that the policy is implemented and to assess usage and responses? On what basis and when will the policy be reviewed and revised (if necessary)?

General ICT and digital Policy

An ICT and digital policy is an essential management tool that can facilitate the successful implementation of ICTs and digital in TVET. ANTA (2001) analysed country policies integrating ICT and digital-mediated teaching and learning in TVET in Botswana, Canada, China, the European Union, the Republic of Korea and Malaysia. Results indicated that country policy for ICT and digital integration revolved around three main categories, namely people, infrastructure and content. The people policy included the elements dealing with workforce development, equity, culture, society and lifelong learning. The infrastructure policy was focused on issues related to access to technology, affordability, the digital divide and bandwidth. Finally, the content policy focused on the integration of flexible learning into the mainstream and content generation.

The British Educational Communications and Technology Agency (BECTA, 2001) defines an ICT and digital policy as 'a statement of the beliefs, values, and goals of a school's staff working cooperatively in the context of using ICTs and digital in the operation of that school.'

According to BECTA (2001), the following areas should also be included in an ICT and digital policy statement:

- The aims of ICTs and digital and how they relate to or contribute to the school's aims;
- The distinctive contribution of ICTs and digital to the curriculum;
- The contribution ICTs and digital make to other subjects;
- How the subject will be monitored and evaluated;
- A strategy for implementation;
- Teaching and learning styles;
- Recording, assessment and reporting;
- Monitoring and review;
- Classroom and resource management;
- Inclusion and Special Educational Needs;
- Continuity and progression;
- Staff development and training issues;
- Leadership and management roles;
- Links to the Management Information System (MIS);
- After-hours and community use.

Technology infrastructure requirements

The key elements of ICT and digital infrastructure include (Bates, ibid):

- computers
- mainframes or servers
- networks
- operating software
- routers
- telecommunication links
- telephone services
- videoconferencing equipment

Purchasing Policy

A transparent purchasing policy must be established to ensure ethical, accountable and efficient use of the resources committed to ICT and digital development. This purchasing policy should include the following elements:

- a distinction between capital investment and consumables
- an assessment of needs
- requisition of ICTs and digital
- approval of requisition
- request for quotations from suppliers
- selection of suppliers
- submission of purchase orders
- mode of payment
- receiving ICT and digital equipment and adding it to inventory
- negotiating site licences

Provision must be made to back up critical information and important databases.

Policy for the maintenance Of ICT and digital Infrastructure

The policy for the maintenance of ICT and digital infrastructure should include four essential components, namely:

- data backups,
- ICT and digital infrastructure maintenance,
- infrastructure upgrading and replacement,
- training of technical staff.

Provision must be made to back up critical information and important databases. The policy should clearly state the frequency with which different types of data backups should be performed, and who is responsible for performing them. The policy for scheduled maintenance should focus on preventing ICT and digital infrastructure breakdown. A plan should be developed to outline the nature and frequency of preventive maintenance that should be performed on all hardware and software. The policy should also specify who is responsible for troubleshooting, maintaining and repairing the ICT and digital infrastructure.

An appropriate policy must be formulated regarding the periodic upgrading and replacement of ICT and digital infrastructure, to cover hardware and software.

All technicians need to participate in ongoing professional development training to help stay abreast of technological change.

Policy on the use of ICTs and Digital in TVET

The policy governing the use of ICTs and digital in TVET should include the following key elements:

- approved users
- acceptable use of ICTs and digital
- ethics in the use of ICTs and digital
- the consequences of unauthorized use of ICTs and digital

The policy should specify:

- who are entitled to use the systems: students, faculty and staff
- procedures for assigning user IDs and passwords
- maximum access time on-site and off-site, if applicable
- user fee, if applicable
- procedures for giving access to various system components
- criteria for gaining access to various system components

A description of what constitutes acceptable use of ICTs and digital must be included in the policy:

- acceptable use by students
- acceptable use by faculty
- acceptable use by staff

The ICT and digital policy should be drawn up in a way that ensures all system users conform to copyright requirements with respect to software and digitalized materials.

Conclusion/Summary

In conclusion, this Unit discussed general and specific policy issues, and key constituents of the policy governing the use of ICTs and digital, and the maintenance policy and purchasing policy as a guide to enable participants to develop a new policy, to review and revise existing ones. Similarly, a planning model is required at institutional and national levels as discussed in module 4.3.

Transformative Reflection

Now that you have completed this segment of instruction, please engage in the following transformative reflection activities:

1. Focus on the assumptions underlying your beliefs, feelings and actions regarding ICT and digital policies in TVET.
2. Examine and assess the consequences of these assumptions on your beliefs, feelings and actions in relationship to ICT and digital policies in TVET.
3. Consider your learning experiences while completing this segment of instruction. Conduct a critical reflection regarding the extent to which this instruction has helped you identify and explore alternative sets of assumptions or reinforced your initial assumptions regarding ICT and digital policies in TVET.
4. If this instruction has helped you consider alternative sets of assumptions, test the validity of these assumptions by participating in a reflective dialogue with a critical friend or by engaging in self-reflection.

Unit 4.2
Quiz

Self-assessment questions

Multiple choice: Circle all the correct answers that apply for each question. There may be more than one correct answer.

1. The key stages involved in developing policies involve:

A. Identifying TVET institutional needs

B. Identifying who will take lead responsibility

C. Data collection

D. Draft policy

2. To properly identify TVET institutional needs:

A. constantly assess its activities, responsibilities and the external environment

B. constantly assess its responsibilities and the external environment

C. constantly assess its external environment

D. constantly assess its policies and procedures

3. ICT and digital policy responsibility falls to:

A. an individual and working group

B. subcommittee or staff members

4. Who will approve the policy?

A. The TVET Management Committee

B. TVET staff

5. To whom will the policy be communicated?

A. TVET staff

B. The TVET Management Committee

C. Volunteers

6. An ICT and digital policy is:

A. an essential management tool

B. a statement of beliefs

C. a statement of goals of a school's staff

D. a statement of values

7. An ICT and digital policy should cover the following areas:

A. An assessment of needs

B. Classroom and resource management

C. The contribution of ICTs and digital to the curriculum

D. A strategy for implementation

E. Teaching and learning styles

8. The key elements of ICT and digital infrastructure include:

A. Computers, mainframes or servers

B. Networks and operating software

C. Routers, telephone services and videoconferencing equipment

9. A transparent purchasing policy must ensure

A. Equity

B. Accountability

C. Efficiency

10. A purchasing policy should include the following elements:

A. An assessment of needs

B. An approval of requisition

C. Negotiating site licences

D. Issuing invoices

11. The policy for the maintenance of ICT and digital infrastructure should include:

A. Maintenance of ICT and digital infrastructure

B. Infrastructure upgrades and replacements

C. Training of teaching staff

D. Backups of data

12. The policy governing the use of ICTs and digital in TVET should include:

A. Approved users

B. The consequences of unauthorized use of ICTs and digital

C. Equity in the use of ICTs and digital

D. Procedures for giving access

13. The policy governing the use of ICTs and digital in TVET should specify:

A. Who are entitled to use the systems

B. Procedures for assigning user IDs and passwords

C. Criteria for gaining access to various system components

14. The use of ICTs and digital must be:

A. Acceptable use for faculty;

B. Acceptable use for management.

15. The policy for ICT and digital integration revolves around:

A. People

B. Infrastructure

C. Facilities

C. Content

16. The people policy covers:

A. Workforce development

B. Culture

C. Society and lifelong learning

17. The infrastructure policy focuses on issues relating to

A. Access to technology

B. Equity

C. Affordability

18. The content policy focused on the integration of flexible learning into:

A. The mainstream

B. Content

Practice Questions

1. Using your transformative reflection experience, develop the following ICT and digital policies to govern the integration of ICT and digital into TVET:

- general policy
- purchasing policy
- maintenance policy
- usage policy

2. If your organization has already developed specific policies governing the integration of ICT AND DIGITAL into TVET, review and revise these indicators as necessary

3. Ask a group of key TVET stakeholders to review these policies.

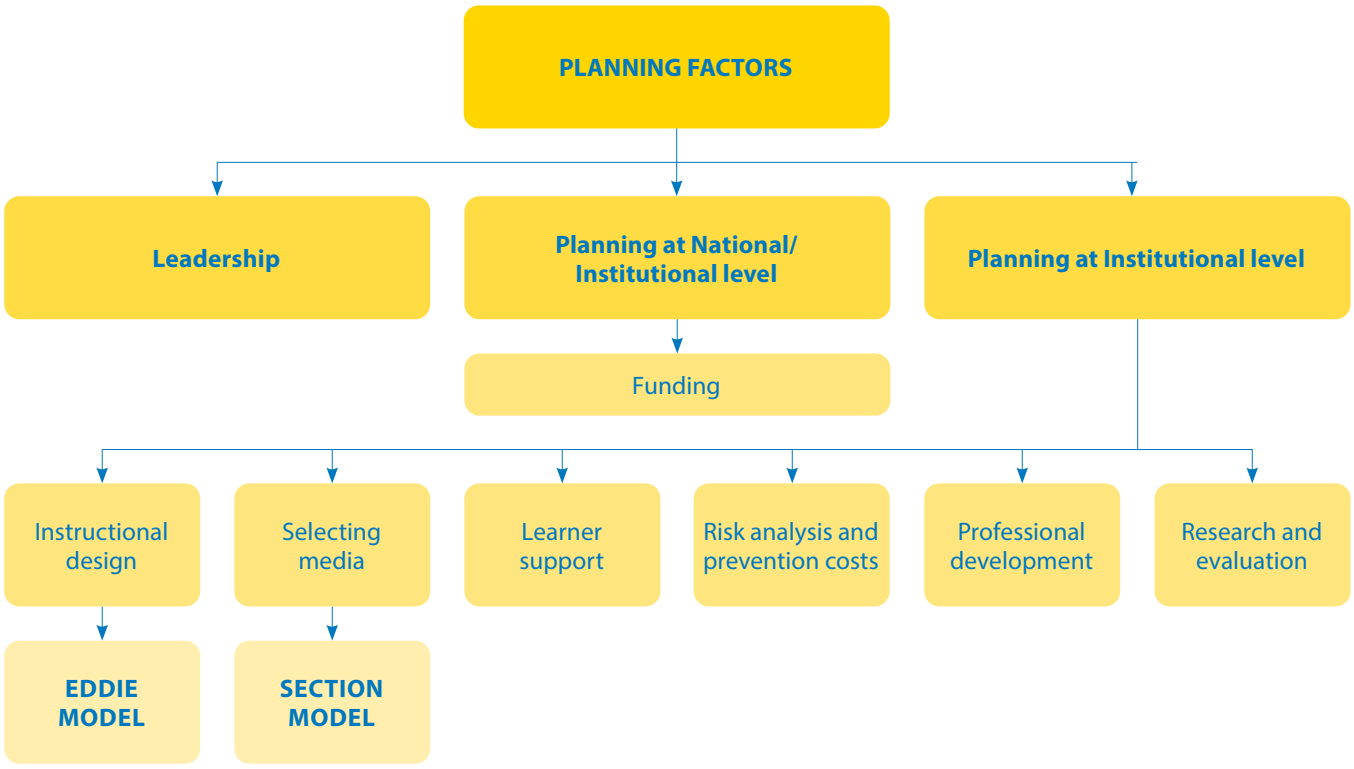
PLANNING MODEL FOR INTEGRATING ICTs AND DIGITAL INTO TVET AT NATIONAL AND INSTITUTIONAL LEVELS

Unit 4.3 Planning for the integration of ICTs AND DIGITAL at national and institutional level

Objective 4.3.1

Develop a plan for the integration of ICTs and DIGITAL into TVET at national and institutional level

Has your institution developed a plan to integrate ICTs and digital at National and Institutional Levels?



Digital transformation in TVET requires the creation of a training ecosystem wherein all of the stakeholders in the internal and external organizational ecosystems agree, collaborate and share resources, information and services. This chapter examines important planning factors that need to be addressed at national and institutional levels in order to achieve successful applications of ICTs and digital in TVET education:

- Leadership
- Resource planning and costing
- Collaboration and networking
- Professional development
- Instructional design
- Selection of media and methods
- Learner support
- Research and evaluation

Leadership at National and Institutional Levels

Frydenberg (2002) observes that the widespread adoption of quality e-learning requires strong executive commitment as well as high standards of technology infrastructure, instructional design, course development, pedagogy and student services. Shelton (2011) confirms that quality is strongly linked to institutional leadership, effective overall policymaking and strong and ongoing support and motivation on the part of all managers and staff. Kotsik, Tokareva, Boutin and Chinien (2009) observe that the integration of ICTs and digital into TVET requires strategic, pedagogical, organizational and technical readiness.

- Strategic readiness involves redefining the vision, mission, values, objectives, standards, strategies, time frame, staff time allocations and quality assurance systems. It also involves budgetary changes to cover the costs of the technology, infrastructure, staffing, staff development, course and materials development and delivery, which may differ from those in conventional teaching. Tough decisions may be required regarding abolishing existing systems and creating new strategic directions.
- Pedagogical readiness involves reappraising teaching and learning methods, instructional design and technologies needed to meet the learners' needs and providing induction and ongoing pedagogical and technological training for all staff and learners.
- Organizational readiness involves ensuring that there are leaders, champions, support and incentives to uphold the planned innovations and to ensure quality in all operations.
- Technical readiness involves providing the technological/infrastructural requirements for ICT and digital integration, including hardware/software production facilities, software licences and systems maintenance.

All of the authors of the case studies in this manual have shown leadership in their own particular ways, empowering and enabling others to achieve their potential. And they have all also depended upon leadership and encouragement from their governments, ministries or senior managers. For example, the Finnish National Board of Education made Omnia one of its national professional development providers for TVET. Moreover, innovation, technology and education are core components of the city of Espoo, where Omnia is headquartered. All of these factors helped Omnia to become a leader in and catalyst for applying ICTs and digital to twenty-first-century learning solutions and challenged its managers, teachers and learners to step outside their comfort zones and embrace new ways of thinking and working. Sometimes it takes external agencies partnering with institutional systems to catalyse leadership for innovation. For example, the COL, the intergovernmental organization created by Commonwealth Heads of Government to promote and support the development of all forms of distance education, helped to establish the Innovation in Vocational Education and Skills Training in Africa (INVEST Africa) initiative. However, this initiative was then put into operation in partnership with the Commonwealth Association of Polytechnics in Africa (CAPA) and 13 member institutions of CAPA in seven African countries. All these stakeholders acknowledged the supportive role played by their governments and TVET ministries and the 'early adopters' and 'champions' within the institutions who modelled the desired behaviours and in turn influenced their peers. Leadership behaviour – good and bad – is contagious and has a trickle-down effect (Zenger and Folkman, 2016).

Planning at National and Institutional Level

Analysing system-wide approaches to developing e-learning in tertiary education in a range of countries, Brown, Anderson and Murray (2007) discerned a common pattern in the series of steps involved.

1

The first step is to establish the physical infrastructure for broadband access.
In 2015, there were more than seven billion mobile phone subscriptions worldwide, and 3.2 billion people worldwide – 2 billion of them in developing countries – were using the Internet. Mobile broadband is the most dynamic market segment, reaching 47 per cent of the world's population. The proportion of the population with access to a 2G mobile phone network has reached 95 per cent, while 3G mobile broadband coverage is extending rapidly, including into rural areas, with a penetration rate of 97 per cent. However, in developing countries, Internet penetration is only 35 per cent, and only 34 per cent of households in these countries have Internet access, compared to more than 80 per cent in developed countries. In the least developed countries, Internet penetration is only 10 per cent, and only 7 per cent of households have Internet access, compared to the global average of 46 per cent. Moreover, in developing countries the average monthly fixed broadband prices are three times higher than in developed countries, mobile broadband prices are twice as expensive as in developed countries and differences in broadband speed persist (ITU, 2015). This means there are still countries and regions where infrastructure issues need to be addressed in order to realize the vision of online education for all, and a truly inclusive information society (Latchem, 2017).

2

The second step is to provide the necessary training, guidance and support in online learning for managers, teachers and learners.
As shown in the case of Omnia and INVEST Africa, this is typically achieved by drawing upon the experience and expertise of early adopters.

3

The third step is to undertake research and evaluation. This means finding evidence of the benefits of e-learning to inform policymaking and decision-making, build demand for online services and encourage collaboration and cooperation among institutions. BIBB's mandated tasks include cooperating with institutes of higher education and research bodies, conducting research, advising on significant issues relating to Vocational Education and Training and contributing to theoretical development in the field (Latchem, 2017).

4

Step four involves developing systems to mainstream ICT and digital-based teaching and learning and pedagogical change at national and institutional levels.
Australia provides a useful example of national planning for ICT and digital-enabled TVET. In 1999, the country's federal and state governments collaboratively developed a five-year national strategy, the Australian Flexible Learning Framework for the National Vocational Education and Training System (2000–2005). This was developed to provide the TVET sector with the e-learning infrastructure and expertise needed to meet the challenges of a modern economy and the training needs of Australian businesses and workers. The agenda was further advanced through a second framework strategy (2005–2007), which focused on engaging with key target groups, and a third framework strategy (2008–2011), which focused on embedding e-learning in training for providers and businesses (Latchem, 2017).

Case Study of Planning at Institutional Level

The University of Technology (UTech) Jamaica was an example of a successful integration of ICT and digital-based teaching and learning methods which Jeanette Bartley-Bryan describes as a 'total systems approach'. UTech established a central specialized unit to oversee the entire process of change, clarify expectations, identify sources of expertise and resources, provide templates for the design of learning activities and assessment of modules and units, and manage budgets and workflows. Bartley-Bryan also stresses how essential professional development was to ensuring consistency, quality and learner centredness in the course design, development and delivery, even suggesting that it should be mandatory. She explains how this approach to ICT and digital integration succeeded in developing a cadre of TVET instructors, course writers and others who were capable of applying their new pedagogical and course management skills to online and blended learning (Latchem, 2017).

However, after reviewing the outcomes of these national frameworks, TVET Australia (2012), a ministerial entity providing services to the TVET system, concluded that while access to e-learning infrastructure and technologies is important for delivering rich learning environments, it would not in itself achieve a 'step change' in the use of ICTs and digital in teaching, learning and assessment in the national training system. Achieving a critical mass of teachers and trainers who are well prepared for, confident about and capable of incorporating e-learning into their practices, and who have the skills to use e-learning in transformative and innovative ways, requires a long-term focus and a well-planned and well-resourced national strategy for development within the sector.

Another way of encouraging e-learning is to offer competitive innovation and development grants and seed funding for nationally strategic projects.

Advancing TVET transformation involves encouraging and supporting collaboration between institutions and industry. No single party has all the capabilities required to provide the range of TVET structures, resources and services needed to meet the heightened expectations of the sector, especially at a time when government and funding agencies are reducing their contributions. Collaboration provides breadth and quality in the courses and learning environments, labour market-relevant certification and labour mobility, while raising the profile of the sector as a whole. However, forming partnerships between different institutions and between institutions and industry, with their different goals and cultures, can be challenging. The prerequisites for successful collaboration initiatives are: shared purposes, interdependencies linking various stakeholders and recognition of mutual benefits. Risk analysis may be needed to assess the possibility of resistance to change, lack of preparedness and slow or weak cooperation between providers, changes in political and economic circumstances, and a lack of sustainability potential.

Centralization Versus Decentralization

In organizing national or state-wide open, distance and online learning systems, it is important to strike the right balance between centralization and localization. The benefits of centralization lie in the co-location of people with similar skill sets and highly specialized capabilities, cost savings, standardized procedures and coordination and cohesion across the system or organization.

Case Studies

Marope, Chakroun and Holmes (2015) describe how the Republic of Korea created a single specialized agency, the Korea Education and Research Information Service (KERIS), to be responsible for the substantial enhancement of public education by shifting the knowledge-centred teaching and learning system to an activity-centred teaching and learning system based upon ICTs and digital. KERIS established the master plan, secured the budget, defined the roles and responsibilities of the various partners and providers, standardized the procedures, selected and ran pilot programmes, built consensus on the new systems in consultation with stakeholders and developed the training and research system. Today it also provides educators and the public with a National Education Information Service, Research Information Service System, National Education Service System and Korea Open CourseWare, a nationwide educational content-sharing service for universities and colleges. This centralized approach has helped them to achieve the ambitious goals set by the Korean government and increase the quality of education and training in pursuit of the national goals.

In his description of the work of Germany's BIBB, Michael Härtel explains that not only are ICTs and digital one of the strongest drivers of innovation, but also that the organization plays a proactive and leadership role in advancing ICTs and digital in vocational education and training (Härtel, 2017). It does this through national research and development projects and targeted competitive funding measures for innovative use of the media in the sector and industry, some of which are industry-wide and some of which are trade-based. It has also established an online portal called 'foraus.de' for teachers and in-company trainers to freely access training and information services and opportunities and to exchange ideas and experiences.

Robyn Harriden explains how the vocational and training system for distance education in New South Wales, Australia, was originally decentralized, with students enrolling in local colleges and being supported by local correspondence teachers and tutor and seminar groups (Harriden, 2017). However, with the establishment of the Open Training and Education Network (OTEN) and greater use of online learning, it was decided that this arrangement should be replaced with a centralized system of course and learning materials development and student support. A centre now manages the development, reproduction, duplication, manufacture, storage and distribution of the course materials, most of which are developed from the National Training Packages developed by Service Skills Organizations to meet the training needs of an industry, or a group of industries, and approved by the Australian Skills Quality Authority .

As the European Centre for the Development of Vocational Training (Cedefop) (2015) observes, TVET is also behind the provision of universally available information, advice, counselling, skills assessment, mentoring and career development support for individuals of all ages and at all career stages. This requires up-to-the-minute nationwide labour market information and online tools such as the island-wide Online National Careers Guidance and Counselling System established in Sri Lanka by the Ministry of Youth Affairs and Skills Development and the Tertiary and Vocational Education Commission.

However, over-centralization can sometimes lead to delays and bottlenecks, and delivery to the end user is most effective when there are institutions, study centres and other forms of learner support available at convenient locations. To ensure the best outcomes possible, it is best to develop a system that not only employs physical and functional centralization to coordinate the key operations, but which also encourages and supports innovation, creativity and locally adaptive systems at all levels to address local problems quickly and effectively.

[28] *www.asqa.gov.au/about/australias-vet-sector/training-packages1.html*
[29] *www.cedefop.europa.eu*

Funding

Simply adopting e-learning on the assumption that it will be profitable, cheaper or a means of coping with reduced funding can lead to many problems. ICT and digital-based learning can be resource- and labour-intensive for both staff and students, and if its advantages are to be economic and sustainable as well as pedagogical and sociocultural, careful attention needs to be paid to funding issues.

For the majority of public TVET providers, government agencies are the main source of funding...

For the majority of public TVET providers, government agencies are the main source of funding, and in many countries such funding is being reduced in real terms. Other sources of funding include students' fees, grants, aid agencies, donors, charitable organizations, public-private-partnerships and revenue earned from entrepreneurial activities. Tinio (2015) observes that using public-private partnerships to pilot or fast-track ICT and digital-based projects is a strategy that is gaining currency among ministries of education in developing countries. Many of the most significant ICT and digital-in-education efforts have also been supported by multilateral organizations and international aid agencies.

Google is a useful source of information about grants that are available. For example, the Fund for Internet Research and Development (FIRE Africa) announces a call for grant funding, inviting agencies to apply to develop innovative projects using ICTs and digital to provide solutions for Africa's unique technical innovation, community development, governance enhancement and educational needs. Gaining support from such sources requires strategic plans with well-defined objectives that will persuade funding agencies that direct and tangible outcomes are likely, and with evidence of previous achievements. It may also be advisable to seek funding for important areas of educational development that have been overlooked or poorly provided for by other developers.

However, as Tinio (2015) points out, the financial litmus test of ICT and digital-based programmes is their ability to continue after the donors' funding comes to an end. Far too many pilot ICT and digital-based education programmes prove to be unsustainable because governments are unable to provide permanent funding, and local institutions or communities are not in a position to support the programmes. As the Cambodian case study (Mabille, 2017) suggests, it may therefore be better for some training centres in developing countries to aim for self-sufficiency rather than dependency on government or overseas aid funding, as in the case of Fundación Paraguaya Escuela Agricola.

Planning at Institutional Level

At institutional level, a mix of centralization and decentralization may also provide the best answer for using ICTs and digital for TVET transformation. Co-locating people with similar skill sets can foster innovation and the development and spread of highly specialized capabilities, so there may well be value in centralizing functions such as instructional design, media production, staff development, quality assurance, and research and administration of online services for students. However, as the staff in the subject departments become more proficient in developing and delivering on- and off-campus courseware from their own desks, the working relationship between the centre and the periphery may change. As Bates (2000) observes, there is a tradition of autonomy in tertiary teaching that has extended to ICT and digital-based teaching and learning, and many online programmes are now developed autonomously by 'lone ranger' academics. This suits small-scale courseware development that needs to be developed quickly, encourages staff to become involved in ICT and digital-based teaching and learning and lets them work out what teaching and learning methods best suit them and their students.

Some institutions even go so far as to try to completely devolve all responsibility for distance education to teaching departments and dispense with any form of centre. The problem with this approach is that department heads and staff can find themselves swamped with administrative matters and dependent upon insufficient numbers of teaching and technical staff with the knowledge, skills, experience and time to develop and deliver the range and quality of programmes needed.

Describing how online learning was introduced into the University of Technology (UTech) in Jamaica, Bartley-Bryan (2017) argues that the successful integration of ICT and digital-based teaching and learning methods requires what she describes as a 'total systems approach'. UTech ended up establishing a central specialized unit to oversee the entire process of change, clarify expectations, identify sources of expertise and resources, provide templates for the design of the learning activities and assessment of the modules and units, and manage budgets and workflows. Bartley-Bryan also stresses how essential professional development was to ensuring consistency, quality and learner centredness in the course design, development and delivery, even suggesting that it should be mandatory. She explains how this approach to ICT and digital integration succeeded in developing a cadre of TVET instructors, course writers and others who were capable of applying their new pedagogical and course management skills to online and blended learning.

> ***Co-locating people with similar skill sets can foster innovation...***

Instructional Design

The most basic forms of ODL and e-learning may involve little more than placing existing text and PowerPoint presentations online, webcasting or podcasting lectures and interviews, or producing short videos demonstrating actions, behaviours and technical processes. These are cheap and easy to produce and, as shown in the Cambodian TVET Academy pilot programme (Mabille, 2017), they can be extremely beneficial for students who are unable to attend classes or learn from the best teachers.

However, developing more sophisticated, interactive, professional-level multimedia online courseware is much more time-consuming and costly. It requires careful thought about instructional design, the required interactions with and between the learners, the degree of self-motivation and self-learning skills in the learners and which tools are best for these. The quality of distance education and online course materials depends on due care being given, to paraphrase Bernard, Naidu and Amundsen (1991), to:

1. Content presentation strategies (developing advanced and graphic organizers, statements of objectives and instructional methods that help the organization and presentation of the content and learning activities).
2. Activation strategies (creating systems for student participation through reading, questioning, reflecting, self-tests, assignments, practical work, field studies and so on).
3. Social support strategies (providing opportunities for collaborative learning, peer group activities and tutoring).
4. Feedback and correction strategies (assessing and providing feedback on learners' performance).

In the New Zealand Open Polytechnic case study, Seelig and Nichols (2017) presented an interesting discussion about the challenges faced by a traditional, campus-based tertiary education institution as it transforms itself into a distance and online provider and considers whether it should adopt the 'lecture-based' or 'resource-based' model of instructional design, two models that use technology in very different ways. However, Merill (2002) concludes that all theories and models of instructional design are essentially five fundamental principles which, in their most concise form, can be summarizedsummarisedsummarized as follows:

- Learning is promoted when learners are engaged in solving real-world problems.
- Learning is promoted when existing knowledge is activated as a foundation for new knowledge.
- Learning is promoted when new knowledge is demonstrated to the learner.
- Learning is promoted when new knowledge is applied by the learner.
- Learning is promoted when new knowledge is integrated into the learner's world (pp. 44–45).

The Training Industry (n.d.) recommends that instructional designers and training developers adopt the ADDIE (Analysis, Design, Development, Implementation and Evaluation) framework.

In this, as shown in Figure 1 below, each stage in the instructional design process is subject to review and has an outcome that feeds into the subsequent stage. Such use of formative evaluation identifies problems with the inputs while they are still easy to correct and therefore saves time, money and effort. At the implementation stage, summative evaluation is then applied to assess the outcomes and impact of the product and services.

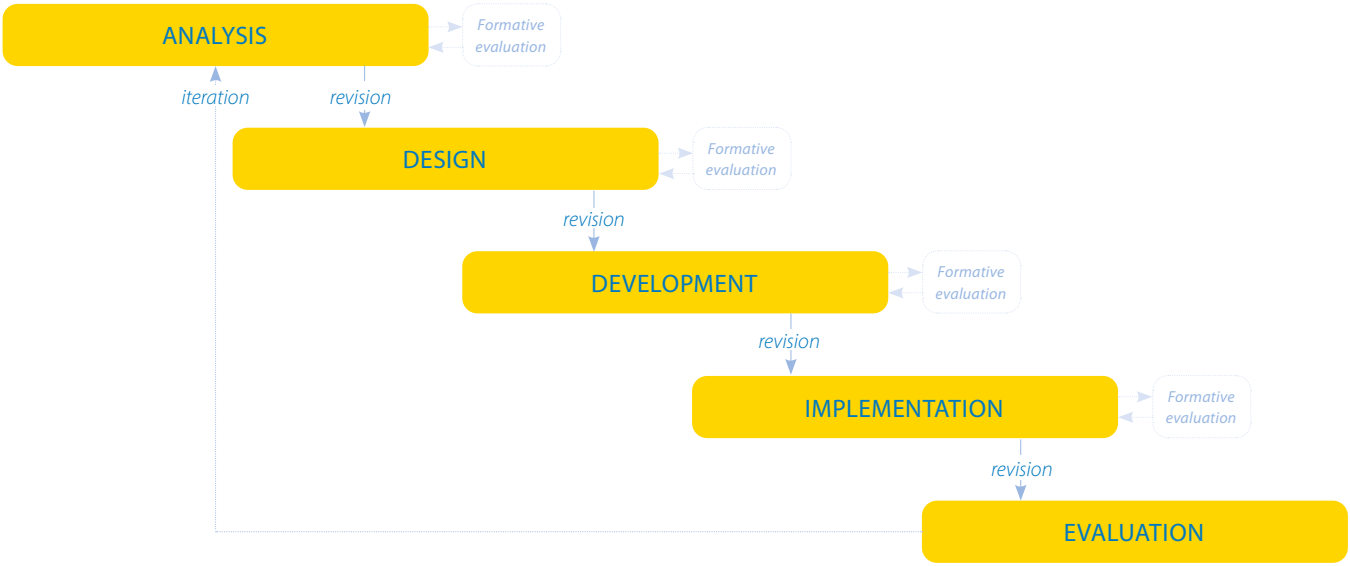


Figure 9. The ADDIE model
(Source: Wikimedia Commons; Creative Commons Attribution-Share Alike 3.0 Unported licence)

Instructional design for distance, online and blended learning calls for a set of knowledge and skills in the course, and for media designers that are quite distinct from those of the conventional teacher. In its simplest forms, instructional design can be managed by individual subject experts or groups of subject experts working on their own. Alternatively, subject experts can be responsible for determining the learning needs, content and assessment methods but can call on instructional designers and technical staff to help them with creating the courseware. These support staff can be in-house, should the scale of work warrant this, or outsourced to commercial production agencies. The latter may be necessary if staff lack the specialized skills or are struggling to keep up with work or deadlines, but it can be costly and may mean relinquishing some management control and adapting to different and unfamiliar working styles and procedures.

It is difficult for individuals to master all the technical and pedagogical skills needed, to understand all the different students' needs and to provide the breadth and depth of content needed to satisfy the requirements of other staff or institutions using the courseware. This is why in many cases, and particularly where multimedia and multidisciplinary courseware is involved and will be used by a number of providers, a course team approach is advisable. This is more costly and time-consuming, but if the courseware is going to be used extensively and for a long period, this approach will ensure that it is comprehensive, widely acceptable, embraces various perspectives and approaches and makes the best use of them various media.

Selecting Media

There are numerous ways of providing text, audio, images, animation, video, learner support and collaborative learning via digital means. All of these can be used to motivate learners, enhance understanding by illustrating up-to-the minute, real-life situations and provide project- and problem-based learning at times and in ways that best suit the learners. Given the demands for quality, equity and access placed on the sector, it is no longer a question of whether TVET should adopt these alternative forms of delivery, but of how the sector can best use them.

The Internet, social media and the recent phenomenon of free open publishing open up new opportunities for the sector and are particularly popular with the younger generations. YouTube alone is an enormous repository of educational and training channels and programmes. Every minute of every day, 300 hours of music, do-it-yourself, self-instructional and educational videos; TV clips; video blogs, etc., are uploaded to this digital platform. Accessed by one billion users a month, it is the second-largest search engine in the world behind Google, of which it is a subsidiary. With the ever-increasing number of people using this and other video-sharing websites to upload, share and view videos that reflect their personal interests, this can be an excellent means of attracting people to TVET and supporting them in their learning.

When it comes to selecting appropriate media and methods for delivering ICT and digital-based courses and programmes, Bates (2015) provides a useful set of criteria in his SECTIONS model. This is research-based, has stood the test of time, and has been found to be useful to many courses and materials designers. It sets out the factors that must be considered when selecting media and methods in descending order of importance. These are:

- Students
- Ease of use
- Cost
- Teaching functions, including pedagogical affordances
- Interaction
- Organizational issues
- Networking and novelty
- Speed and security

Effective teaching and learning in all forms call for fundamental adjustments of thought, application, discipline and concentration. Creating quality ICT and digital-based courses and programmes can also be costly and time-consuming. It is therefore advisable to check whether appropriate courseware already exists elsewhere and, if so, whether it is possible to access and use or adapt it. There must be many commonalities in TVET courses, so rather than every institution and course team 'reinventing the wheel', there must be great scope for TVET institutions and industry to collaborate in creating high-quality generic online courseware in the form of OER and MOOCs that everyone across the system can then share, adopt, adapt, customize, update and use in whatever ways and contexts they wish. Such collaboration can also help catalyse new ideas, knowledge, skills and practices. Conducted on an international basis, this approach could also help to resolve the access, equity, cost and quality challenges and provide the flow of ideas, research and best practices needed to ensure quality in TVET in developing countries.

The Figure below is a visualization of what the William and Flora Hewlett Foundation sees as the methods for equalizing access to educational resources worldwide:

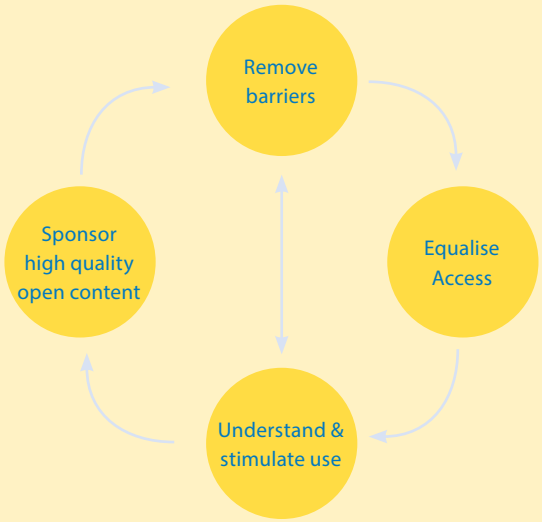


Figure 10: Methods for equalizing access to educational resources worldwide
(Source: Jisc. (2015). OER Guide: Stakeholders and benefits. https://jisc.ac.uk/guides/openeducational-resources/stakeholders-and-benefits)

Effective teaching and learning in all forms call for fundamental adjustments of thought, application, discipline and concentration.

Time will tell whether MOOCs in their current form prove to be 'a silver bullet' in TVET. But it is clear that they are attracting attention from millions of people around the world with an appetite for learning from video tutorials and interacting online with others. MOOCs enable the sharing of expertise and costs in a multimedia and multimodal provision. They provide pathways from informal and non-formal learning to formal study. Introductory and 'taster' modules can be freely downloaded from OER repositories such as the UK Open University's (OU) OpenLearn via the web, iTunes U and YouTube. These can take the form of extracts or complete courses. Some users only wish to study small 'chunks' of courseware for their immediate learning or work purposes. Others wish to see what courses are on offer and what demands they make before signing up for formal study. The learners work through these resources at their own pace and can receive assistance with or an assessment of their studies for a modest fee, should they so wish.

If they decide to go on to formal study, they can sign up for the course(s) of their choice. And thanks to the global nature of the web, these courses are cross-border and leverage knowledge and expertise on a worldwide basis. The most common criticism of some MOOCs is that they provide inadequate learner support.

Learner Support

As a former director of Student Services at the OU observed (Sewart, 1998), if the sole or major factor in successfully educating distance students was the creation of well-designed learning packages, distance education would have won a global victory years ago. Unfortunately, as he testifies, the one thing that is all too often ignored in the rush to embrace distance and online learning is learner support. Learners can be drawn to distance study by its flexibility and convenience but then find that they lack the aptitude, experience and knowledge for self-directed study and need confidence and morale boosting, tutorial support and counselling for personal problems. Inadequate support hinders studies and leads to higher failure and dropout rates than in face-to-face study. As the Commonwealth of Learning and Asian Development Bank (1999) explain, in distance education there is therefore a need for tutors to be:

- Experts, explaining the course content and clarifying learners' understanding
- Facilitators, guiding the learners' studies without seeking to teach or explain directly
- Reflective practitioners, co-exploring with learners and without presuming to possess superior knowledge
- Assessors, examining or testing the learners on what they have learned and providing feedback on their performance

Support can be provided through face-to-face orientation, study group sessions and practical exercises in local learning centres and workplaces, and provided asynchronously or synchronously by means of email, blogs and Skype. It can also be embedded within the instructional design in ways that help the learners think for themselves, apply and test their learning, and monitor their own progress. Different students' needs, different course requirements and different circumstances call for different solutions. And while the use of computer-based learning packages and online resources may appear to offer economies of scale, it is important to remember that the costs of learner support increase as the number of students increases. Peer support, with learners sharing and offering knowledge, skills, experience and practical help, certainly has its place, but it cannot be a substitute for tutoring by expert staff, so it is always important to factor in the costs, person hours and resource requirements of learner support.

Risk Analysis and Prevention Costs

TVET providers must balance the benefits of using the various ICT and digital-based approaches with costs. They must also analyse the risks, because identifying and reducing any negative impact of events and circumstances on processes and outcomes also helps to contain or reduce the costs (Sarah Hoosen and Butcher, 2017). Feigenbaum (1956) explains that risk analysis needs to take into account three sets of costs: prevention costs, appraisal costs and internal and external failure costs. The prevention costs are those incurred in avoiding defects in systems, programmes and services at the very outset – for example the costs of policymaking, planning, consulting stakeholders and establishing the correct organizational and management procedures for the curriculum and for pedagogical development, instructional design, technical services, course delivery and learner support. Appraisal costs are costs incurred in evaluating the systems, products and services as they are being developed to ensure that they will meet the required standards and expectations when they are launched into the public domain. Internal failure costs are costs incurred before the final creation or delivery of systems, products and services. The later any faults or failures are detected, the costliercostlier their reworking or abandonment will be. External failure costs arise when systems, programmes and services fail at the implementation stage. It is vital to avoid these, because responding to a stream of students' problems and complaints, losing income from fees or grants and countering bad publicity can be extremely costly.

Professional Development

At the 2nd UPI International Conference on Technical and Vocational Education and Training in Indonesia in 2012 , a workshop entitled 'TVET educators' tackled the question of the appropriate professional profile of TVET teachers and trainers. This resulted in a 'Bandung Manifesto on TVET educators'. This manifesto observed that the best predictor of successful learning is the quality of the teachers, and that it was therefore essential to ensure the quality of TVET teachers' pedagogy and knowledge of the vocational and technical fields for which they are preparing their students.

However, a Europe-wide study by Cedefop, conducted in conjunction with the Training of Trainers Network (TTnet) into the competencies required in TVET professionals, revealed serious shortcomings in the training of TVET teachers. Interviews with TVET staff in the various countries revealed that many of them felt unprepared for the complex demands being placed upon them by their line managers, were confused by the constant reforms, had little or no time for professional development and felt unsupported, undervalued and overburdened with administrative tasks and bureaucracy. Cedefop then compiled an inventory of the competencies required in TVET teachers, trainers and leaders. These included capabilities in adult learning, the use of ICTs and digital and digital networks, networking, communications, collaboration, curriculum development and quality assurance. The resultant handbook by Volmari, Helakorpi and Frimodt (2009) identified areas where pre- and in-service training were needed and argued for the development of a lifelong learning culture within the sector. On the other side of the world, TVET Australia (2012) observed that TVET teachers tend to be strong in either their industrial knowledge or their pedagogy, and need far more professional development, encouragement, support and training in integrating ICTs and digital into learning. Daniel, Alluri and Mallet (2008) observe that not only is initial teacher training needed to provide qualified TVET teachers at secondary, post-secondary and tertiary levels, but that practising teachers should also be helped to upgrade their knowledge, skills and qualifications through continuing professional development. What none of these studies mention are UNESCO's calls for new agendas to be addressed in the TVET curriculum, such as greening skills and sustainable development (Munjanganja, 2010).

The scale and complexity of providing such a broad range of ongoing training for TVET teachers, particularly in developing countries and areas and institutions where there are high levels of staff turnover and part-time and casual staff, is clearly challenging. Many TVET teachers are of an age or in a country or a culture where they have only ever experienced teacher-centred, low-tech or no-tech learning environments. However, as explained in Chapter 2, Danaher and Umar (2010) illustrate how open, distance and ICT and digital-enabled means can be used to effectively broaden and streamline access to initial and in-service teacher training, and how social media and industry networks can be used for updating industry-specific knowledge and skills. Using such means as the web, CD-ROMs, video streaming and e-forums, teachers can tap into entire teacher training courses or short chunks of the just-in-time information they need to solve problems, perform specific tasks or update their knowledge and skills in ways that fit in with their busy schedules, anywhere in the world. There are already many teacher training courses and resources on the web that are available for free or for a nominal fee, including MOOCs from such providers as Coursera, edX and Udacity. Once again, much time, money and effort can be saved by first checking whether there are online or digital resources that can be readily adopted or adapted to meet TVET-specific teacher training needs. Where these cannot be found, online customizable OER, learning toolboxes, trainers' guides, technical guides and sets of frequently asked questions (FAQs) can be developed for TVET teachers, trainers, managers and support staff. Collaboration between institutions, and between institutions and industry, can make the development of these resources more economical, draw on an extensive range of knowledge, skills and experience and help to ensure the credibility of the training materials.

National and international repositories of training materials and case studies of best practices can be created, and national and international 'e-champions' featured to motivate, mentor and enable teachers to develop their e-learning capacities. By using social media, teachers can also learn from each other online and form learning communities, some of which can even be global. Links to industry and professional websites featuring case studies of e-learning and e-training can be established. And information about ICTs and digital and their uses can be disseminated throughout the sector nationally and even internationally by means of online publications, conferences, newsletters and media releases. Systems like the UNEVOC Network Portal (UNESCO-UNEVOC, 2012) provide the basis and frameworks for South-North and South-South as well as North-North information exchange and collaboration. The potential is limitless, but such networks are only effective if they are comprehensive and kept up to date by the policymakers, managers, teachers and students whose experiences and opinions are so crucial to TVET development

If teachers and trainers are going to commit themselves to TVET transformation and the integration of ICT and digital-based methods in their courses, incentives are needed. Johnson (1986) suggests that there are three theories of motivation and productivity:

- Expectancy theory (people are more likely to make an effort in their work if there is an anticipated reward that they value).
- Equity theory (people are dissatisfied if they are not duly compensated for their efforts and accomplishments).
- Job enrichment theory (people are more productive when their work is varied and challenging).

The provision of rewards, recognition and incentives plays an important role in encouraging change, innovation and creativity. It is also important to ensure that workloads and deadlines are realistic and that teachers are granted the time to master the new technologies and methods and develop, apply and evaluate the courses, courseware and support systems that are needed.

Research and Evaluation

Unlike their colleagues in higher education, few TVET staff would consider research to be part of their duties. However, Marope et al. (2015) observe that one of the main things standing in the way of TVET realizing its potential is a weak tradition of and poor investment in research-based knowledge, and the weak documentation of promising operational knowledge relative to research and development in other sectors of the education industry. They suggest that this weak culture of research and analytical knowledge creation, and the lack of regular and current data, substantially limit the TVET sector's capacity for foresight and futuristic orientation, and for anticipating and even leading trends rather than being mostly reactive to contextual pressures. Lauglo (2006) observes that if TVET is to have a higher visibility and gain greater respect nationally and internationally, the sector must develop a more robust quantitative and qualitative evidence base to demonstrate the effectiveness and efficiency of its policies, governance and practices. He suggests that there is a need for research into policymaking and management, labour market monitoring and forecasting, external and internal effectiveness, equity, cost-efficiency, new models for TVET systems and qualifications frameworks, alternative models of financing the uses and impact of ICTs and digital. The importance of research into the latter cannot be overstated. Rauner and Maclean (2009) observe that for more research to be undertaken throughout the sector, teachers will need more training and support for investigating and reporting on the effectiveness of curricula, learning environments and delivery methods in the different vocational disciplines and in regard to the requirements of employers and the market. In Paul Little's account of piloting e-apprenticeship training at Red River College and Nova Scotia Community College in Canada (Little, 2017), the evaluation process focused on student issues, management issues, instructor issues, course and instructional design issues, industry supervisor issues and only latterly technology issues.

Funding and support will also be needed for pilot projects, writing up case studies and measuring outcomes and impacts to inform policy, planning and practice. ICTs and digital can be invaluable in such work, not only for collecting and analysing findings, but also in the all-important dissemination and transfer of research-based knowledge into practice in ways that are comprehensible and relevant for different stakeholders. The traditional methods of academic research dissemination are conference presentations and peer-review articles. Important as these are, they are not generally accessible or appropriate to the needs of funding agencies, employers, busy practitioners and members of the general public. Therefore, alternative methods are needed for the different audiences, using appropriate language and information levels and employing different dissemination methods. These can include print or online materials with illustrations, graphs and figures, the mass media and social media, oral presentations at meetings and so on, leveraging whatever resources, relationships and networks can be brought to bear on the process. To be most effective, dissemination strategies must be designed and funded right at the start of projects and incorporated into all stages of research studies, rather than being mere afterthoughts.

In creating the dissemination plan, researchers should consider the following:

- What are the aims of the dissemination effort?
- Who is affected by this research?
- What are the most effective means of reaching and informing the various audiences?
- At what stages do these various audiences need to be informed?
- Who is best placed to do this?

The Practitioner Research and Evaluation Skills Training (PREST) online material published by the Commonwealth of Learning and International Research Foundation for Open Learning (Commonwealth of Learning, 2004) provides a great deal of useful advice on how to conduct all aspects of research and dissemination. The material has been developed expressly for use in open, distance and online education by practitioners in the field and includes examples drawn from international sources.

Unlike their colleagues in higher education, few TVET staff would consider research to be part of their duties.

Conclusion/Summary

The Qingdao Declaration (UNESCO, 2015) states that to achieve the goal of inclusive and equitable quality education and lifelong learning by 2030, ICTs and digital – including mobile learning – must be harnessed to strengthen education systems, knowledge dissemination, information access, quality and effective learning and more efficient service provision. This unit highlighted the important planning factors (with examples of case studies BIBB, OTEN, Open Polytechnic, etc.) that need to be addressed at both national and institutional levels in order to achieve successful applications of ICTs and digital in TVET education. The biggest mistake that policymakers, managers and educators and trainers can make in response to these calls and in using ICTs and digital for transformation in TVET is to focus too much on the technology and not enough on the needs, expectations and circumstances of the learners and other stakeholders and the quality of the instructional design and learner support. A great deal can be gained by following the Qingdao Declaration's calls for collaboration between governments and the private sector in implementing scalable technology-supported innovation in education and training, and the Incheon Declaration's encouragement for bold and innovative action to achieve inclusive, equitable, quality education and lifelong learning opportunities for all (World Education Forum, 2015). By infusing more equitable and effective practices into its systems and adopting new models of learning and uses of ICTs and digital, TVET can therefore develop the gifts and talents of all and more effectively meet the development needs of present and future generations.

Transformative Reflection

Now that you have completed this segment of instruction, please engage in the following transformative reflection activities:

1 Consider your learning experiences while completing this segment of instruction. Conduct a critical reflection regarding the extent to which this instruction has helped you identify and explore alternative sets of assumptions or reinforced your initial assumptions regarding ICT and digital policies in TVET.

2 If this instruction has helped you consider alternative sets of assumptions, test the validity of these assumptions by participating in a reflective dialogue with a critical friend or by engaging in self-reflection.

Unit 4.3
Quiz

Self-assessment questions

Multiple choice: Circle all the correct answers that apply for each question. There may be more than one correct answer.

1. Digital transformation in (TVET) requires all of the stakeholders to:

A. Agree

B. Collaborate

C. Develop e-learning

D. Share resources, information and services

2. Some planning factors that need to be addressed at both national and the institutional level include:

A. Leadership

B. Collaboration and partnership

C. Instructional design

D. Research and development

3. The integration of ICTs and digital into TVET requires:

A. an individual and working group

B. subcommittee or staff members

4. Redefining the vision, mission, values, objectives requires:

A. Strategic readiness

B. Institutional readiness

C. Technical readiness

5. Reappraising the teaching and learning methods, instructional design and technologies needed to meet learners' needs requires:

A. Organizational readiness

B. Strategic readiness

C. Technical readiness

D. Pedagogical readiness

6. To Plan at National and Institutional Level:

A. Establish the physical infrastructure for broadband access

B. Provide the necessary training, guidance and support

C. Commence research and evaluation

D. Develop a systems approach to mainstreaming ICT AND DIGITAL-based teaching and learning

7. The advantages of ICT and digital-based learning are that it is:

A. Economic and sustainable

B. Pedagogical

C. Sociocultural

8. Other sources of funding for ICT and digital-based learning include:

A. Students' fees and grants

B. Aid agencies and donors

C. Charitable organizations

D. Students' contributions

E. Revenue earned from entrepreneurial activities

9. The quality of distance education and online course materials depends upon

A. Content presentation strategies

B. Activation strategies

C. Social support strategies

D. Feedback and correction strategies

10. The fundamental principles of instructional design how that:

A. Learning is promoted when learners are engaged in solving real-world problems.

B. Learning is promoted when existing knowledge is activated as a foundation for new knowledge.

C. Learning is promoted when new knowledge is demonstrated to the learner

D. Learning is promoted when new knowledge is applied by the learner

E. Learning is promoted when new knowledge is integrated into the learner's world.

11. Media can be used to:

A. Motivate learners,

B. Provide project-based learning

C. Provide problem-based learning

12. In distance education, tutors need to be:

A. Lecturers

B. Facilitators

C. Reflective practitioners

D. Examiners

13. Risk analysis needs to take into account:

A. Prevention costs

B. Appraisal costs

C. Fixed costs

D. Variable costs

E. Internal and external failure costs

14. Prevention costs are those incurred in avoiding:

A. Defects in the systems

B. Programmes

C. Structure and facilities

D. Services

15. Appraisal costs are those incurred in:

A. Evaluating the programme

B. Evaluating the system

C. Evaluating the products

D. Evaluating students' needs

E. Evaluating the services

16. Internal failure costs are those incurred:

A. During delivery of systems

B. During delivery programmes

C. During delivery of products and services.

Practice Questions

1. Using your transformative reflection experience, developed a plan to integrate ICTs and digital at national and international levels
2. If your organization has already developed a plan for integrating ICT and digital into TVET, review and revise these indicators as necessary
3. Ask a group of key stakeholders in TVET to review these policies.

References

Australian National Training Authority (ANTA) (2001). Strategy 2001, Project 17, VET Policy Advice. Retrieved June 19, 2020 from: http://www.flexiblelearning.net.au/policies

BECTA (2001). What is Whole-School ICT and digital Policy? Retrieved June 19, 2020 from the World Wide Web: http://www.becta.org.uk/technology/infosheets/html/itpolicy.html

Brown, M., Anderson, B., & Murray, F. (2007, December). *E-learning policy issues: Global trends, themes and tensions*. Paper presented at ASCILITE 2007, ICT and digital: Providing choices for learners and learning, Singapore. Retrieved June 19, 2020 from www.ascilite.org/conferences/singapore07/procs/brown.pdf

Farrell, G.M. (2001). Issues and Choices. In G. M. Farrell (Ed.), The Changing Faces of Virtual Education (pp. 141–152). Vancouver, Canada: The Commonwealth of Learning.

ITU. (2015). *ICT and digital facts & figures. The world in 2015*. Geneva: Author. Retrieved June 19, 2020 from www.itu.int/en/ITU-D/Statistics/Documents/facts/ICTFactsFigures2015.pdf

Latchem, C. (2017). *Using ICTs and digital and blended learning in transforming technical and vocational education and training*. UNESCO Publishing.

Hoosen, S., & Butcher, N. (2017). Considerations in Costing ODL and ICTs and digital in TVET. *Using ICTs and digital and blended learning in transforming TVET*, 185.

Little, P. (2017). Canada: e-Apprenticeships. *Using ICTs and digital and blended learning in transforming TVET*, 169.

Harriden, R., & Lachtem, C. (2017). Australia: OTEN. *Using ICTs and digital and Blended Learning in Transforming TVET*, 73.

Mabille, P (2017) Cambodian: The TVET Academy. *Using ICTs and digital and blended learning in transforming TVET*, 155.

Seelig, C., & Nichols, M. (2017). CHAPTER New Zealand: Open Polytechnic. *Using ICTs and digital and Blended Learning in Transforming TVET*, 103.

Bartley-Bryan, J. M. (2017). Jamaica: UTech. *Using ICTs and digital and Blended Learning in Transforming TVET*, 117.

Naud, C. & Bremner, B. (2002). Building Technology-Literate Organizations: Making Virtual a Reality. Paper presented at the UNEVOC-Canada/CVA conference, Developing Skills for the New Economy. Winnipeg, MB.

Bates, A. W. (Tony). (2000). *Managing technological change: Strategies for college and university leaders*. San Francisco: Jossey-Bass.

Bates, T. (2015, 3 January). Choosing a model for media selection [Web log posting]. Retrieved 22 May 2016 from www.tonybates.ca/2015/01/03/ choosing-a-model-for-media-selection

Bernard, R. M., Naidu, S., & Amundsen, C. L. (1991). Choosing instructional variables for practice and research in distance education. *Media and Technology for Human Resource Development: Journal of Educational Technology, 4*(1), 3-13.

Brown, M., Anderson, B., & Murray, F. (2007, December). *E-learning policy issues: Global trends, themes and tensions*. Paper presented at ASCILITE 2007, ICT and digital: Providing choices for learners and learning, Singapore. Retrieved 22 May 2016 from www.ascilite.org/conferences/singapore07/procs/brown.pdf

Cedefop. (2015). Lifelong guidance. Retrieved 22 May 2016 from www.cedefop. europa.eu/en/events-and-projects/projects/lifelong-guidance

Commonwealth of Learning. (2004). *The practitioner research and evaluation skills training (PREST)*. Cambridge, UK: Commonwealth of Learning, Vancouver & International Research Foundation for Open Learning. Retrieved 22 May 2016 from http://oasis.col.org/handle/11599/604

Commonwealth of Learning & Asian Development Bank. (1999). *Learner support in open and distance learning: Trainers' kit 006*. Vancouver: Commonwealth of Learning; Manila: Asian Development Bank. Retrieved 22 May 2016 from http://oasis.col.org/handle/11599/67

Danaher, P. A., & Umar, A. (Eds). (2010). *Perspectives on distance education: Teacher education through open and distance learning*. Vancouver: Commonwealth of Learning. Retrieved 22 May 2016 from http://oasis.col.org/ handle/11599/115

Daniel, J., Alluri, K., & Mallet, J. (2008). *Tertiary TVET: Pathways for pioneers*. Guest Address at the University of Vocational Technology (UNIVOTEC), Sri Lanka. Retrieved 22 May 2016 from http://oasis.col.org/handle/11599/1003

Department of Industry, Innovation, Science, Research and Tertiary Education. (2012). *National VET E-learning strategy 2012–2015*. Canberra, ACT: Australian Government. Retrieved 22 May 2016 from www.det.act. gov.au/__data/assets/pdf_file/0011/268229/National_VET_E-learning_Strategy_2012_-_2015_Handout.pdf

Feigenbaum, A. V. (1956). Total quality control. *Harvard Business Review, 34*(6), 93-101.

Flexible Learning Advisory Group. (2013). *2014 E-learning benchmarking survey: National VET E-learning Strategy*. Canberra: ACT.

Frydenberg, J. (2002). Quality standards in e-Learning: A matrix of analysis. *International Review of Research in Open and Distributed Learning, 3*(2). Retrieved 22 May 2016 from www.irrodl.org/index.php/irrodl/article/view/109/189

ITU. (2015). *ICT and digital facts & figures. The world in 2015*. Geneva: Author. Retrieved 22 May 2016 from www.itu.int/en/ITU-D/Statistics/Documents/facts/ ICTFactsFigures2015.pdf

Johnson, S. M. (1986). Incentives for teachers: What motivates, what matters. *Educational Administration Quarterly, 22*(3), 54-79.

References

Kotsik, B., Tokareva, N., Boutin, F., & Chinien, C. (2009). ICT and digital application in TVET. In R. MacLean & D. Wilson (Eds), *International handbook for the changing world of work* (pp. 1863-1877). Dordrecht, The Netherlands: Springer.

Lauglo, J. (2006). *Research for TVET policy development*. Bonn & Magdeburg: InWEnt – Internationale Weiterbildung und Entwicklung gGmbH Capacity Building International, Germany. Retrieved 26 July 2015 from www.unevoc.unesco.org/fileadmin/user_upload/pubs/IntLib_DiscP_PolicyDev.pdf

Marope, P. T. M., Chakroun, B., & Holmes, K. P. (2015). *Unleashing the potential: Transforming technical and vocational education and training*. Paris: UNESCO. Retrieved 22 May 2016 from http://unesdoc.unesco.org/images/0023/002330/233030e.pdf

Merill, M. D. (2002). First principles of instruction. ETR&D, 50(3), 43–59. Retrieved 22 May 2016 from http://mdavidmerrill.com/Papers/firstprinciplesbymerrill.pdf

Munjanganja, L. E. (2010). Introduction. In R. Dubois, K. Balgobin, M. S. Gomani, J. K. Kelemba, G. S. Konayuma, M. L. Phiri, & J. W. Simiyu, *Integrating sustainable development in technical and vocational education and training: Six case studies from Southern and Eastern Africa*. Bonn: UNESCO UNEVOC International Centre for Technical and Vocational Education and Training. Retrieved 22 May 2016 from http://unesdoc.unesco.org/images/0019/001906/190635e.pdf

Rauner, F., & Maclean, R. (2009). *Handbook of technical and vocational education and training research*. New York: Springer Science and Business Media.

Sewart, D. (1998). Tuition and counselling: Supporting the teachers for competitive advantage. In C. Latchem & F. Lockwood (Eds), *Staff development in open and flexible learning*. London & New York: Routledge.

Shelton, K. (2011). A review of paradigms for evaluating the quality of online education programs. *Online Journal of Distance Learning Administration, 4*(1). Retrieved 22 May 2016 from www.westga.edu/~distance/ojdla/spring141/shelton141.html

Tinio, V. L. (2015). ICT and digital in education/key challenges in integrating ICTs and digital in education. Wikibooks. Retrieved 22 May 2016 from https://en.m.wikibooks.org/wiki/ICT and digital_in_Education/Key_Challenges_in_Integrating_ICTs and digital_in_Education

Training Industry. (n.d). ADDIE Model. Cary, NC: Training Industry, Inc. Retrieved 22 May 2016 from www.trainingindustry.com/wiki/entries/addie-model.aspx

TVET Australia. (2012). *Productivity commission education and training workforce study: Submission by TVET Australia*. Melbourne, VIC: Author. Retrieved 22 May 2016 from www.pc.gov.au/inquiries/completed/educationworkforce-vocational/submissions/sub056.pdf

UNESCO. (2015). Qingdao Declaration promotes use of ICT and digital to achieve education targets in new sustainable development goals (Press Release No. 2015-48). Paris: Author. Retrieved 22 May 2016 from www.unesco.org/new/en/media-services/singleview/news/qingdao_declaration_promotes_use_of_ICT and digital_to_achieve_education_targets_in_new_sustainable_development_goals/#.VWk00M-qpBc

UNESCO-UNEVOC. (2012). *International Forum on the Role of the UNEVOC Network in Transforming TVET for a Sustainable Future* (Meeting Report). Bonn: UNESCO-UNEVOC International Centre for Technical and Vocational Education and Training. Retrieved 22 May 2016 from http://unesdoc.unesco.org/images/0022/002229/222926e.pdf

Volmari, K., Helakorpi, S., & Frimodt, R. (Eds). (2009). *Competence framework for VET professions. Handbook for practitioners*. Thessaloniki, Greece: Cedefop/

Helsinki: Finnish National Board of Education. Retrieved 22 May 2016 from www.cedefop.europa.eu/en/publications-and-resources/publications/co01
World Education Forum. (2015). *Incheon Declaration. Education 2030: Towards inclusive and equitable quality education and lifelong learning for all*. Retrieved 22 May 2016 from www.waam2015.org/sites/default/files/incheon_declaration_en.pdf

Zenger, J., & Folkman, J. (2016,14 January). The trickle-down effect of good (and bad) behaviour. *Harvard Business Review*. Retrieved 22 May 2016 from https://hbr.org/2016/01/the-trickle-down-effect-of-good-and-badleadership

Module 5

AN ICT AND DIGITAL STRATEGY FOR TVET AT NATIONAL AND INSTITUTIONAL LEVELS

Unit 5.1 ICT and digital strategic integration plan for TVET

Objective 5.1.1

Develop the institution's ICT and digital vision for ICT and digital-mediated teaching and learning

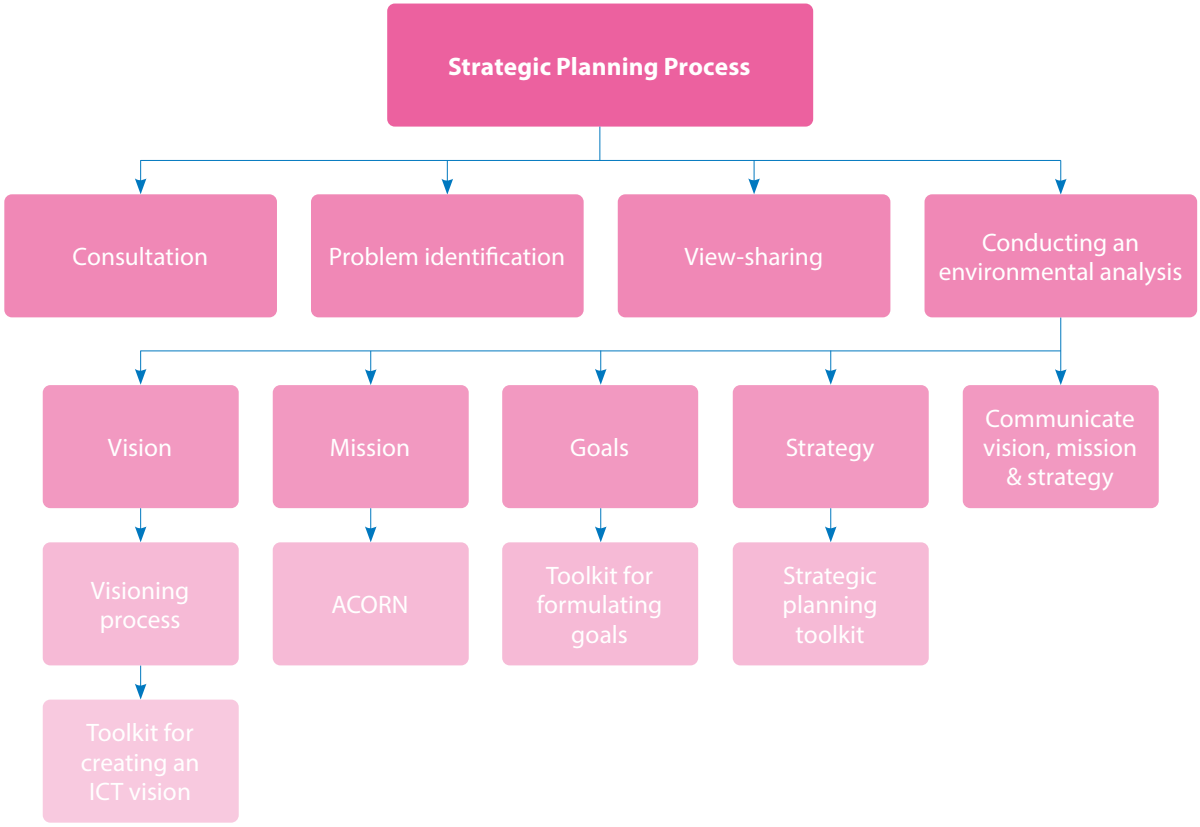
Objective 5.1.2

Develop the institution's ICT and digital mission for ICT and digital-mediated teaching and learning

Has your organization established a vision for the integration of ICT and digital-mediated teaching and learning?

Does this vision match the institution's activities, values and beliefs and mission statement?

Has your organization established a mission for the integration of ICT and digital-mediated teaching and learning?



The development of a strategic plan is essential for successful implementation of ICT and digital-mediated teaching and learning in TVET. Latchem (2004) identified the advantages of the strategic planning process:

- Engaging management, staff and other stakeholders in dialogue about the vision, mission and goals of open and flexible learning within specific institutional contexts.
- Informing and shaping the curriculum, courses, teaching and learning practices and priorities.
- Directing organizational activities towards the overall attainment of medium- to long-term strategic objectives.
- Guiding staff development, research and quality assurance in open and flexible learning.
- Guiding policymaking bodies and institutional committees in their work relating to open and flexible learning.
- Communicating the institution's intentions and commitment to internal and external stakeholders (p. 1).

Various uses of ICTs and digital in TVET must be considered in developing the ICT and digital vision, mission, goals and strategy for TVET. While the overall ICT and digital vision, mission, goals and strategy should be developed, it is also necessary to develop a specific ICT and digital vision, mission, goals and strategy for each function adopted.

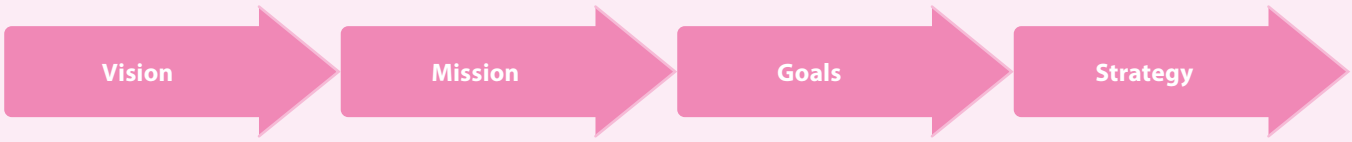
Latchem advocates a four-stage strategic planning process:

Stage 1.
Consultation with current and potential stakeholders – students, staff, employers and representatives of the wider community – in order to identify or anticipate external expectations, opportunities and threats and match these to internal capabilities and weaknesses.

Stage 2.
Identification of the principal problems or opportunities – those elements that will have the greatest impact or exert the most leverage.

Stage 3.
Sharing views on the organization's strategic options, how to implement and assure quality in policies and procedures.

Stage 4.
Conducting an environmental scan or analysis of the operating environment, the institutional mission, vision and value statements, strategic goals, key strategies and targets, accountability and quality assurance mechanisms. An operational plan is then needed to translate these ideas into reality (pp. 1–2).



The development of an ICT and digital-mediated teaching and learning vision, mission, objectives and strategies must be based on the existing institutional mission, vision and values statements and strategic goals.

Vision

ICTs and digital are a powerful tool for adapting to the ever-changing demands of a global information society. There is a growing dependence on communication, learning and computing technologies to sustain potential learners. Without access to and continuous development of innovative ICTs and digital, many individuals, public and private institutions, and possibly entire countries, would fail to acquire the competitive edge needed to succeed. Given this imperative, it is necessary to develop best practices that encourage and sustain ICT and digital-mediated teaching and learning in TVET. This can be made possible through the formation of a strategic ICT and digital plan.

Visioning is the cornerstone of strategic planning...

One such best practice in the development of a strategic ICT and digital plan is the creation of an ICT and digital vision. A favourable ICT and digital vision provides the institutional and conceptual framework necessary to develop an environment that endorses creativity and sustainability within ICT and digital-mediated teaching and learning. Visioning is the cornerstone of strategic planning, and is propelled by the mission, strategy and objectives of the institution. A cogent vision is based upon the preferred future of the institution, as well as the culture, beliefs, individual identity and goals of the institution (National School Board Foundation, no date). It is also fluid enough to accommodate a change, given rapidly changing technological demands. The process of creating a vision should culminate in a vision statement.

Conditions for Creating Institutional Vision

There are two key conditions necessary for an institutional vision to materialize, the creation of a mission statement and the inclusion of a belief system. First, a valued mission statement delineates the goals of the institution, and how these goals will be achieved. Good mission statements typically exemplify common characteristics. The characteristics include statements that are:

- Straightforward, concise and memorable
- Unambiguous, but broadly written
- Reasonably stable, but flexible enough to adapt to the institution as it changes and responds to the demands of the world in which we live;
- Driven by principles and not limited to quantitative or qualitative evaluation
- Futuristically oriented and not constrained by the present
- Applicable to all for whom they apply
- Inspiring, motivating and meaningful

The second condition to promote the creation of a vision is the inclusion of the institution's belief system. Institutions and belief systems are interdependent (Environmental Governance, Belief Systems and Perceived Policy Effectiveness, p. 2). It is arguable that people will believe in the vision if the structure of governance reflects congruency between the belief system and the espoused vision. The belief system should therefore support the goals of the institution and community at large; it should reflect the values of the institution; direct the activities of the people; guide the dissemination and sharing of knowledge; be observable in future planning; be realistic; and be corroborated by outcomes (National School Board Foundation, Key Components of Your Vision). Walter, Caplan & McElvain (2000) proposed a five-step visioning process:

Table 2. The five-step visioning process

STEP 1	Visioning – What is your vision and how will ICTs and digital impact your institution in 1 year, 5 years or 10 years?
STEP 2	Identifying Challenges – What are the challenges or barriers to achieving this vision?
STEP 3	Prioritizing the challenge – Which of these challenges are the most important? (Determine the top challenges by voting rather than discussing)
STEP 4	Identifying needs and assets – What are the needs that will affect our ability to address challenges? What resources or assets are available to help address these challenges?
STEP 5	Strategizing – Given our needs and assets, what strategies could we use to address the challenges? (Brainstorming)

Source: Walter, Caplan & McElvain (2000). Beyond the Bell: A Toolkit for Creating Effective After-School Programmes. North Central Regional Educational Laboratory, Illinois.

To develop an ICT and digital-specific vision, consideration must be given to strategic components needed for ICT and digital development. The following are questions to consider when developing an ICT and digital vision. By no means is this list of questions exhaustive, but they may lead to other relevant questions.

How do we create an enabling environment that encourages user-friendly and barrier-free technologies; access to telecommunications and information systems; policies on confidentiality, information security and intellectual property rights; the development of ICT and digital applications including ICT and digital facilities and related infrastructure and networks, priority being given to the more disadvantaged and marginalized ICT and digital-poor? ICTs and digital have particular potential for enriching and improving the quality and relevance of education provided to the poor.

- How do we increase ICT and digital awareness among the disadvantaged and marginalized as well as other segments of society? Awareness-building programmes and vocational training through an information, education and communication component should be incorporated into an ICT and digital vision for the future.
- How do we support literacy development with a focus on lifelong learning as necessary for improving knowledge and skills? ICTs and digital support and promote self-directed, informal, non-formal and transformative learning, and these are important types of learning within the framework of lifelong learning.
- How do we support knowledge-sharing and dissemination of information and knowledge? ICTs and digital and the globalization of specialized communication and information networks support knowledge-sharing, and the Internet is an important component and powerful communication tool that provides a means of distributing information and knowledge.
- How do we foster the development of human resources that are capable of responding to the rising demands of the information society?

The following Toolkit can be used to create an ICT and digital vision.

Table 3. Toolkit for create an ICT and digital vision

ACTION	OUTCOME
Exploit experience curves and review the purpose of your institution	• Document institutional values and beliefs. • Document institutional strengths, weaknesses, opportunities and threats. • Document the needs of potential learners, customers and/or target audiences. • Document training gaps, staffing complement, other employee needs • Examine resource availability. Examine revenue streams (if applicable).
Talk about innovation	• Have an understanding of how technology and innovation are affecting your institution and industry. • Have an understanding of how technology and innovation will affect your institution and industry in future. • Document ideas about short- and long-term effects.
Explore alliances and partnerships	• Document potential partners and opportunities they may present. • Document benefits or disadvantages of potential partnerships and alliances. • Document competitors and any innovative response strategies used by them.
Exhaust questions related to creating an ICT and digital-specific vision	• Document responses to questions and considerations.
Create a priority listing of information collected in the above and write a vision statement	• A statement that communicates the information collected from the above steps in a succinct yet detailed manner. Qualify and quantify statements (see bolded statements in the sample below) so that results are observable or measurable by all involved in activity generation.

Source: Chinien, (2005).

Vision creation is only one of four steps in devising an ICT and digital strategic plan. These four steps are: vision, mission, goals and strategy. This sequence allows the goals to be derived from the vision and mission, and the strategy to support the goals.

Mission

A mission statement is only effective to the degree that its premise is meaningful to those who follow its creed. What makes a mission statement unique is the identity of the institution for which the mission statement was written; the goal of the institution as expressed in the mission statement; the tasks of the people who will fulfil the goals; and the values of the institution, whether they are implied or overtly stated in the mission statement (Magarrel, 1999, Essential Elements of a Mission Statement). The Gilbert (1978) ACORN test to assess the appropriateness of a mission statement at policy level was used to develop the following TOOLKIT for mission statement formulation.

A mission statement is only effective to the degree that its premise is meaningful to those who follow its creed

Table 4. Toolkit for formulating a mission statement

A	The statement must describe an Accomplishment, and not just a behaviour
B	Those assigned to the mission have primary Control over it
C	The statement must reflect a true Overall Objective, but merely a subgoal
D	The mission must be Reconciled with other goals of the institution
E	A Number can be put on it. That is, it can be measured

The ACORN test can be used to review the mission statement for ICT and digital-mediated teaching and learning in TVET.

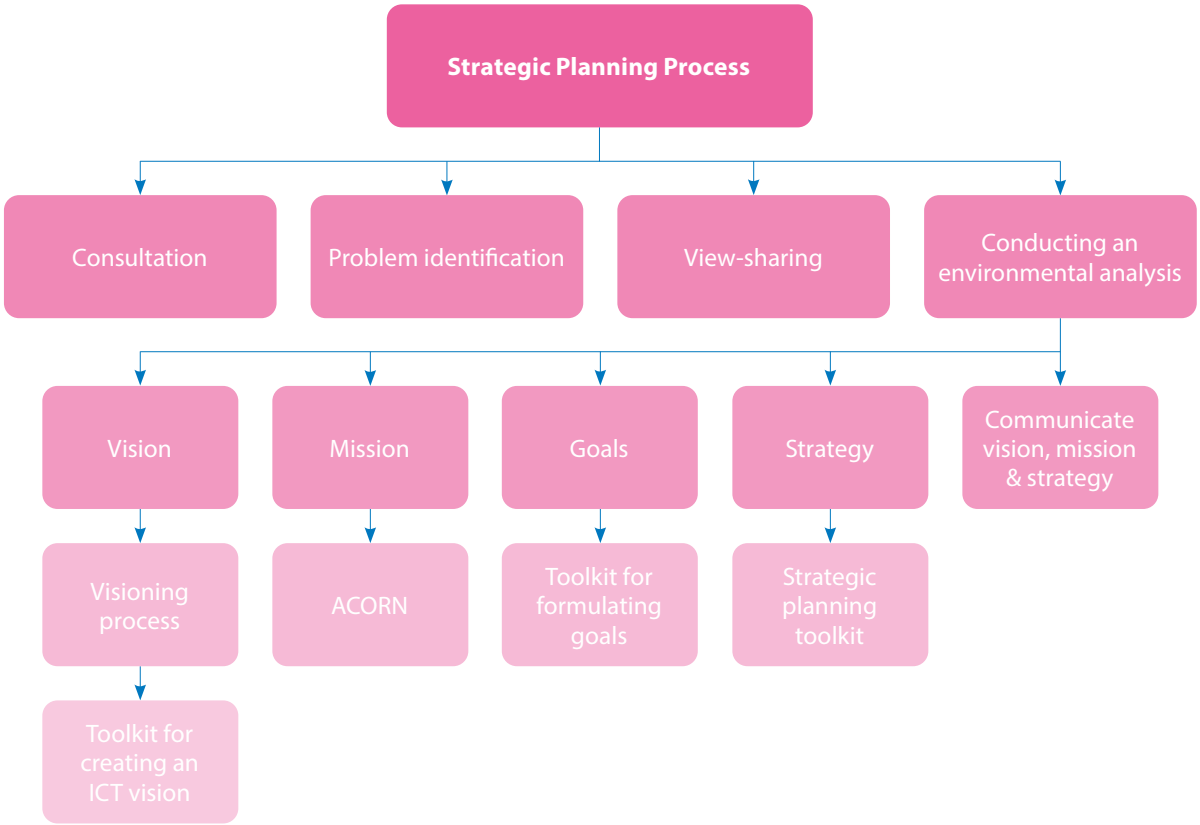
AN ICT AND DIGITAL STRATEGY FOR TVET AT NATIONAL AND INSTITUTIONAL LEVELS

Unit 5.2 ICT and digital integration goals and strategic plan for TVET

Objective 5.2.1

Develop the institution's ICT and digital goals and strategy

Has your organization established a strategy for the integration of ICT and digital-mediated teaching and learning?



Goals

Goal setting involves a reflective process because it requires people to examine what they want and what they do not want. Goal- setting involves a reflective process because it requires people to examine what they want and what they do not want. One of the first steps in establishing goals is acknowledging that there is something that requires change (10 Steps to Get What YOU Want: Creating YOUR Reality, why do people set goals). The following Toolkit (Table 7) can be used to formulate goals for the integration of ICT and digital-mediated teaching and learning in TVET.

Table 5. Toolkit for formulating goals for the integration of ICT and digital-mediated teaching and learning in TVET

Design accomplishment	Conditions	Standard to be achieved

Latchem (2004, p. 9) provided the examples of Vision, Mission and Objectives statements from the e-learning strategic planning process of Samuel Jackman Prescod Polytechnic (SJPP) in Barbados. SJPP could no longer meet demands through traditional face-to-face and off-campus methods. ICT and digital-mediated teaching and learning was considered a viable option. The following are the vision, mission and objectives for ICT and digital-mediated teaching and learning.

Vision

- To be a regional leader in developing and delivering open and flexible technical education, nationally and internationally.

Mission

- To be proactive in providing quality, inclusive and cost-effective, open and flexible initial and continued education relevant to the needs and circumstances of the nation, region and widest possible range of learners.

Objectives

- To provide open and flexible courses, programmes, facilities and services that are responsive to demand, inclusive and provided at a reasonable cost.
- To serve group and individual needs, including those with special needs, by employing a variety of methods and media.
- To enable SJPP staff to keep abreast of developments in open and flexible learning and technology, and to recognize and reward endeavours in these areas.
- To assure quality in open and flexible learning through monitoring, evaluation, reflective practice and action research.
- To establish strategic alliances with other institutions, sectors and internationally for the purposes of information/resource-sharing, collaborative course development and delivery, coordination, accreditation and credit transfer.

Strategy

Developing a clear strategy is critical because it is aimed at determining how goals will be achieved. A strategy facilitates the development of a plan of action by outlining the primary activities that will be undertaken to achieve the goals as identified. Strategies encompass the objectives or activities that are carried out in day-to-day operations that produce actual results: this translates the goals into action. It is likely that there will be more than one strategy because there are often several goals. In addition, there may be more than one strategy for each goal.

Strategy development should be systematic, rational and interactive.

Strategy development should be systematic, rational and interactive. It typically takes place over an extended period of time, allowing for additions, changes and modifications based on the interests of all relevant stakeholders. Furthermore, it is subject to institutionalized political forces and should be modified accordingly.

Review the institution's ICT and digital vision, mission, goals and strategy

Due to the turmoil and uncertainties that characterize the current environment in which TVET institutions operate, their ICT and digital-mediated teaching and learning vision and strategy must be flexible and adaptable to changing ideas, technologies and circumstances. Because of this fluid environment, it is also necessary to conduct a periodic review and refinement of the ICT and digital vision and strategy. This review process can be performed in consultation with key stakeholders using focus group or survey methodologies.

Strategic Planning Toolkit for Integrating ICTs and digital into TVET

The successful implementation of ICT and digital-mediated teaching and learning requires careful planning, since there are many pitfalls to be avoided, as cited earlier in Module 3, such as:

- Allowing decisions to be driven by technology
- Jumping on the 'everybody's doing it' bandwagon
- Overlooking existing educational and ICT and digital systems
- Underestimating the front-end and ongoing funding requirements
- Unclear statements of objectives to be achieved
- Raising unrealistic expectations
- Failing to keep stakeholders briefed and involved in the decision process (Farrell, 2001, p. 152).

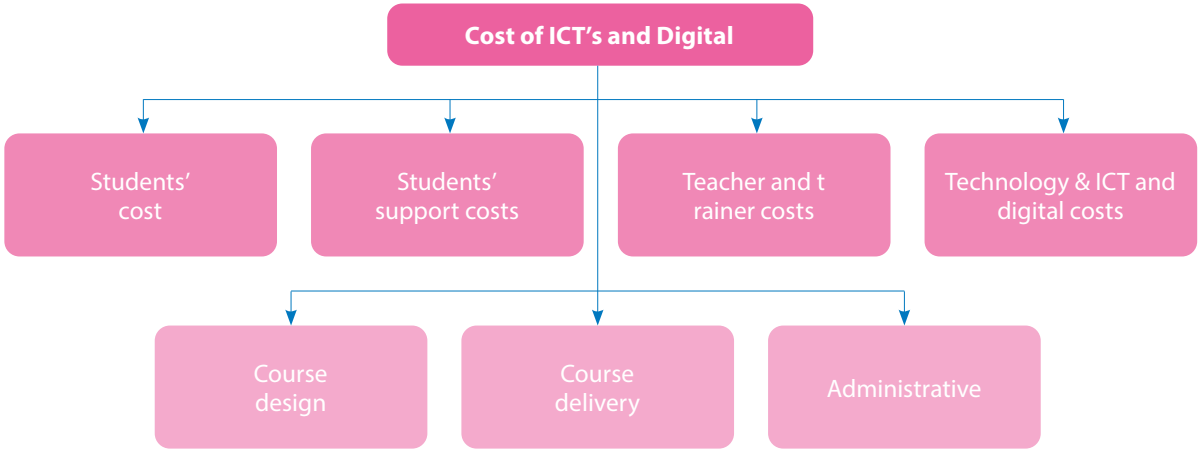
AN ICT AND DIGITAL STRATEGY FOR TVET AT NATIONAL AND INSTITUTIONAL LEVELS

Unit 5.3 Communicate the ICT and digital strategic integration plan for TVET

Objective 5.3.1

Communicate the institution's ICT and digital vision, mission, goals and strategy

Has your organization communicated its vision and mission for a ICT and digital-mediated teaching and learning strategy in TVET to all key stakeholders?



Communication Plan for a TVET ICT and digital Strategy

A good communication plan is critical to the success of an ICT and digital-mediated teaching and learning initiative. The communication plan should meet the information needs of all stakeholders and should specify when, what, how and with whom to communicate. Some critical elements to consider in the development of a communication plan include (http://www.isixsigma.com/library/content/c010304a.asp, Six Sigma (2004, p. 1)):

Who
The person responsible for delivering the communication.

What
The type of communication that must be delivered.

Why
The purpose of the communication plan, i.e., to establish and enforce a contract for communication.

Where
The location where the recipient will find the communication.

When
The time and/or frequency at which the communication will be delivered.

How
The delivery mechanism that will facilitate the communication.

To Whom
The audience or recipients of the communication.

The following Toolkit (Table 6) can be used to plan the ICT and digital communication strategy in TVET.

Table 6: Toolkit for planning the ICT and digital communication strategy in TVET

What	To whom	When	Who communicates	How	Where

Adapted from: Six Sigma (2004). A project charter communication strategy is essential. Retrieved 16 June 2004 formhttp://www.isixsigma.com/library/content/c010304a.asp

Conclusion/Summary

In a nutshell, this unit explored the advantages and stages of a strategic planning process. Specifically, the stages of a vision statement were highlighted and discussed, together with the toolkit and measures for formulating a good mission statement, a goal strategy and plan to effectively communicate the vision, mission, goals and ICT and digital-mediated teaching and learning strategy for TVET to all key stakeholders. An example of Vision, Mission and Objectives statements resulting from the e-learning strategic planning process of Samuel Jackman Prescod Polytechnic (SJPP) in Barbados was presented to guide learners to independently develop a new vision, mission, goal and strategy. The next module, Module 6, delved into an analysis of different aspects of ICT and digital integration for the purposes of costs, budgeting and funding. Emphasis is placed on the ability to develop proposals, locate funding and grants for the digital transformation of the TVET system.

Transformative Reflection

Now that you have completed this segment of instruction, please engage in the following transformative reflection activities:

1 Focus on the assumptions underlying your beliefs, feelings and actions regarding the ICT and digital-mediated teaching and learning communication strategy for TVET.

2 Examine and assess the consequences of these assumptions on your beliefs, feelings and actions in relationship to ICT and digital-mediated teaching and learning visioning, strategic planning and communication strategy for TVET.

3 Consider your learning experiences while completing this segment of instruction. Conduct a critical reflection regarding the extent to which this instruction has helped you identify and explore alternative sets of assumptions or reinforced your initial assumptions regarding ICT and digital-mediated teaching and learning visioning, strategic planning and communication strategy for TVET.

4 If this instruction has helped you consider alternative sets of assumptions, test the validity of these assumptions by participating in a reflective dialogue with a critical friend, or by engaging in self-reflection.

Unit 5.3
Quiz

Self-assessment questions

Multiple choice: Circle all the correct answers that apply for each question. There may be more than one correct answer.

1. Some of the advantages of the strategic planning process are:

A. Staff in dialogue about the vision, mission and goals

B. Directing organizational activities

C. Consultation with current and potential stakeholders

D. Identifying or anticipating external expectations

2. Arrange the stages of the strategic planning process in the correct order:

A. Sharing views on the organization's strategic options; consultation with stakeholders; identifying the principal problems; conducting an environmental scan.

B. Consultation with stakeholders; identifying the principal problems; sharing views on the organization's strategic options; conducting an environmental scan.

C. Conducting an environmental scan; consultation with stakeholders; identifying the principal problems; sharing views on the organization's strategic options.

D. Consultation with stakeholders; conducting an environmental scan; identifying the principal problems; sharing views on the organization's strategic options.

3. The stakeholders involved in strategic planning may involve:

A. Students

B. TVET staff

C. Community representatives

D. All these answers are correct

4. _____ is the cornerstone of strategic planning:

A. A mission statement

B. Strategic goals

C. A vision statement

D. Strategy

5. The two key conditions necessary for an institutional vision to materialize are:

A. The inclusion of the institution's belief system

B. The creation of laudable objectives

C. Stating realistic goals

D. The creation of a mission statement

6. The steps in the visioning process are:

A. Visioning

B. Identifying and prioritizing the challenge

C. Identifying needs and strategizing

D. All these answers are correct

7. ACORN means:

A. Accomplishment; Control; Objective; Reconciled; Number

B. Accommodate; Conceive; Overall; Review; Narrate

C. Achieve; Control; Overall; Review; Narrate

D. Accomplish; Control; Obligate; Review; Number

8. Developing a clear strategy:

A. Determines how goals will be achieved

B. Facilitates the development of a plan of action

C. Should be systematic, rational and interactive

D. Should be smart, specific, measurable, and time-bound

9. A good communication plan should specify:

A. Who is responsible for delivering the communication

B. The type and purpose of the communication plan

A. The location and time at which the communication will be delivered

B. All these answers are correct

10. Reviewing the purpose of your institution's ICT and digital vision requires:

A. Documenting an institutional SWOT

B. Documenting the needs of customers

C. Documenting training gaps, staffing complement, other employee needs

D. Examining staff availability and staff needs.

Practice Questions

1. Using your transformative reflection experience, develop an ICT and digital plan for your TVET programme. Your plan should include the following elements:

- Vision
- Mission
- Goals and objectives
- Strategy
- To communicate the vision, mission, goals and strategy to stakeholders

1. If your organization has already developed an ICT and digital plan for your TVET programme, review and revise this plan as necessary

1. Ask a group of key stakeholders in TVET to review the plan.

References

Farrell, G.M. (2001). Issues and Choices. In G. M. Farrell (Ed.), The Changing Faces of Virtual Education (pp. 141–152). Vancouver, Canada: The Commonwealth of Learning.

Latchem, C. (2004). Strategic Planning for Open and Flexible Learning. Retrieved on June 19, 2020 from http://www.unescobkk.org/ODL/doc/latchem Strategic%20Plannning%20for%20Open%20and%20Flexible%20Learning.doc

Gilbert, F.T. (1978). Human Competence: Engineering Worthy Performance. McGraw-Hill Book Company. New York.

Walter, K.E., Caplan, J.G. & McElvain, C.K. (2000). Beyond the Bell: A Toolkit for Creating Effective After-School Programme. North Central Regional Educational Laboratory (NCREL), Illinois.

Module 6

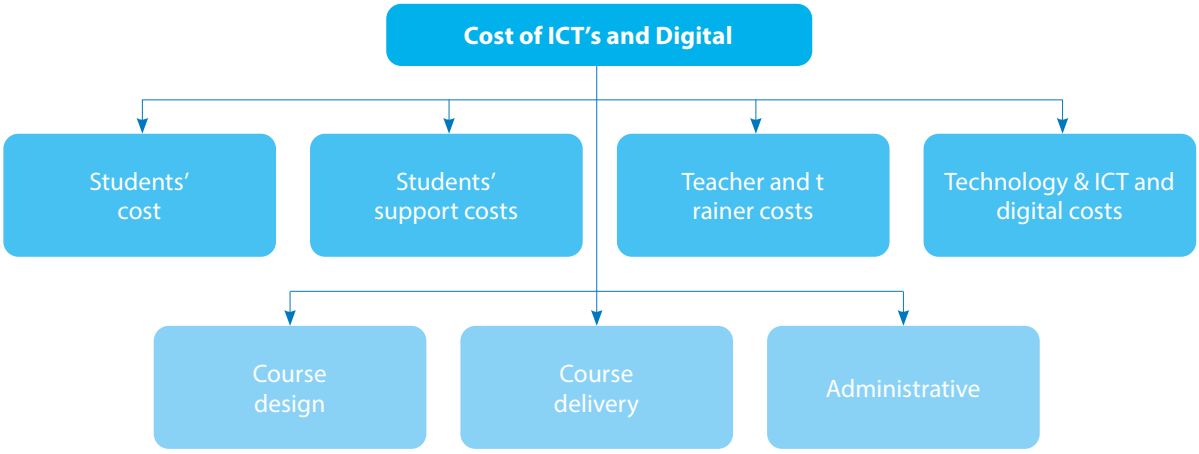
COSTING AND FINANCING ASPECTS

Unit 6.1 Analysis of the cost of integrating ICT and digital into TVET

Objective 6.1.1

Develop awareness of the cost effectiveness of integrating ICT and digital into TVET

Is your organization aware of the cost effectiveness of ICT and digital integration in TVET?



Cost Effectiveness of ICTs and digital

ICTs and digital are viewed by many policymakers, at both national and institutional levels, as a potentially cost-effective means of tackling the challenges of access, equity and quality in education. Sound and rigorous financial planning is essential for governments and institutions seeking to harness these methods, but unfortunately there has been little analysis of the costs of such provision in the TVET sector.

With the growing ability to present simulations and modelling using ICTs and digital, it is becoming increasingly possible to offer new forms of TVET at a distance. However, there may be misguided or ill-informed assumptions and claims about the cost savings of employing these technologies that suggest that ODL is less expensive than traditional contact education. For a start, achieving economies of scale can be a major challenge in integrating ICTs and digital into TVET, since the training demand in most developing countries is for small numbers of graduates in a wide range of occupational profiles (UNESCO IITE, 2005). Economic concerns can raise major barriers to offering ODL programmes in TVET. This is particularly challenging in contexts where government funding for TVET is low. This lack of funding limits the extent of the training, the number of students who can be trained and the quality of the training, with the recruitment of teachers, modernization of equipment and acquisition of training resources being especially affected (Siriwardene and Qureshi, 2009).

Some studies have attempted to establish relative the costs of ICTs and digital in education (Potashnik and Capper, 1998) (cited by Baalen and Moratis, 2001, p. 103):

> Print, audiocassettes, and pre-recorded instructional television (lectures) are the lowest-cost technologies for small numbers of students (fewer than 250), while radio requires 1,000 students or more to achieve comparable per student costs. Computer conferencing is a low-cost approach to providing interactivity between teachers and students, but live interactive broadcasts and videoconferencingvideoconferencing are still very high-cost technologies, regardless of the number of students enrolled.

Research on the cost effectiveness of ICT and digital-mediated teaching and learning is inconclusive. While some studies demonstrate that ICT and digital integration can be cost-effective, others suggest that technology is not a cost-effective solution, and that implementation and maintenance costs will continue to climb.

Any discussions relating to the cost of ICTs and digital naturally raise the fear that 'information poverty will reinforce "real poverty" in poorer countries' (Buckley, 2000, p. 1). In an analysis designed to assess whether ICTs and digital can promote education in developing countries, the author noted that telephone, television, and computers are in very short supply in developing countries, and 'as the north-south digital divide expands, radio appears to be the only electronic medium that minimizes constraints on access to information' (p. 1). The analysis by Bates (1995) (cited by Stevens, 2001) in the context of the UK's Open University demonstrated that instructional radio could be cost-effective:

> Radio costs per student for courses with over just 100 students a year are ten times higher than courses with 1,250 students or so per year…Courses needed to have over 1,250 students a year before unit costs dropped below $1.50 per student study hour; on the foundation courses, though, each with more than 6,000 students a year, radio costs came down to 30 cents per hour.

Research on the cost effectiveness of ICT and digital-mediated teaching and learning is inconclusive.

The issue of economy of scale is a major challenge forfor the integration of ICTs and digital into TVET, since the training demand in most developing countries is for small numbers of graduates in a wide range of occupational profiles. Learning consortia must be created among developing nations to minimize purchase and maintenance costs.

Daniel (ibid) views the effectiveness of education within a framework that encapsulates three elements: (1) access, (2) quality, and (3) costs. He defined quality as 'fitness for purpose at minimum cost to society' (p. 2). This framework is extremely useful in any consideration of accessibility:

> When you express the basic challenge of education in terms of this triangle of forces, one uncomfortable fact is clear. Traditional methods of teaching and learning cannot produce the changes required. Try putting more students in each class. Access may go up, cost may go down, but everyone will accuse you of lowering quality. Traditional ways of improving quality tend to reduce access and raise costs. There is clearly a problem. Throughout history, education has made an insidious link between quality and exclusivity. You can only have high quality if you exclude many people from access to it (p. 2). Daniel (2002) pointed out that evidence shows that technology can increase access, improve quality, and lower cost all at the same time.

'It appears that investment in IT universities is a highly politicized process...'

Holt and Thompson (1998)

Research conducted by Curtin (2002) identified three models in current use by the TVET system in Australia to achieve cost effectiveness outcomes in online delivery:

- Reduce costs while maintaining current levels of effectiveness and volume
- Improve learning effectiveness while maintaining current costs and volume
- Increase volumes while maintaining current levels of costs and effectiveness (p. 6).

These models validate Daniel's framework establishing the relationship between access, quality and cost. It appears that cost-benefit analysis does not make the decision-making process easier for adopting ICTs and digital in educational institutions.

Holt and Thompson (1998) cited by Bates (2000) noted: 'It appears that investment in IT in universities is a highly politicized process, often based at least partly on an act of faith that IT will help deliver on the quality and productivity agenda…Such investment processes and imperatives are not necessarily amenable to rationalistic cost-benefit investment models and techniques' (p. 125).

International copyright and intellectual property rights increase costs on high-quality ICT and digital training materials, making them less accessible to developing countries. Varoglu and Wachholz (2001) (cited by Stevens, 2001): 'Express concerns with the effort by more advanced countries to "commoditize" knowledge and rigidly enforce international copyright and intellectual property rights'.

There has been no consistent or comprehensive research into the comparative costs of integrating ICTs and digital. Some of the studies undertaken have focused on institutional costs, others have considered public expenditure costs, and yet others have focused on the total economic costs. Some focus on fixed costs, considering the initial costs for processes such as designing, developing and producing instructional materials for the first offering and the one-time technological infrastructure costs. Others accept that there are significant continuing costs which can vary over time, such as the number of students per course and location, the costs of distributing materials, course updating and revising, supporting students, researching and developing the delivery systems, and the ever-changing technological infrastructure (Bart, 2008).

Nevertheless, the literature does suggest that distant learning programmes can be more cost-efficient than their conventional equivalents if they enrol large numbers of students on every course and thus achieve large economies of scale. Remote courses are not restricted by classroom size, so per student costs decrease as enrolments increase. The literature also suggests that distance learning institutions can be more cost-effective than conventional institutions when they offer high-quality learning materials and tutorial support for students, thereby securing satisfactory retention and graduation rates. Conversely, if they fail to achieve satisfactory retention and graduation rates, they may well be much more expensive, particularly in terms of cost per graduate, and especially if graduation rates are the sole measure of educational value added. Cost calculations based only on successful graduations favour conventional institutions, because distance education students who are satisfied with partial completion of programmes (particularly in the context of lifelong learning and low-cost fee environments) are ignored and their costs are charged to graduations (Butcher and Roberts, 2004).

In distance learning, the literature on costing typically concerns seven main areas: student costs, student support costs, teacher costs, instructional technology costs, material design costs, course delivery costs and administrative costs, among other considerations.

Students' Costs

In a face-to-face learning environment, students contribute towards their study costs such as fees, textbooks and other educational or training materials, living expenses, accommodation, meals, travel, and may experience a loss of, or reduction in, income. Students' perceptions of the cost and value of their programmes relate to whether the studies and qualifications increase their prospects for employment, promotion, higher earnings or enhanced personal goals (Thompson, 2005). In the case of distance, flexible or blended education, regardless of location or mode, some of the costs, such as accommodation and travel, can be avoided and learners may be able to combine their studies with full- or part-time work and contribute to the family income. However, they may incur additional costs, such as to access a computer and connect to the Internet.

Student Support Costs

The costs of providing student support by any institution depend on the number of enrolments, together with the lecturer-to-tutor, tutor-to-student and student-to-student ratios. These ratios generally increase the direct cost of providing student services. The quality and quantity of student support becomes an important cost driver (Griesel, 2012). For example, the role of a tutor in an institution like the UK Open University includes:

- Providing individual support through teaching and grading assignments.
- Playing a key role within the assessment scheme in the ultimate recognition of learning through credit and qualification.
- Paying attention to students' progress, through both response and intervention.
- Providing opportunities for social learning, where possible in groups and through a local and familiar lens through face-to-face contribution to learning.
- Providing support regarding administrative and other systemic issues (Tait, 2014, p. 8).

In addition, student support costs are also incurred in non-academic functions such as enrolment/study options, advisory services, counselling, library services and ICT and digital-based administration and support. If such student support activities are not costed or planned for, teachers and trainers may spend large amounts of unpaid/personal time responding to student queries and concerns. Underinvestment in student support may reduce the cost of delivery per enrolling student but significantly increase the cost per successful student, as reduced or poor-quality student support is likely to lead to higher attrition and failure rates. However, as Tait (2014) observes, online course materials can now be designed to contain self-management tools and learner support, which can reduce the problems and costs of over-dependency on tutors. This is now becoming even easier with the availability of learner analytics that allow providers to diagnose and respond to learners' needs through real-time data collection and intervention.

Teacher and Trainer Costs

In a traditional TVET institution, student numbers are the main driver used to determine the cost of teachers and trainers. The costs of face-to-face teaching increase every time a desirable class size is exceeded. If the recommended maximum class size is 20, and a further 15 students are enrolled, another class will be needed and another teacher will need to be assigned to this class. ICT and digital integration can change this by substituting the expensive addition of extra staff with the less expensive mediated learning and management of students' learning. This can lower costs per student, provided large numbers of students can take the course and the resulting unit cost advantage is not eroded by lower success rates (Butcher and Roberts, 2004).

To integrate ICTs and digital into TVET, there is often a need to upgrade the teachers' knowledge and skills in integrating the new method and technologies into teaching and learning (Herd and Mead Richardson, 2015). In costing distance learning, it is therefore important to budget for the costs of inducting and training teachers and supporting and mentoring staff in their uses of the new methods and resources, creating reliable assessment procedures, effectively managing their students and keeping the course content up to date and relevant (Butcher and Roberts, 2004). Furthermore, there may be merit in ensuring that funding is allocated to other teacher incentives such as innovation grants, teaching excellence awards, conference attendance, and tenure and promotions for those who perform well (all too often these incentives, including time release, go to researchers rather than teachers).

To integrate ICTs and digital into TVET, there is often a need to upgrade the teachers' knowledge and skills in integrating the new method and technologies into teaching and learning.

Technology Costs

In developing countries and areas lacking a reliable or affordable Internet connection, in ODL the move is towards ever-greater use of ICTs and digital and the myriad teaching and learning options they provide. With this greater reliance on technology to deliver instruction and to support learners, it is inevitable that technology costs will rise. These can be considered in four categories: the initial purchase price of hardware and cabling (including the periodic replacement of obsolete equipment); the cost of software and related resources; connectivity costs, and support, maintenance and training costs.

Many institutions are now investing in Learning Management Systems (LMSs) and related online learning platforms, as well as specialized assessment software to facilitate online, mobile and blended learning. Investing in these may pose a challenge in some countries. In Zambia, for example, the level of government funding for TVET institutions is so low that it is cost-prohibitive for institutions to progress to the use of ICTs and digital. If the technologies are adopted, the costs of these are usually passed on as increased fees to the students, which then reduces the number of people who can afford TVET study (Herd and Mead Richardson, 2015).

Furthermore, there are significant costs associated with the repair, maintenance, security and replacement of technology. There is also the all-important issue of providing funds for training personnel in the use of this technology. Each technology option considered therefore has its own cost structure and implications and ICTs and digital are, of course, in a constant state of transition and change, so with each new technology bringing the potential for new and better forms of learning delivery, there will be new costs to consider. It may therefore be better, particularly in developing countries, to stick with easy-to-use, robust and low maintenance technology.

Course Design Costs

The key to quality in the various forms of ODL, regardless of delivery mode, lies in the instructional design of the courses and programmes – that is, the rigorous links between the instructional goals, methods, assessment methods and learning outcomes. A core expectation of any educational or training institution is effective teaching and learning, which requires appropriate investment in curriculum and course design, materials development, ongoing evaluation and regular revision and overhauling of the curriculum and course design. Because these costs can be tracked and managed, they are the ones most often studied.

Course and courseware development costs can be high in ODL – particularly if they involve the use of 'expensive' media and technologies (Butcher and Roberts, 2004). Course development is a fixed cost incurred by education providers regardless of the number of students who are studying on the course. In addition to fixed costs, there are ongoing costs such as updates and additions to course materials or course revisions, depending on the volatility of the material. Hence, a development budget can range from the very simple (e.g., a contract to write learning materials that are then turned over to a production unit to shape into a suitable ODL package) to the very complex (e.g. a budget that must allow for internal cost recoveries and internal and external contracts for special services and long-term suppliers of technical support for the development phase of a project) (Thompson, 2005).

Course design, renewal and remediation is potentially a bottomless pit of expenses, since it is always possible to add more person power to course design teams or seek more expensive media and technologies. But this may not always be so. Many effective courses have been designed with a relatively small number of personnel. However, a generalization with fairly high reliability in the case of ODL is that the quality of the course (subject matter and pedagogy) is linked to the level of investment in its design (Butcher and Roberts, 2004).

ICT and digital Costs

Course development costs have generally increased over time, as ICT and digital-based multimedia materials and interactive learning systems are significantly more expensive to develop than the traditional printed materials that have been the most popular means of teaching practical skills in distance TVET. However, it is important to note that some of the production tools for video and multimedia have become both cheaper and more readily available. Costs differ according to the types of media used. For example, generally speaking, the higher the number of students, the lower the per capita costs of printing the learning packages. It used to be that if print runs were too large or there was a need to make major modifications to, or even discontinue, courses or programmes, there could be major losses (nowadays, digital presses allowing for short-run, just-in-time printing have changed the economic models for printing).

Alternatives such as instructional video materials are increasingly being used and can lead to better practical skills acquisition (see, for example, Donkor, 2010).

Thus, while videos and simulations may be more expensive to produce than printed resources, they can be more cost-effective in contexts where practical demonstrations are required. In addition, the same content can be used to teach successive cohorts and increasing numbers of students over a period of several years, provided the design allows for easy amendments and updates to the content and envisaged use in a range of applications and markets (Griesel, 2012). Videos and multimedia presentations are particularly useful and likely to generate cost savings where the content is unlikely to change (e.g., in trades such as bricklaying or online in-service programmes on the basic principles of TVET teaching and training).

Course Delivery Costs

Successful ODL systems are likely to require as much attention to course presentation as to course preparation. As highlighted, course delivery systems that allow for a wide distribution of course materials which can then be reused can significantly reduce costs. However, as student numbers grow through increased distribution, either the amount of interaction with students decreases (which affects quality and completion rates, thus increasing the cost per graduate), or student-trainer interaction increases (which increases the costs of the service provision). The degree and nature of interaction in learning and support interactivity will depend upon the pedagogical needs of particular programmes and the values and mission of the training institution. This, in turn, will influence the types of technology used and their associated costs. A programme with tutorial-style interaction will consequently cost more than one where the content is simply presented online with self-learning expectations (Sadik, 2009). A balance has to be struck somewhere in all of this because, as Curtain (2002) argues, while high levels of interactivity will be more expensive, learning effectiveness, assessed in terms of student satisfaction levels, depth of learning outcomes and graduation rates, is likely to be much better than with low-interaction, traditional distance education courses.

Course delivery systems that allow for a wide distribution of course materials which can then be reused can significantly reduce costs.

Training providers can also plan for infrastructure and facilities that allow collaboration between and among students, between students and staff, and among staff. Collaboration between colleagues who have never physically met each other in person is possible with computer conferencing, instant messaging, Voice-over Internet Protocol (VoIP) applications like Skype, Zoom, and social interaction tools like Facebook can help to nurture communities of practice. These tools, once considered expensive, are now mostly free or relatively cheaply available, particularly where broadband connectivity is readily available.

Blended delivery can also be used, combining ICT and digital-based learning with practical hands-on components within institutional settings or workplaces in partnership with employers and industry. The benefits of such an approach are increased flexibility, reduced opportunity costs for the students and employers and efficiency gains for TVET providers arising from decreased institutional training time requirements (Stevens, 2001).

Research shows that the effectiveness of ODL and ICT and digital-based teaching and learning depends on the trainer's understanding of the target audiences and students' needs and circumstances, how to make best use of the technologies and how to organize and deliver the content and materials (Valentine, 2002). This calls for investment in their professional development. As they become more proficient at using the new methods and technologies, they will be able to resolve problems more quickly and effectively, and their dependency on technicians and other support staff is likely to decrease – unless changes in technology or approaches require new forms of support.

Course delivery costs therefore depend on the choice of media, the level of support required in a programme (and the corresponding level of synchronous interactivity), the level of training required by the trainers, the levels and nature of the technical support required (which will likely decrease over time as proficiencies increase, but may still be required as new technologies arise), and recurrent costs for software licences if proprietary software is being used.

Administrative Costs

The effective delivery of programmes and the financial sustainability of institutions relies in no small part on the efficiency of administration. Administrative costs usually involve functions designed to support the development, delivery and support services of an institution, particularly the human resource, financial and student support and service systems. Effective management of institutions is increasingly reliant on ICTs and digital. MISs save time and avoid unnecessary duplication by capturing and making the required information available in integrated systems (although they can also lead to significant time-wasting if poorly designed). Importantly, these systems can also support strategic decision-making and policy implementation by stimulating and supporting the free flow of information, thereby facilitating better planning, monitoring and resource allocation. Such investments in designing online administrative systems for distance education are generally regarded as fixed (although the costs of running the administration are obviously not).

Institutions may develop their own administration systems to enable students to access information about and register for courses, and to enable staff to track student progress, publish course results and address matters such as payment, resources procurement and facilities management. Others may use databases such as Oracle and PeopleSoft, which offer institutions a virtual platform for organizing registration systems and payroll and managing matters such as staff requests for leave. In all of these cases there will be the costs of purchasing and maintaining the licenses for these systems, as well as training the staff to operate them.

Conclusion/Summary

This Unit developed an awareness of the cost effectiveness of integrating ICTs and digital into TVET. Seven areas of cost concerns such as student costs, student support costs, teacher costs, instructional technology costs, material design costs, course delivery costs and administrative costs among other considerations were discussed. This unit has great implications for budget development discussed in unit 6.2.

Transformative Reflection

Now that you have completed this segment of instruction, please engage in the following transformative reflection activities:

1. Focus on the assumptions underlying your beliefs, feelings and actions regarding the cost effectiveness of ICT and digital-mediated education in TVET.
2. Examine and assess the consequences of these assumptions on your beliefs, feelings and actions in relationship to the implementation of ICT and digital-mediated education.
3. Consider your learning experiences while completing this segment of instruction. Conduct a critical reflection regarding the extent to which this instruction has helped you identify and explore alternative sets of assumptions or reinforced your initial assumptions regarding the cost effectiveness of ICT AND DIGTAL-mediated education in TVET.

Unit 6.1 Quiz

Self-assessment questions

Multiple choice: Circle all the correct answers that apply for each question. There may be more than one correct answer.

1. One of the models used by the TVET system in Australia to achieve cost effectiveness outcomes in online delivery are:

A. Reducing costs while maintaining current cost and volume.

B. Improving learning effectiveness while maintaining current levels of effectiveness and volume.

C. Increasing volumes while maintaining current levels of cost and effectiveness.

D. Reducing costs while maintaining current levels of cost, effectiveness and volume.

2. In a face-to-face learning environment, students contribute towards their study costs such as:

A. School fees

B. Living expenses

C. Travels

D. Training materials

3. In distance learning, costs typically lie in the following main areas:

A. Teacher support costs

B. Students cost

C. ICT and digital costs

D. Administrative costs

4. The costs of providing student support by any institution depend on:

A. Tutor-to-student ratios

B. The number of enrolments

C. Mentor-to-tutor ratios

D. Student-to-student ratios

5. In a traditional TVET institution, _____ is the main driver used to determine the cost of teachers and trainers.

A. Tutor-to-student

B. Students' enrolments

C. Mentor-to-tutor

D. Student-to-student ratios

Practice Questions

1. Using your transformative reflection experience, prepare a toolkit to assist senior TVET administrators in their deliberations regarding the integration of ICT and digital-mediated education into TVET based on cost-effectiveness considerations.
2. If your organization has already developed some guidelines regarding cost considerations for ICT AND DIGITAL-mediated teaching and learning in TVET, review and revise these guidelines as necessary.
3. Ask a group of key stakeholders in TVET to review this toolkit.

COSTING AND FINANCING ASPECTS

Unit 6.2 Budgeting and proposal development for the integration of ICT and digital into TVET

Objective 6.2.1

Develop a budget for the integration of ICTs and digital into TVET

Objective 6.2.1

Identify funding sources to support the integration of ICTs and digital into TVET

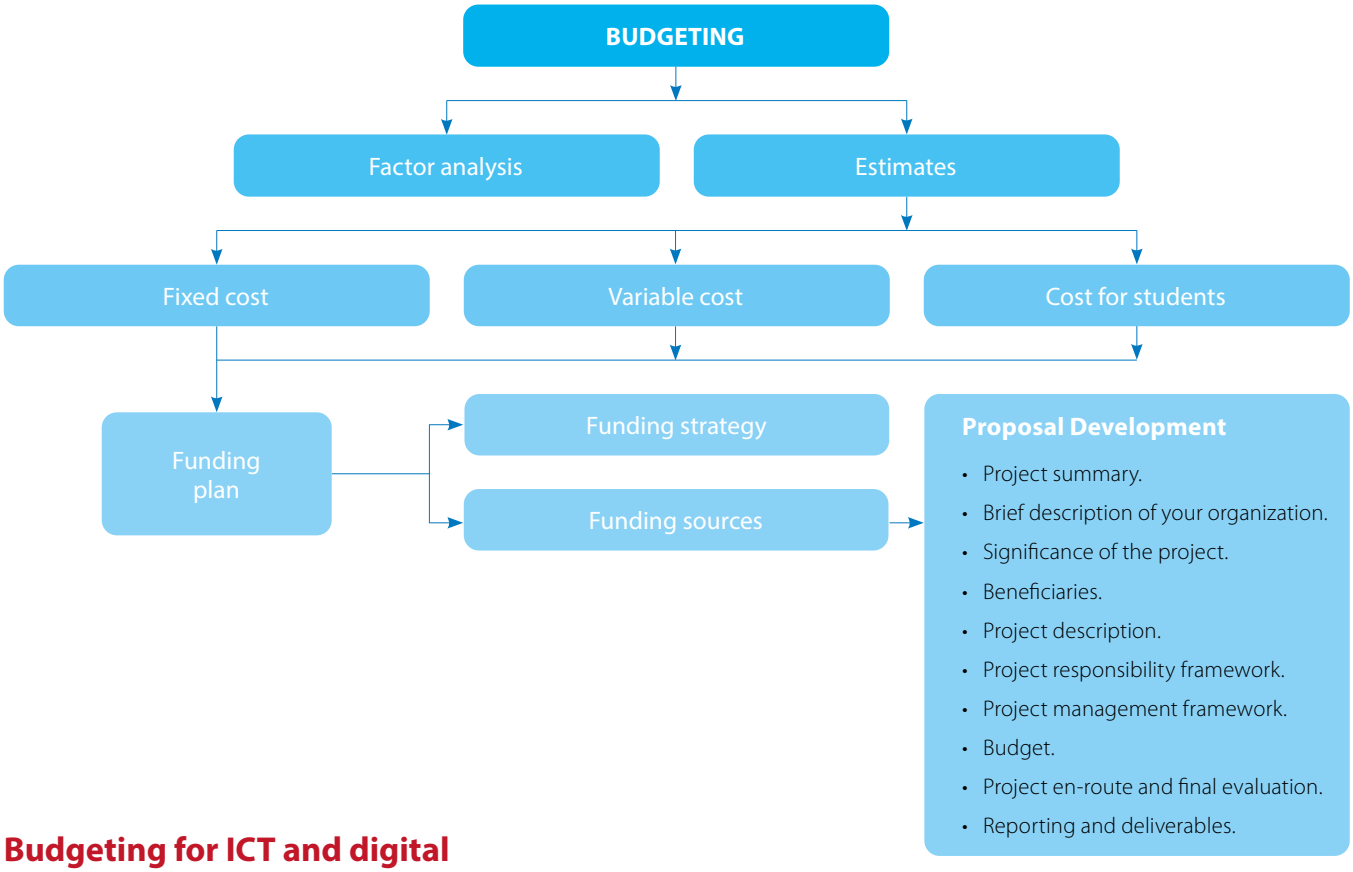
Objective 6.2.2

Develop a funding proposal for the integration of ICTs and digital into TVET

Has your organization already developed a budget for the integration of ICTs and digital into TVET?

Has your organization identified appropriate funding sources to support the integration of ICTs and digital into TVET?

Has your organization been successful in generating competitive grants and contributions to support the integration of ICT and digital into TVET?



Budgeting for ICT and digital Implementation

As discussed in the previous section, the decision to use ICTs and digital in TVET involves major cost implications. Kruse (2004) noted that many training vendors will use rules of thumb to estimate the cost of developing ICT and digital-mediated teaching and learning. These rules of thumb can be based on either per hour or per screen rates. Kruse noted that it takes 600 person hours to develop one hour of high-quality ICT and digital-mediated teaching and learning material, as compared to only 300 hours to develop simpler web- or computer-based training without audio or video features. Considering that most training vendors charge from $100 to $125 per hour for their services, the development of multimedia CD-ROM training will vary from $60,000 to $75,000 per hour of instruction. Kruse argues that the flat rate estimate does not reflect the true costs of e-learning. He suggests the use of a ten-factor analysis approach for determining the costs of ICT and digital-mediated teaching and learning.

These factors are:

1. The mode of training delivery.
2. Bandwidth requirements for web-based courses.
3. The subject matter content.
4. The duration of training.
5. Special features, such as audio, video and animations.
6. Content sources.
7. The need for student-tracking capabilities.
8. Project start and end dates.
9. The nature of in-house contribution to training development.
10. The lifespan of the course.

It is essential to make careful estimates of both fixed and variable costs during planning stages. It is also important to consider the costs for students in relation to institutional policy on access and equity. According to Bates (2000), a good ICT and digital-based, distance education budget should include the following cost estimates:

Fixed cost

- Subject matter experts.
- Internet specialists.
- Graphics and interface design.
- Copyright clearance.
- Direct overhead costs.
- Library.
- Technical infrastructure costs.
- Tutors.
- Administrative costs.

Variable costs

- Tutoring.
- Delivery costs registration.
- Student administration.
- Printed materials, including postage.

Costs for students

- Fees.
- Required reading.
- Postage.
- Internet access.
- Computer.

Estimates of e-learning costs must also take into consideration whether the course will be developed in-house, as well as the purchase off-the-shelf materials or professional services to develop custom products. Bates (ibid) stresses the importance of building the life cycle of a course into the budget. He indicates that the maintenance and upgrading of print-based courses has an annual price tag which is equal to 10 per cent of the initial developmental costs. He estimates that the maintenance and updating cost of web-based courses accounts for approximately 33 per cent of the initial costs.

Funding sources to support the integration of ICTs and digital into TVET

The great majority of TVET institutions integrate ICTs and digital into teaching and learning to improve access to their programme, and not as a strategy to increase revenues. Research conducted by Johnson and Benson (ibid) in the USA indicates that TVET institutions adopt ICT and digital-mediated teaching and learning to reach new and non-traditional students, increase student access and improve instruction. Bates (ibid) argues that institutions committed to the use of ICTs and digital for teaching and learning will use their base budget to allocate resources to ICT and digital development. Given the high costs of ICT and digital-mediated teaching and learning, TVET institutions must develop a sound funding strategy during the planning stage. Bates (2000, p. 153) identifies several funding strategies that can be considered:

- Using external grants
- Charging student technology fees
- Increasing general operating grants from government to support the use of technology for teaching
- Reallocating internal funds
- Centralizing or decentralizing funding
- Balancing funding between infrastructure, administrative applications, and educational applications
- Developing partnership or consortia

In many countries there is a vast array of funding sources available to support the integration of ICTs and digital into teaching and learning. The British Educational Communication and Technology Agency (BECTA) (2004, p. 1) provides a listing of potential funding sources that support development and training in ICTs and digital in the UK:

- BECTA / The Guardian UK Education website Awards
  http://www.becta.org.uk/schools/websiteawards/index.html
- BT / The Guardian Schools Awards
  http://www.groupbt.com/ICT and digital/bt_schools_awards/index.html
- Education Extra Excellence Awards 2002
  http://www.educationextra.org.uk/
- ICT and digital Innovation Awards from National Grid for Learning Scotland
  http://www.ngflscotland.gov.uk/innovationawards
- Sources of charitable and foundation funding
  http://www.ids.ac.uk/eldis/fund/fun3.htm
- Tesco Computers for Schools
  http://www.tesco.com/TalkingTesco/cfs.htm
- Sainsbury's
  http://www.jsainsbury.com/csr/community.htm
- Using ICT and digital to help achieve regeneration objectives – a good practice guide
  http://www.odpm.gov.uk/stellent/groups/odpm_urbanpolicy/documents/page/odpm_urbpol_608054.hcsp
- UK online centres
  http://www.dfes.gov.uk/ukonlinecentres/
- Wired Up Communities
  http://www.makingthenetwork.org/common/wuc.htm
- Curriculum Online
  http://www.curriculumonline.gov.uk/
- Anytime Anywhere Learning
  http://www.microsoft.com/uk/aal/
- Independent/State School Partnership scheme
  http://www.dfes.gov.uk/indstatepartner/
- Socrates II
  http://europa.eu.int/comm/education/programmes/socrates/socrates_en.html
- New Opportunities Fund
  http://www.nof.org.uk
- TeacherNet, Funding Organization
  http://www.teachernet.gov.uk/professionaldevelopment/
- British Council
  http://www.britishcouncil.org.uk/
- Tools for Schools
  http://www.tfs.org.uk/
- Microsoft Authorized Refurbisher Scheme
  http://www.microsoft.com/uk/refurbishers/
- CAP
  http://cap.becta.org.uk/
- Teachers Online
  http://teachersonline.ngfl.gov.uk/awards.php3
- Cash for Schools
  http://www.optimuspub.co.uk/public_pages/cash_for_schools/overwiew.html
- Practical Funding for Schools
  http://www.practicalfunding.com/
- RM Funding Ideas and Opportunities for expanding ICT and digital provision
  http://www.rm.com/Primary/Articles/ArticleDetail.asp?cref=HA5854&?em=130901
- Times Educational Supplement – ICT and digital Noticeboard
  http://www.tes.co.uk/your_subject/noticeboard.asp?subject=ICT and digital
- Funding sources
  http://www.becta.org.uk/leas/leas.cfm?section=5_1&id=1252

Global Opportunity Channel provides an extensive list of donors who support ICT and digital projects in developing countries: http://www.digitalopportunity.org/article/archive/4893/

Generating competitive grants and contributions to support the integration of ICT and digital into TVET?

If your funding strategies for ICT and digital-mediated teaching and learning include funds generated from external sources, you will most likely be required to develop an elaborate funding proposal. The development of grant proposals is an art and a science.

A good funding proposal will include the following sections:

- Project summary.
- A brief description of your organization.
- The significance of the project.
- Beneficiaries.
- Project description.
- Project responsibility framework.
- Project management framework.
- Budget.
- Project at midpoint and final evaluation.
- Reporting and deliverables.

The Environmental Protection Agency (EPA) has produced a self-instructional, web-based tutorial to help communities and non-profit organizations to produce more competitive grant applications. Although the focus is on environmental issues, the mechanics and guidelines are also applicable to ICT and digital proposal development. This tutorial can be accessed at the following URL: http://www.epa.gov/seahome/grants/src/grant.htm

Conclusion/Summary

This unit highlights the ten-factor analysis for determining the costs of ICT and digital-mediated-learning as well as fixed costs, variable costs and costs for students' engagement, including upgrading and maintenance of equipment and facilities. Knowledge of the various costs will determine realistic budgeting and sourcing for funds.

Transformative Reflection

Now that you have completed this segment of instruction, please engage in the following transformative reflection activities:

1. Focus on the assumptions underlying your beliefs, feelings and actions regarding budget estimates for ICT AND DIGITAL-mediated education in TVET.
2. Examine and assess the consequences of these assumptions on your beliefs, feelings and actions in relationship to budgeting and funding sources/proposals of ICT AND DIGITAL-mediated education in TVET.
3. Consider your learning experiences while completing this segment of instruction. Conduct a critical reflection regarding the extent to which this instruction has helped you identify and explore alternative sets of assumptions or reinforced your initial assumptions regarding the costs of ICT AND DIGITAL-mediated education in TVET.

Unit 6.2
Quiz

Self-assessment questions

Multiple choice: Circle all the correct answers that apply for each question. There may be more than one correct answer.

1. The factor analysis approach in determining the costs of ICT and digital-mediated teaching and learning may include:

A. Subject matter and content sources

B. Project start and end dates

C. Course lifespan

D. None of the above

2. Funding strategies to be considered are:

A. Using external grants

B. Costing student technology fees

C. Decentralizing funding

D. Developing training support

3. A good funding proposal will include the following sections:

A. Project description

B. Beneficiaries

C. Project development

D. Significance of the study

4. Fixed cost budgets should include the following cost estimates:

A. Subject matter experts

B. Tutoring

C. Graphics and interface design

D. Copyright

5. Variable cost budgets should include the following cost estimates:

A. Administrative costs

B. Delivery costs registration

C. Student administration

D. Printed materials

6. Costs for students' budget should include the following cost estimates:

A. Printed materials

B. Students' fees

C. Required reading

D. Internet access

Practice Questions

1. Using your transformative reflection experience, develop a budget and use it to create a funding proposal for integrating ICT and digital-mediated teaching and learning into a specific TVET trade.
2. If your organization has already developed a budget for integrating ICT and digital-mediated teaching and learning into a specific trade, review and revise this budget as necessary.
3. Identify agencies and foundations that are interested in funding ICT and digital projects in TVET.
4. Create a directory of these potential funding agencies.
5. If your organization has already developed a directory of potential funding agencies, review and revise this directory as necessary.
6. Ask a group of key stakeholders in TVET to review this budget, your proposal and directory.

References

Baalen, van P. J. & Moratis, L.T. (2001). Management Education in the Network Economy: its Context, Content, and Organization. Kluwer Academic Publishers, Dordrecht.

Bates, A.W. (1995). Technology, Open Learning and Distance Education. Routledge, London.

Bates, A.W. (2000). Managing Technological Change: Strategies for College and University Leaders. San Francisco: Jossey-Bass Publishers.

Bart, M. (2008, 3 November). Distance education – Measuring the benefits and costs. Faculty Focus. Retrieved June 17, 2020 from www.facultyfocus.com/articles/distance-learning/distance-education-measuring-the-benefitsand-costs

BECTA (2004). How to Find Sources of ICT and digital Funding. Retrieved on June 21, 2020 from http://www.ictadvice.org.uk/index.php?section=ap&catcode=as_pur_02&country=sco&rid=3847&PHPSESSID=147104467b650362c3f05281e9f93bee&pagenum =3&NextStart =1&prin t=1

Buckley, S. (2000). Community Radio – the New Tree of Speech, Imfundo Background Paper #19. Retrieved June 17, 2020 from the World Wide Web: http://www.imfundo.org/Buckley/contents.htm

Butcher, N., & Roberts, N. (2004). Costs, effectiveness, efficiency: A guide for sound investment. In H. Perraton & H. Lentell (Eds), *Policy for open and distance learning* (pp. 224–245). London: Routledge.

Chinien, C. (2005). ICT and digital application in technical and vocational education and training: Specialized training course. Institute for Information Technologies in Education, Moscow.

Curtain, R. (2002). Online delivery in the vocational education and training sector: Improving cost effectiveness. Australian National Training Authority. Retrieved on June 24, 2020 from http://unpan1.un.org/intradoc/groups/public/documents/apcity/unpan009989.pdf

Curtin, R. (2002). *Online Delivery in Vocational Education and Training Sector: Improving Cost Effectiveness.* Australian Training Authority. National Centre for Vocational Education Research, Australia.

Daniel, J. (2002). Technology and Education: Adventures in the Eternal Triangle. Keynote Address presented at the LEARNTEC conference, Karlsruhe, Germany, Retrieved June 17, 2020 from the World Wide Web: http://www.unevoc.de/learntec2002/KeynoteDaniel.pdf

Donkor, P. (2010). The comparative instructional effectiveness of print-based and video-based instructional materials for teaching practical skills at a distance. *The International Review of Research in Open and Distributed Learning*, 11(1). Retrieved 22 June 2020 from www.irrodl.org/index.php/irrodl/article/view/792/1486

Griesel, L. (2012, September). *Is ODL a cheaper option for expanding the higher education system in South Africa?* Paper presented at The First Unisa International Open Distance Learning Conference. Retrieved on June 21, 2020 from www.unisa.ac.za/contents/conferences/odl2012/docs/submissions/ODL-075-2012_Final_GrieselL.pdf

Herd, G., & Mead Richardson, A. (2015). *World report on TVET — The promise and potential of ICT and digital in TVET.* Retrieved on June 21, 2020 from http://oasis.col.org/bitstream/handle/11599/824/UNESCO%20World%20Report%20-%20ICT%20in%20TVET%20-%20Herd%20%2B%20Mead%20Richardson.pdf

Kruse, K. (2004) How Much will it Cost? Estimating E-Learning Budgets. Retrieved on June 21, 2020 from http://www.e-learningguru.com/articles/art5_2.htm

Potashnik, M. & Capper, J. (1998, March). Distance Education: Growth and Diversity. Finance and Development. Retrieved from the World Wide Web:http://www.worldbank.org/fandd/english/pdfs/0398/0110398.pdf

Sadik, A. (2009). The effectiveness and costs of distance education. TECH4101: Distance education & the Internet (Slide 3, Document #3). Retrieved on June 21, 2020 from www.slideshare.net/alaasadik/3effectiveness-andcostspdf

Siriwardene, L., & Qureshi, M. A. (2009). TVET in the Asian Region: Issues, concerns and prospects. In R. Maclean & D. Wilson (Eds), *International handbook of education for the changing world of work: Bridging academic and vocational learning* (pp. 547-564). Dordrecht, The Netherlands: Springer.

Stevens, G. (2001). Distance Learning for Technical and Vocational Education in Sub-Sahara Africa. The World Bank. Retrieved June 17, 2020 from the World Wide Web: http://www.gtz.de/wbf/bibliothek/detail.asp?number=1431

Tait, A. (2014). From place to virtual space: Reconfiguring student support for distance and e-learning in the digital age. Open Praxis, 6(1), 5-16. Retrieved 22 June 2020 from http://openpraxis.org/index.php/OpenPraxis/article/viewFile/102/74

Thompson, B. (2010). The cost-effectiveness of using open and distance learning in teacher education. In P. A. Danaher & A. Umar (Eds), *Teacher education through open and distance learning* (Chapter 11). Vancouver: Commonwealth of Learning.

UNESCO Institute for Information Technologies in Education. (2005). *ICT and digital application in technical and vocational education and training – Specialised training course*. Moscow: UNESCO.

Valentine, D. (2002). Distance learning: Promises, problems and possibilities. *Online Journal of Distance Learning Administration, 5*(3).

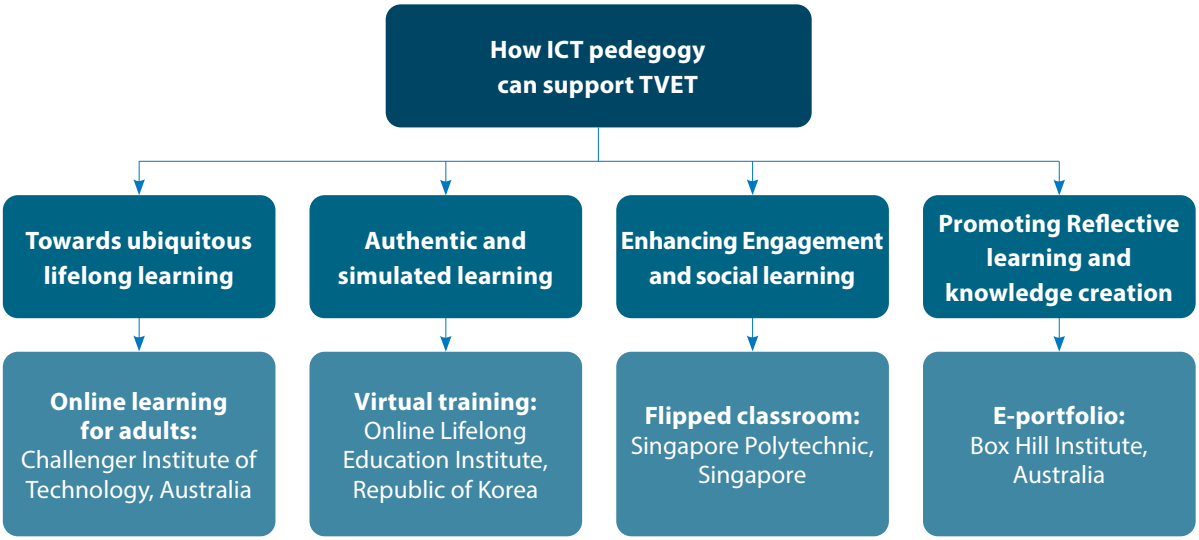
Module 7

INTERNATIONAL EXPERIENCES OF INTEGRATING ICT AND DIGITAL INTO TVET

Unit 7.1 Understanding of the potentials of ICT and digital support in TVET

Objective 7.1.1

Develop an understanding of the potentials of ICT and digital support in TVET



The Education 2030 Framework for Action, which outlines how to translate global commitment into practice (UNESCO et al., 2015), recognizes the immense potential of ICT and digital in achieving lifelong learning for all. It highlights the need for ICT and digital to 'be harnessed to strengthen education systems' and to assist in increasing knowledge dissemination, expanding access to information, improving the quality and effectiveness of learning, and in providing more effective services' (UNESCO et al., 2015, p. 8). The Education 2030 vision was endorsed by the Qingdao Declaration (UNESCO, 2015), articulated at the International Conference on ICT and digital and post-2015 education, which noted that ICT and digital can improve access to education and inclusion, support open education resources and solutions, support quality learning, facilitate lifelong learning pathways, enable online learning and improve mechanisms for quality assurance and recognition of learning.

ICT and digital is a powerful means to increase access to high quality, lifelong TVET, and enhance the relevance and authenticity of learning. It also enables workplaces to be brought into learning. Although hands-on practical training cannot be replaced by technologies, modern technologies are able to enhance the acquisition of practical skills, under a fundamental assumption that learning is essentially a social phenomenon (Cox, 2013; Haddad and Draxler, 2002; Valentine, 2011; Wenger, 1998). With the power to innovate pedagogical approaches, ICT and digital can also improve the employability of workers.

ICT and digital-enhanced pedagogies can support learning in four ways:

ICT and digital Can Promote Flexible Lifelong Learning

ICT and digital offers those who had to drop out of basic education or who wish to gain further skills ubiquitous formal and informal learning opportunities. In addition, using ICT and digital can enable greater flexibility in learning arrangements, for example through the use of cloud-based file storage, browser-based software that is device-independent, online collaborative workspaces and social networking tools. Learning analytics, on the other hand, process student log data generated by learning management systems, allowing the institution to customize learning paths that are unique to students' learning needs, style, strengths and weaknesses, rather than forcing students to follow a standard curriculum and path.

ICT and digital Can Enhance Learning Engagement and Social Learning

With blended learning and 'flipped classroom' techniques, ICT and digital can enable learners to prepare at home for classroom discussions and activities to exchange ideas and deepen knowledge. In addition, online social networks enable just-in-time learning from peers and a wider network of experts. This is a teaching and learning approach that 'flips' conventional learning delivery, such that content is delivered outside of the classroom, often online, while activities that might have once been considered homework (e.g. group projects) are moved into the classroom.

ICT and digital Can Provide Authentic and Simulated Learning

Serious games and simulations are increasingly used in education to provide learners with more opportunities to practise techniques and manipulate different parameters. Serious games using augmented reality and virtual reality technologies, for example, allow students to apply theory to practise in a realistic, safe and controlled way. It was found in one study that nursing trainees were able to transfer knowledge and skills from the simulation training to apply them on real patients during their practicum (Rush et al., 2010). Such technologies create close-to-realistic learning environments that were not previously possible.

ICT and digital can promote reflective learning and knowledge creation

Project-based learning using ICT and digital and e-portfolios enable evidence-based practice in workplace contexts in which knowledge and skills are used and new knowledge is created. Use of ICT and digital in such contexts, along with interactions with peers and industry experts, reinforces learning and enables students to develop their reflective capacity. E-portfolio and project-based learning encourages students to be knowledge producers rather than knowledge consumers and can change the way students respond to holistic and process-driven assessments.

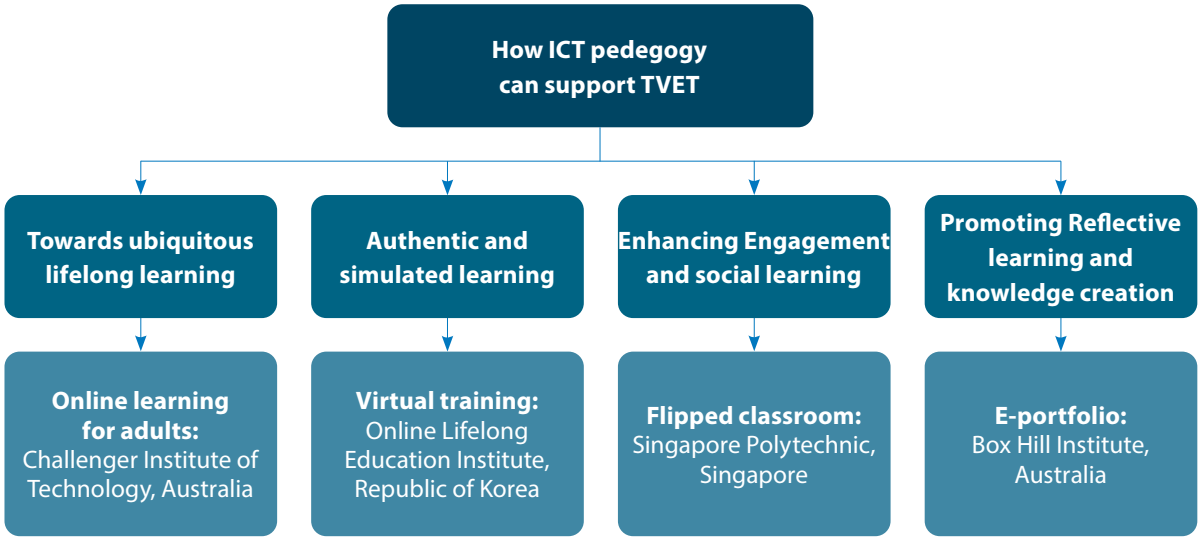
Figure 11: 2017 ICT and digital Development Index by region

INTERNATIONAL EXPERIENCES OF INTEGRATING ICT AND DIGITAL INTO TVET

Unit 7.2 Promising international cases of ICT AND DIGITAL application in teaching and learning

Objective 7.2.1

Familiarise learners with the promising international cases of ICT and digital application in teaching and learning



Promising Practices

Here we present a series of promising promising international cases of organizations that have implemented enterprise-level e-learning as well as staff development. These cases illustrate advanced applications of ICT and digital in teaching and learning that go beyond basic access to computing networks and services. The case studies are presented below in four categories: towards ubiquitous lifelong learning; enhancing learning engagement and social learning; authentic and simulated learning; and promoting reflective learning and knowledge creation. Each case study covers the institutional background, the challenge that the TVET organization used ICT and digital to overcome, a description of the project and the learning insights for increasing access to quality training through the use of ICT and digital to shift the paradigm of TVET.

Towards ubiquitous lifelong learning

Project Title: Online Learning for Adults
Institution: Challenger Institute of Technology
Country: Australia

Institutional Background

The Challenger Institute of Technology is a Technical and Further Education (TAFE) institution based in Fremantle, Western Australia. It offers more than 140 career development programmes that cater to industry training areas. In April 2016, South Metropolitan TAFE incorporated the Challenger Institute of Technology and now provides services to urban and regional communities.

Challenge

One of the Challenger Institute's post-school programmes for adults is the Certificate II in General Education for Adults. Students in this programme come from varying backgrounds, including mature students returning to work or education and students with special needs, limited educational background, or who are undertaking training as part of a welfare scheme. It is a traditional classroom-based programme, focusing primarily on mastering learning. Distance learning is possible, with paper-based resources mailed to students who then communicate with instructors via telephone and email. The diversity within the student cohort means that some students struggle with learning in a classroom setting. Some do well because they like the social aspect of classroom learning, while others find it intimidating, non-productive or unsafe. Some distance learners also struggle because they feel isolated. After realizing that many people were not benefiting from the training due to these learning realities, the institute's administrators decided to provide a better, more needs-driven service to students.

Project Detail

The online version of the Certificate II in General Education for Adults aims to:

- provide a more individualized, student-focused learning experience, with a strong
- relationship between teachers and students;
- offer a more productive, supportive learning environment for distance learners;
- provide a more flexible and accessible learning environment for students;
- produce a product that is accessible to students from great geographical distances.

In designing the online programme, the institution applied constructivist pedagogies because most of the learning activities were cognitive-driven, and this would ensure that learning outputs and products would be individual. Critical and reflective practices became the core of the programme. Students are now required to develop a deep understanding of 'why' rather than simply recollecting facts. Instructors develop tasks and assessments based on the students' knowledge, previous experiences and personal interests at the start of the programme.

Because the programme is for adult learners who may be lacking confidence, the training is partly geared towards increasing that confidence while nurturing self-directed learning habits. Activities are designed to follow a trajectory of increasing autonomy in each learner, albeit with a teacher's supportive presence. While the programme was designed to be fully deliverable online, students can opt for classroom delivery if they feel a need for face-to-face interaction with their teachers and peers.

For the programme to be effective, the TVET organization requires time and commitment from the teachers.

Learning Insights for Increasing Access to Quality Training

Online instruction provides learners with greater flexibility in accessing learning resources and support. Geographical location is no longer an issue for students, and this encourages and facilitates lifelong learning. Such learning can be pursued anywhere and at any time. The course structure nurtures self-directed learning capacity, and the students find the learning environment safe and more student-centred.

For the programme to be effective, the TVET organization requires time and commitment from the teachers. The teaching team must be as committed to pastoral care as they are to content. The Challenger Institute of Technology recognizes the need for continuous improvement of programmes and therefore adjusts the online programme based on feedback from students.

A contributing factor to the course's success was the Australian Government's policy of promoting flexible learning. The Australian Flexible Learning Framework (2008–2011) policy covers e-learning through vocational education and expands training participants' access to professional development opportunities, products, resources and support networks in an increasingly technology-driven learning environment. The Flexible Learning Advisory Group, a policy advisory group on national directions and priorities for ICT and digital in the TVET sector, manages the framework (including the regulatory guidelines, platform, resources and network of practitioners).

Authentic and simulated learning

Project Title: Virtual Training
Institution: Online Lifelong Education Institute
Country: Republic of Korea

Institutional Background

The Online Lifelong Education Institute (OLEI), within the Korea University of Technology and Education, is a hub for online vocational training specializing in technology and engineering. The institute relies largely on interactive and experiential e-learning practices by incorporating new technologies into its online learning environment. Funded by the Korean Ministry of Employment and Labour, OLEI has developed and now offers more than 200 online courses free of charge to industrial workers and jobseekers on mechanics, electronics, mechatronics, ICT and digital, design, materials, architecture and chemistry.

Challenge

In the past, if a TVET institution wanted to teach students how to handle industrial equipment, it either had to install the equipment, which is expensive, or schedule a day trip to a site that allowed the students to see the equipment in practice. In either case, the students could not do certain things, such as take apart and reassemble the equipment. And instructors could only teach using books, images or video clips; interactive hands-on activities were not typically possible.

Project Detail

Recognizing the need for more hands-on learning with industrial equipment, the OLEI administrators developed virtual training content using simulators, emulators and virtual reality (and augmented reality) software. Through specialized ICT and digital, students can now learn about various types of equipment, including macrosized tools, ultra-mini tools and highly expensive equipment that institutions cannot afford to buy. They also learn how to stay safe in dangerous work situations. Through the online platform (http://vt.e-koreatech.ac.kr), students log in to access the learning content at any time. This environment enables them to study when it is convenient and lets them practice as much as they want. Since 2007, OLEI has developed 31 virtual training courses in subject areas such as mechanics, electronics, mechatronics, architecture, design and new energy and offers them at 141 public and private training centres. Deploying these courses, the centres have so far trained 24,418 students.

OLEI developed three types of virtual training: component, scenario and equipment practice (Figure 9.2). The component type helps learners understand the inner structure of equipment by enabling them to take it apart and put it back together using 3D modelling. The scenario type helps learners understand how to operate equipment by following the prescribed procedure. The equipment practice type generates a diversity of practice environments in which learners control the equipment until they accomplish the right result.

Using the virtual training ICT and digital, learners experience how equipment works and under what conditions. They can master the handling procedures for each equipment item and learn how to react to various emergency situations at work. OLEI uses virtual training technology in the context of student-directed teaching, based on constructivism and the experiential learning approach, which emphasizes active, hands-on learning and offers diverse learning experiences to ensure that students master the desired trade skills. OLEI operates on the belief that students learn better if they can control their learning and make their own choices with the learning content.

Learning Insights to Enhance Skills Development

The OLEI administrators surveyed students from 2013 to 2015 to evaluate the virtual training courses. They found a high level of satisfaction. For this practice to be effective in supporting skills mastery, it is important to choose subject areas that have good virtual training content. While the virtual training content allows students to work with expensive equipment or learn a machine in a dangerous work situation, developing the software is also expensive. Hence, OLEI had to choose wisely and think carefully about how long the content would be relevant before the technology became obsolete. OLEI also realized that providing virtual training content freely over time to its training centres reduced overall vocational training costs.

For this practice to be effective in supporting skills mastery, it is important to choose subject areas that have good virtual training content.

Innovation in Vocational Education and Skills Training in Africa (INVEST AFRICA)

A two-week UNESCO-UNEVOC e-forum on the implications of the ICT and digital revolution for TVET (Kafka, 2013) highlighted the need to incorporate ICTs and digital into TVET and raised concerns that teachers may not always be prepared to use ICTs and digital in their teaching.

In response to these findings, the Innovation in Vocational Education and Skills Training in Africa programme (INVEST Africa) was established in 2010 by the COL, in partnership with the Commonwealth Association of Polytechnics in Africa (CAPA). The dominance of traditional ways of teaching and the slow adoption of ICT and digital-based teaching and learning were seen to be among the critical challenges in transforming African TVET. The aims of INVEST Africa were therefore to develop capacity in the use of educational media and technology at CAPA member institutions in order to:

- Expand access to TVET to the informal sector.
- Help the huge numbers of poorly educated, frustrated and unemployed young people who are 'locked out' of the formal skills training systems.
- Address the unequal training opportunities fostered by inequities based on geographical location, gender and socioeconomic factors.
- Improve the quality of TVET offerings in general.

INVEST Africa and Institutionalizing ICT AND DIGITAL-based Methods

The INVEST Africa concept of ICT and digital-based teaching and learning concerns opening up systems through the development and use of OER that are self-instructional and have open licences to:

- Move beyond the traditional boundaries of formal courses to incorporate informal and non-formal learning
- Progress beyond classroom-based learning
- Offer opportunities to non-traditional learners and learners in the informal sector
- Develop flexible, digitally-mediated learning environments that support learning at a distance and combine or 'blend' these with classroom-based learning
- Adopt a learner-centred approach to learning that embraces self-instruction and self-directed and self-paced learning
- Enable teachers to play the role of facilitators of learner-centred learning
- Challenge traditional gender stereotyping in skills development

The ICTs and digital used to provide these opportunities can include printed texts, audio and video recordings and teleconferencing, DVDs, radio, television, SMS, mobile phones and computer networks. The INVEST Africa approach focuses on developing a whole new TVET system wherein the use of these new tools and methods is integral to the fabric, culture and operations of the institutions. It is intended to catalyse systemic transformation by changing:

- Policymaking and strategic planning, to enable the integration of the new flexible and blended methods.
- Organizational structures, to enable the development and delivery of these new forms of learning and teaching.
- Technology infrastructure, to support the management and optimal use of digital technologies and educational media that support and enhance classroom and distance learning and teaching.
- The learning and teaching practices of teachers, by raising awareness of and developing their competencies in the new modes of delivery.
- The numbers, locations and types of learners to whom the training opportunities are provided, by promoting the inclusion of learners in the informal sector.
- Traditional cultural and institutionalized gender biases by mainstreaming gender equity and encouraging the recruitment of girls and women into male-dominated technical and vocational areas (Isaacs, 2015, p. 22).

Through a range of INVEST Africa capacity-building, partnership development and community of practice support activities, the two Kenyan and Zambian colleges were helped to institutionalize the new forms of development and delivery and install the technology and infrastructure as below.

Table 7: The changes achieved in the two Kenyan and Zambian colleges by December 2014

INSTITUTIONAL CHANGE	RIFT VALLEY TEACHER TRAINING INSTITUTE	TECHNICAL AND VOCATIONAL TEACHERS' COLLEGE
Policymaking and strategic planning	• Developed policy statements and a strategic plan including a commitment to ICT and digital-based and blended learning. • Developed an ICT and digital policy that governs equitable and fair use of all computing resources. • Identified the actions to be taken in adopting these alternative means of delivery.	• Amended the existing open and distance learning policy statement in June 2013 to include flexible and blended approaches. • Established an ICT and digital policy that encourages all staff and students to use ICT and digital.
Organizational Structures	• Identified a champion for the new methods of teaching and learning. • Established an ICT and digital Office and a Flexible and • Blended Learning Office as part of the Office of the Deputy Academic Principal.	• Established an Open and Distance Learning Department. • Established champion teams in the various teaching departments. • Created collaborative partnerships with other institutions to create space for their distance learning students.
ICT and digital infrastructure	• PC labs have 300 PCs and another that is Internet-enabled with 200 PCs. • Access to a 2 MB Internet connection and competent technical support. • All Human and Organizational Development (HOD) offices have both a desktop computer and a laptop. • Every departmental staffroom has at least two computers accessible to teachers. • An e-Library. • A SMART Board. • CCTV cameras to secure ICT and digital infrastructure. • Moodle platform and two classrooms equipped with networking infrastructure. • New online enrolment system.	• Established an ICT and digital Department. • Established a laptop loan scheme to improve staff access to ICT and digital. • Support for staff in lesson planning and delivery. • Provision of campus-wide Wi-Fi access. • New online enrolment system.
Gender equity	• Appointed a coordinator for the Women in TVET • (WITED) Chapter. • Formation of WITED Chapter and Gender • Mainstreaming Committees.	• Launched the WITED Chapter. • Achieved higher female student • enrolment in the Design and • Technology course.
Informal sector learners	• Seven courses developed for 315 informal sector learners.	• Thirty young people participating in an initial new non-formal Carpentry • and Joinery course. • Recruited a second cohort of 30 • students in the second year.

Virtual and augmented reality

Project Title: Virtual and Augmented Reality
Institution: Institute of Technical Education
Country: Singapore

Institutional Background

The Institute of Technical Education (ITE) is a post-secondary education institution established in 1992 under the Ministry of Education. As one of the providers of career and technical education, the ITE's mission is to create opportunities for students and adult learners to acquire skills, knowledge and values for employability and lifelong learning. With an emphasis on practical training, its 'hands-on, minds-on, hearts-on' approach is suitable for TVET delivery.

Challenge

In the past, theory was largely taught using conventional methods, while practical lessons were given in authentic learning spaces, such as a hotel, restaurant or aeroplane hangar. In such contexts, students learned how to deal with real customers, equipment and work situations. While lecturers tried to incorporate situated learning into their lessons as much as possible, they faced challenges for the following reasons:

- Certain tasks were not replicable due to safety concerns (heavy shipyard equipment or running aircraft engines, for example).
- Certain tasks were difficult to replicate due to high costs and limited budgets (such as floristry courses where students have to decorate venues with floral arrangements for large-scale events).
- Authentic work environments were not replicable (adverse weather conditions at sea, for example, cannot be scheduled).

Project Detail

Due to its recognized need for more authentic learning experiences, the ITE's academic leaders introduced two types of immersive technologies: 3D virtual reality and 3D augmented reality. The school worked closely with technology solution providers to design relevant learning activities for students based on the curriculum requirements.

3D Virtual Reality System

The multi-wall 3D virtual reality system (iCube) is a revolutionary PC-based, multisided immersive environment in which students are surrounded by virtual images and sound. iCube is a high-end visualization system that can be configured with four to six walls made of light-enhancing rigid material. Students interact with an authentic 3D environment using motion-tracking devices and the system's built-in collaborative capabilities to discuss and explore solutions. For example, students in the marine and offshore technology course use the iCube technology to practise their skills on a simulated oil rig platform (Figure 9.3). Using this ICT and digital, students can safely train for adverse weather conditions, such as heavy rain and strong winds, and learn to react wisely to a variety of environmental conditions and associated job hazards.

In the marine course, one of the tasks involves lifting a pipe weighing nearly one tonne, a risky manoeuvre that can cause harm to workers if safety measures are not closely followed. Using virtual reality technology, students can undertake the task and experience the consequences of not following safety measures without being physically hurt. Having experienced this, the students can better understand that lives can be lost if workplace safety is not taken seriously. In the iCube, they can experiment with different scenarios and have fun while learning. Feedback from students indicated that almost all of them like this mode of learning, and most of them requested more courses that incorporate immersive technologies for learning because they can hone their skills in a realistic and safe environment.

Photo Caption: https://unsplash.com/@xrexpo
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3D augmented reality applications

The 3D augmented reality applications enable students to interact with the real-world environment using real-time data, contextualizing knowledge for just-in-time learning. These augmented reality applications superimpose relevant data onto the real world, in the form of interactive 3D models or 2D information through graphical markers or quick response codes. For example, students in the aerospace technology course can load 3D aircraft engine models onto mobile devices and watch simulations of these engine parts in the augmented reality viewer. These 3D simulations help them to visualize details of complex systems and the operational rules inside the equipment. With the augmented reality application, students who previously experienced difficulty in understanding how air combustion works in an aircraft engine can now visualize and appreciate how complex components work together.

3D virtual reality and 3D augmented reality technologies make immersive hands-on practice possible, expanding the scope of authentic learning spaces for ITE students. By providing a multi-sensory experience in specific work settings, students can appreciate the scale and constraints of work environments and the complex interdependency of the component parts of a system or workflow. Students are also required to use their judgment to make task-based decisions and must face the 'consequences' of their decisions, albeit virtually. Students can use the technology in both independent learning and collaborative problem-solving activities in the context of specific work situations, promoting authentic learning.

Feedback from students indicated that almost all of them like this mode of learning...

Photo Caption: https://unsplash.com/@flderks
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Learning Insights to Enhance Skills Development

As with any technology, the design and development of 3D virtual reality and augmented reality learning resources must be driven by curriculum requirements to justify the high cost for industry-specific skills development. For the technology to be appropriate to the curriculum, it is essential to have close partnerships between schools and the immersive-technology-solution providers when developing the content.

Another essential point is to train the teaching staff on using the technologies effectively to ensure acquisition and retention of workplace knowledge and skills by their students. Plans to increase use of the technology also need to be put in place. Use of the 3D virtual reality system requires a dedicated space. The cost is significant, so a dedicated budget is also required, especially if immersive environments are installed on multiple campuses. For 3D augmented reality, the cost is lower because students can use their own mobile devices or school-supplied devices.

Enhancing learning engagement and social learning

Project Title: Flipped Classroom
Institution: Singapore Polytechnic
Country: Singapore

Institutional Background

The Singapore Polytechnic was set up in 1954 to produce highly skilled graduates to meet the critical human resource needs of the economy. Today, it offers 47 full-time diploma courses and 32 part-time courses through 10 academic schools. The Singapore Polytechnic prepares its students for university and the workforce and has an enrolment of around 16,000 full-time and part-time students (Singapore Polytechnic, 2016).

Challenge

Previous teaching practices at the Singapore Polytechnic consisted mainly of traditional face-to-face lectures and tutorials, with an emphasis on practice and projects. A few years ago, the Singapore Polytechnic management recognized the need to harness technology to train students to become independent, self-directed workers adept at using technology to discover and use information to solve real-world problems collaboratively. This was a challenge, however, particularly when students lacked motivation to learn.

Project Detail

In 2014, the School of Electrical and Electronic Engineering implemented a three-phase 'flipped classroom' (pre-class, in-class and post-class) pilot project among first-year students studying digital electronics.

The three phases of the flipped classroom:

1. For the pre-class phase, students watch short video clips on a particular topic at home and familiarize themselves with the basic concepts and facts.
2. In class, lecturers use short quizzes to check students' understanding of the material covered in the video clips, evaluate student readiness for more difficult topics and determine the topics that need further development during class. The quiz results enable the lecturers to adapt instructional strategies according to students' specific learning needs. These might consist of mini lectures on topics where students did not perform well in the quiz; opportunities for real-world applications of content to solve problems, as well as a setting for collaborative problem-solving, peer discussion and assessment. Lecturers can also conduct a midpoint quiz to validate understanding and provide extra learning support for low-scoring students.
3. At the end of every lesson, students conduct an exit poll to evaluate the effectiveness of the learning experience and to determine areas they have not fully understood. To address difficult topics flagged by the students, lecturers create a 'question and answer' video to clarify complex concepts.

To develop lesson packages, the lecturers use Camtasia, Screencast-o-matic and Soft ChalkChalk software. Singapore Polytechnic uses a learning management system to deliver the electronic learning packages and e-learning activities. For quizzes, the lecturers used quiz tools, like Socrative and Kahoot. All students were required to bring their own laptop computer to class to access the learning resources and online activities. Throughout the semester, WhatsApp online communication was used to inform students of new resources and quiz deadlines. This app was also used to maintain a two-way communication and ensure timely feedback with students. Students are encouraged to learn independently, search for new information to solve problems and collaborate

For the flipped classroom method to be effective, it is important that lecturers orient their mindset to learner-centric delivery...

with their peers online. Learning with and through technology to create knowledge is an essential skill for the modern technology-driven workplace. With the flipped learning resources available online, students are able to learn at their own pace and the quizzes provide useful feedback to them.

At the end of the pilot testing, Singapore Polytechnic conducted a student survey to assess the experience and its impact on their learning. Most students found that the pre-class learning materials and contact with their lecturers via WhatsApp were useful in preparing them for the face-to-face sessions. In the classroom, students enjoyed the use of Kahoot and the class discussions.

The final quiz was seen as useful in clarifying areas where more work was needed, and students saw it as a means of providing feedback to their lecturers. Overall, most students preferred the flipped teaching method, but they were concerned that it could potentially increase their workload. The performance of the students who participated in the flipped classroom pilot was analysed and compared to that of students in classes using conventional methods.

The pilot class outperformed the cohort, and that outperformance was significantly larger when compared with students from similar academic backgrounds. By 2016, all schools within the polytechnic had adopted the flipped learning approach.

Learning Insights to Enhance Skills for the Future

For the flipped classroom method to be effective, it is important that lecturers orient their mindset to learner-centric delivery, whereby learners are self-directed and less dependent on lecturers to disseminate information to them and to understand how their graduates will be operating in the future workplace. For example, they should have the professional discipline not to simply reteach the content but to plan appropriate in-class activities that build on the home learning and emphasize the application of knowledge. The combination of high-impact teaching methods with supporting communication and educational web-based tools must be reviewed frequently to ensure that the workplace practice of scaffolding for learning is constantly reinforced.

Promoting Reflective Learning and Knowledge Creation

Project Title: E-portfolio
Institution: Box Hill Institute
Country: Australia

Institutional Background

The Box Hill Institute is a leading vocational and higher education provider known in Australia and overseas for its collaborative and creative approach to education. It offers a wide variety of courses to local and international students and various delivery modes, including full-time, part-time and off-campus courses. As of 2016, Box Hill had around 40,000 students enrolled in its campuses in Australia and in licensed partners overseas.

Challenge

Box Hill discovered, via feedback surveys, that many students thought that the induction process at the institute could be improved in meeting their needs and in ensuring that they embarked on a successful learning pathway, both during and after their studies. The Box Hill Institute's management also recognized that the institution did not have an organization-wide way of embedding e-learning that would encourage lifelong learning among its students. They decided that a methodological and organizational response was necessary to prepare the institution to connect between classroom learning and workplace learning as well as between teachers, the institution and employers.

Project Detail

Recognizing the need to assist students in acquiring pathways for lifelong learning and to embed e-learning while also supporting connection and communication between classroom learning and workplace learning, Box Hill introduced the Mahara e-portfolio system. An e-portfolio can be understood as 'a learner-driven collection of digital objects demonstrating experiences, achievements and evidence of learning' (O'Neil et al., 2013). EE-portfolios are therefore an evidence-gathering tool that students can use to show their learning achievements and to document the competencies they have attained from training courses and work-based experiences (including apprenticeships and traineeships), allowing them to plan for recognition of prior learning.

The Mahara e-portfolio system enables learners to capture evidence of their learning through a variety of media (video, audio, documents, blogs and plans) and to share that evidence with selected audiences. Mahara combines a range of social collaboration tools, including blogs, comments, groups, forums and profile pages and integrates the use of mobile devices.

An e-portfolio can be a vehicle for (Figure 9):

- supporting transitions and student mobility
- planning and reflecting on learning and career development
- recognizing skills and learning styles
- verification of qualifications
- security and control of private information
- recording evidence of employability skills

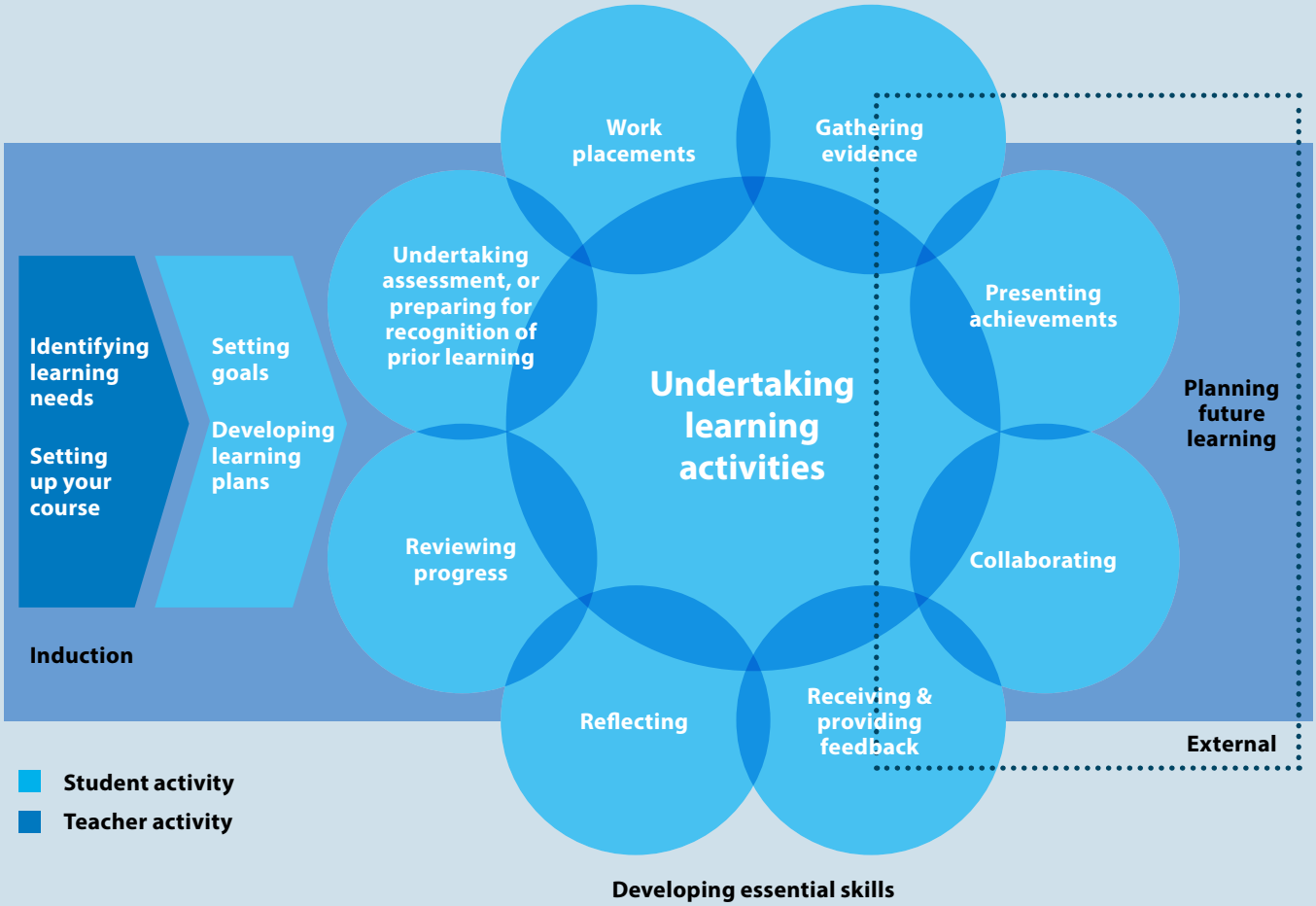

Figure 12: How Box Hill Institute's e-portfolios support learner transitions
Source: Box Hill Institute

The e-portfolio teachers who advocate the use of e-portfolios also designed assessment strategies that integrated summative assessment tasks to ensure that the e-portfolio became an integral component of the course structure. Teachers can use the e-portfolios as a tool for learning, for example, by disseminating instructional videos for students to watch and then asking them to film visual diaries of their tasks and share those via their e-portfolios. This promotes reflective learning and knowledge creation.

While students tend to use e-portfolios collaboratively, teachers tend to use them for assessment purposes or as a means of communication. E-portfolios have lifelong learning applications, such as on-the-job applications and for building a résumé, and are used by Box Hill students in many fields and contexts (table 9).

Table 8: Box Hill Institute's e-portfolio learning contexts

Teaching centre	Context
Biotechnology	Work placements
Creative industries	Industry portfolios for fashion and music
Business programmes	Work placements
Hospitality	Work placements and industry-based recognition of prior learning
Health and community services	Work placements and industry-based recognition of prior learning

The e-portfolio system is based on a student-centric and process-oriented pedagogical approach that encourages students to develop their ability to plan, synthesize, share, discuss, reflect and create knowledge. The system supports Box Hill Institute's efforts to equip students with the skills, knowledge and attitudes to apply their learning to new situations, solve problems, work creatively and cooperatively and engage in lifelong learning. Box Hill believes that e-portfolio-based learning encourages rich and complex processes of planning, synthesizing, sharing, discussing, reflecting and giving, receiving and responding to feedback, and that this process is as important as the end product. The use of e-portfolios goes beyond course delivery to support student-led, lifelong and lifewide learning objectives through informal, non-linear and sometimes chaotic learning processes.

Learning insights to support lifelong learning

For the e-portfolio system to succeed, it is essential that an institute-wide strategy is adopted, with support for the system at every level of the organization. The institute's assessment strategies should be adapted to include e-portfolios as an integral tool for summative assessment. Buy-in from teachers and their commitment to the e-portfolio system is critical to its success. Teachers provide the workplace context and support. Training for teachers must be conducted not only when the system is introduced but also at frequent intervals every year to address concerns, adapt to emerging needs and maintain the system's momentum.

Students also require both initial training and ongoing training. The training should go beyond explaining how to use the technology to cover concepts of lifelong and lifewide learning, and to explain how e-portfolios can improve classroom and workplace-based assessment and expand collaboration. It is also necessary to design and develop templates suitable for local industry-specific contexts and courses. The organization should solicit teachers' opinions and inputs because they will be both users and managers of the system. The use of e-portfolios should also be integrated into workplace learning contexts. This requires explaining the benefits of e-portfolios to workplace managers. Overall, it is vital to have clear communication with all stakeholders.

Organization-wide policies are needed, along with a phased approach. First, expand the programme from first-year students (orientation objectives) to senior students (collection of learning evidence). Second, transition from teacher-led e-portfolios to student-driven e-portfolios. Then move on from stand-alone e-portfolios to those that are integrated with all learning and assessment activities into students' learning workflows. Lastly, adopt a customized approach for each industry and profession.

Conclusion/Summary

This unit developed an understanding of the potentials of ICT and digital support in TVET and presented some examples of promising international cases of ICTs and digital integration. First, the unit highlighted how ICT and digital can promote flexible lifelong learning, enhance learning engagement and social learning, can provide authentic and simulated learning and promote reflective learning and knowledge creation. The unit concluded with a series of promising examples of institutions and organizations that have implemented enterprise-level e-learning as well as staff development initiatives, such as the Challenger Institute of Technology, Australia; the Online Lifelong Education Institute, Republic of Korea; INVEST Africa; the Institute of Technical Education, Singapore; Singapore Polytechnic, Singapore and the Box Hill Institute, Australia.

Module 8 focuses on pedagogical principles for designing, developing and evaluating ICT AND DIGITAL-mediated learning in TVET, as well as how existing materials could be converted for online teaching and learning.

Transformative Reflection

Now that you have completed this segment of instruction, please engage in the following transformative reflection activities:

1 Consider your learning experiences and conduct a critical reflection regarding the extent to which this instruction has helped you identify and explore alternative sets of assumptions or reinforced your initial assumptions regarding funding proposals for the integration of ICT and digital-mediated education in TVET.

2 If this instruction has helped you consider alternative sets of assumptions, test the validity of these assumptions by participating in a reflective dialogue with a critical friend or by engaging in self-reflection.

Unit 7.2
Quiz

Self-assessment questions

Multiple choice: Circle all the correct answers that apply for each question. There may be more than one correct answer.

1. ICT and digital can improve access to:

A. Education and inclusion

B. Support open education resources and solutions

C. Support quality learning

D. Facilitate lifelong learning pathways

2. ICT and digital-enhanced pedagogies can support learning in the following ways:

A. To promote flexible lifelong learning

B. To enhance ubiquitous learning engagement

C. To provide authentic and simulated learning

D. To promote reflective learning and knowledge creation

3. Examples of flexible lifelong learning are:

A. Cloud-based file storage

B. Flipped class workspaces

C. Online collaborative workspaces

D. Blended learning.

4. Examples of authentic and simulated learning are:

A. Flipped classrooms

B. Blended learning

C. Virtual training

D. Virtual and Augmented Reality

5. Ubiquitous lifelong learning is:

A. Flexible lifelong learning

B. Collaborative learning

C. Blended learning

D. Augmented Reality

Practice Questions

1. Using the knowledge gained, identify five TVET challenges where ICT and digital integration will be required to address them.
2. Give a detailed description of a project and the learning insights for solving this problem through the use of ICT and digital integration.
3. Identify agencies and foundations that can partner with your institution/organization during this process.

References

Cox, M. J. 2013. Formal to informal learning with IT: Research challenges and issues for e-learning. *Journal of Computer Assisted Learning*, Vol. 29, No. 1, pp. 85-105.

Haddad, W. D. and Draxler, A. (eds). 2002. *Technologies for education: Potentials, parameters and prospects*. Paris, UNESCO.

Isaacs, S. (2015, March). *INVEST Africa evaluation report*. Vancouver: Commonwealth of Learning. Retrieved 22 May 2016 from http://oasis.col.org/bitstream/handle/11599/810/INVEST_M%2bE_Report_2012-2015_Final_with_Appendices.pdf?sequence=1&isAllowed=y

International Telecommunication Union. 2015. *Measuring the information society report 2015*. Geneva, ITU.

Kafka, N. (2013, May). *What are the implications of the ICT and digital revolution for TVET*? Background note to the UNESCO-UNEVOC e-Forum — Virtual Conference on ICTs and digital & TVET. Retrieved 22 May 2016 from www.unevoc.unesco.org/fileadmin/user_upload/docs/ICTandTVET_background-note.pdf

Rush, S., Acton, L., Tolley, K., Marks-Maran, D. and Burke, L. 2010. Using simulation in a vocational programme: Does the method support the theory? *Journal of Vocational Education and Training*, Vol. 62, No. 4, pp. 467-79.

UNESCO, UNICEF, World Bank, UNFPA, UNDP, UN Women and UNHCR. 2015. *Education 2030: Incheon declaration and framework for action towards inclusive and equitable quality education and lifelong learning for all*. Declaration of the World Education Forum 2015, Incheon, Republic of Korea, 19-22 May.

UNESCO. 2015. *Qingdao Declaration: Seize digital opportunities, lead education transformation*. Bangkok, UNESCO

Valentine, E. 2011. *ICT and digital in vocational education and training: a view of information and communication technology in vocational education in New Zealand*. Wellington, Tertiary Education Commission and Services Industry Training Alliance.

Wenger, E. 1998. Communities of practice: Learning, meaning, and identity. New York, Cambridge University Press.

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