



COMMONWEALTH *of* LEARNING

United Nations
Educational, Scientific and
Cultural Organization

Using ICTs and Blended Learning in Transforming TVET

Colin Latchem
Editor

PERSPECTIVES ON OPEN AND DISTANCE LEARNING



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Foreword by the President and CEO, Commonwealth of Learning

Skills development for livelihoods is a key priority for most governments today. For this reason, Technical and Vocational Education and Training (TVET) is more important globally than ever before. Sustainable Development Goal 4 aims to “ensure inclusive and equitable quality education and lifelong learning opportunities for all,” and to “substantially increase the number of youth and adults who have relevant skills, including technical and vocational skills, for employment, decent jobs and entrepreneurship” by 2030.

How will this be achieved? There can be several ways forward: increased financing, better policies, industry involvement and public-private-partnerships. At the Commonwealth of Learning (COL), we promote the use of innovative approaches and appropriate technologies so that stakeholders in developing countries can adopt more cost-effective options. In fact, we have seen the positive impact of these innovations on the policy, practice and outcomes of our many partner institutions around the Commonwealth.

COL believes that learning is the key to sustainable development and that open, online and flexible learning can play a key role in achieving this. There are 1.2 billion young people between the ages of 15 and 24, most of them in developing countries, 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) provide opportunities to increase access, reduce costs and improve the quality of education.

While ODL has traditionally been used in higher education, its role in relation to skilling cannot be underestimated. From working with farmers to developing agri-businesses in India, to providing technical training to construction workers in Nauru, to using mobile learning to support scientific honey and beekeeping practices among Uganda’s remote Batwa community, COL is finding that flexible and blended approaches using technology in an appropriate social, economic and political context can have a significant impact on communities’ ability to develop sustainably.

As an organisation that provides its resources under an open licence, COL has a repository of open educational resources (OER) in TVET that can be adopted and adapted for various learning contexts. In order to skill our young people at scale, we need quality content, enhanced capacity and better connectivity.

This publication is a timely and important testament to the strong partnership between UNESCO and COL. We are now past the one-year mark of the adoption of the Sustainable Development Goals, and the world needs ideas and solutions to help achieve the ambitious targets outlined therein. I thank the authors from around the world for their valuable contributions and for sharing insights into how we can use ICTs and flexible and blended learning approaches to transform TVET. These lessons are sure to support our collective efforts towards more inclusive and equitable education that will lead to sustainable development.



Professor Asha Kanwar
President & Chief Executive Officer
Commonwealth of Learning

Foreword by the Assistant Director-General for Education, UNESCO

I am pleased to present to our readers this volume prepared jointly by the Commonwealth of Learning (COL) and UNESCO, the latter involving teams both from the Section of Youth, Literacy and Skills Development at UNESCO's headquarters in Paris and the UNESCO-UNEVOC International Centre for Technical and Vocational Education and Training in Bonn. The book is the outcome of a fruitful co-operation between the two organisations. It brings together the work of several leading experts, presented as a series of case studies from around the world showcasing the use of information and communication technologies (ICT) and novel forms of open, flexible and technology-enhanced learning in Technical and Vocational Education and Training (TVET).

TVET's potential to address many of the challenges facing individuals, communities and governments worldwide in their efforts towards achieving employment, decent work and sustainable development are being increasingly recognised, and TVET is accordingly becoming a policy priority in many countries and regions around the world. This is also reflected in the 2030 Agenda for Sustainable Development with several targets of Sustainable Development Goal 4 referring directly to technical and vocational education and skills.

Since the Third International Congress in Shanghai in 2012, UNESCO has been calling for a transformation of TVET systems to ensure that they have the capacity to respond to the multiple demands placed on them as a result of constant and rapid economic, social, geo-political and technological changes. The development of ICT and new modes of learning — such as distance, online and flexible learning — is one such change that TVET needs to respond to if it is to ensure, for example, that learners are equipped with the technological skills necessary to carry out their current and future jobs. ICT has the potential to improve access to, and quality of, learning, increase efficiency, reduce costs, foster innovation, make teaching and learning more relevant to people's work and lives and prepare individuals to become lifelong learners. ICT can thus be a driver for, and a means of, change for TVET.

Both COL and UNESCO acknowledge that learning is more than formal education, and much of TVET is in fact happening in a variety of settings beyond the formal education system — in workplaces, online and in the community. The selection of case studies presented in this book illustrates the different ways ICTs and open and flexible learning are used in these settings. The book includes contributions from partners from a variety of geographical and institutional contexts, and indeed one of the publication's important outcomes is to showcase the diversity of approaches and models being developed and used. The extent to

which each of these approaches and models is achieving its goals and contributing towards TVET's transformation is a question discussed throughout the book.

Many of the authors of the case studies are affiliated with institutions that have long-standing partnerships with our two organisations. I would like to mention in particular The Federal Institute for Vocational Education and Training (BIBB), Germany; Omnia, Finland; the Tertiary and Vocational Education Commission (TVEC), Sri Lanka; and the University of Technology (UTech), Jamaica. All these institutions are members of the UNEVOC Network, UNESCO's global network of TVET institutions with over 250 members around the world. We are grateful to all the authors for their contributions, as well as to the numerous peer reviewers from within and outside COL and UNESCO for their constructive comments and feedback.

A handwritten signature in black ink, appearing to read 'Q. Tang', with a stylized flourish at the end.

Dr Qian Tang
Assistant Director-General for Education
UNESCO

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PART

I

Setting the Context

The Demands and Challenges

Colin Latchem

Introduction

UNESCO defines Technical and Vocational Education and Training (TVET) thus:

Technical and vocational education and training (TVET) 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 organisations, employers, religious groups, donor organisations or other providers. They can be delivered by 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 to the top in global debates about, and government priorities for, education and national development and in 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 forms 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-based) methodologies can contribute to such transformation and expansion. Some readers of this book may be familiar with the nature and operations of TVET but less knowledgeable about open, distance, online and blended learning. Others may be familiar with ICT-based modes of delivery but less familiar with the needs and challenges facing the TVET sector. This first chapter therefore examines the latter while Chapter 2 examines how ICTs can be harnessed to achieve such transformation and expansion. Chapters 3–11 feature case studies of applications of ICTs in TVET. Chapter 12 examines the issues of cost that need to be considered in adopting these new approaches, Chapter 13 considers planning for successful and sustainable applications of ICTs, and Chapter 14 draws conclusions and makes recommendations for the international organisations, governments, policy makers, managers and staff responsible for TVET.

The Demands

The Calls for Transformation

As a leader in the global debate on TVET's role, UNESCO has argued for profound transformations in the conceptualisation, governance, funding and organisation of TVET to ensure that the sector is capable of responding effectively to the many economic, equity and sustainable transformational challenges of the 21st-century world. In 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 the transformation of TVET needed 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 relevance of TVET," was "Promote the integration of information and communication technologies (ICTs) in 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 in education, was released at the conclusion of the International Conference on ICT and Post-2015 Education in Qingdao, China. This declaration, which was approved by participants — including ministers and vice-ministers of education — from more than 90 countries, affirmed the delegates' collective understanding

of how to unleash the full potential of ICTs to achieve the educational targets for equity, access, quality and lifelong learning in the Sustainable Development Goals (SDGs)¹ for the next 15 years. In its Preamble, it affirms, “To achieve the goal of inclusive and equitable quality education and lifelong learning by 2030, ICT — 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 co-operation 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, UNESCO, in partnership with UNICEF, the World Bank, UNFPA, UNDP, UN Women and UNHCR, organised 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 of multilateral and bilateral organisations, 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.^{2 3} This global commitment to provide quality basic education for all children, youth 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 universalise 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)⁴ 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 Goals⁵ 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:

- 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.

1 See <https://sustainabledevelopment.un.org/topics/sustainabledevelopmentgoals>

2 2 www.unesco.org/new/en/education/themes/leading-the-international-agenda/education-for-all/the-efa-movement

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

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

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

UNESCO recommended that the Member States 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 youth; low-skilled adults; the unemployed and vulnerable workers; disadvantaged and marginalised groups; rural, remote, nomadic and migrant communities; the stateless; the disabled; and those affected by conflict or disaster.

The Needs of Youth

The second UN Millennium Development Goal was to ensure that, by 2015, children of both sexes 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, fewer than half of secondary school-age children attend secondary school, leaving millions of young people without the academic and life skills they need. In the developing countries,⁶ 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. And 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.

The 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 appears to 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

6 In May 2016, the World Bank abolished the “developed/developing country” distinction. It considered it no longer statistically useful, noting that statisticians and policy makers needed to attend to the gaps within countries as well as between them and that there is no commonly accepted definition of the term “developing country.” However, since this term is in general use in the literature of all forms of development, it is used throughout this book.

in much of the developing world. The informal sector encompasses all jobs that are not recognised 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 socio-economic development, social cohesion and peaceful societies. UNESCO-UNEVOC has developed a Skills Development Package entitled “Learning and Working”⁷ to promote awareness and motivational campaigns to encourage marginalised 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 in itself not 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 with regard to the design of the technical and vocational skills development, financing and certification systems.

Gender Issues

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, achieve fundamental changes in the existing power relations between women and men, develop programmes that enable girls and women to enter occupations in which they are currently under-represented and, in the developing countries, 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.

Sustainable Development

UNESCO (2015d) also stresses the need for skills development for sustainable development. The World Commission on Environment and Development (1987) defines sustainable development as “development that meets the needs of the present without compromising the ability of future generations to meet their own

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

needs.” Majumdar (2012) argues that since “TVET is the major producer” of the future workforce, it follows that the sector is responsible for aligning education and training to enable future workers to take on responsibility for responding effectively to the principles and needs of the sustainable development agenda. He posits that it is therefore incumbent upon TVET to develop knowledge, skills and competencies for green occupations, economies and societies and the innovations needed to address climate change, preserve environmental integrity and assure the continued health of nature’s essential life support systems.

Other 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, modularisation, 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.
- That TVET be relevant to labour markets.
- Greater national and international collaboration and sharing of research findings, knowledge, experiences and promising practices.

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

These then are the demands. What are the challenges?

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 Member States in expanding access to and improving equity in 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 policy making, 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 upon anticipated work demands and lifelong possibilities). The Asian Development Bank (2009) states that in many countries, particularly those with rapidly evolving labour markets, TVET is multiply challenged 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 the governments combine the roles of policy makers, regulators and training providers. As a consequence of poor co-ordination, capacity and funding, TVET in these countries often provides slow, inflexible and inadequate responses to the needs of the labour markets and the employment expectation-performance gaps.

The World of Work in the 21st Century

As UNESCO-UNEVOC and UNESCO-UIS (2006) point out, the principle original goal of TVET was to prepare participants directly for work. However, with globalisation, 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 globalisation 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. And today's university and college graduates face a much more dynamic and uncertain 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, such as 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, age 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.

Digitalisation — 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 digitalisation, combined with globalisation and the off-shoring of manufacturing, will lead to increasing unemployment and growing income inequality. The Committee for Economic Development of Australia

(CEDA) is but one organisation highlighting the need for more funding for, and co-operation in, preparing for the huge changes in the workforce that will be caused by computerisation 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 computerised 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 on its payroll; and 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 employs 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 21st 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 Enterprises

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 micro enterprises may have fewer than five workers or simply be family concerns.

Governments worldwide recognise 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 the developing countries. In most OECD countries, MSMEs constitute 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 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, 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 (see 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 Member States 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 marginalised 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 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) emphasise the need for TVET to educate the poor; under-served minorities; women and girls; and illiterate, semi-literate and innumerate learners in those 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 organised 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 youth and young women) lack the foundational, cognitive, non-cognitive and technical skills that employers demand. TVET is widely recognised 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 implementation of specific youth-focussed 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 call for 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 globalisation, 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 industrial 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 because of 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, organising 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 organisational 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 the 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 facing such a 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 the training and retraining needs in developing countries. These include insufficient 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-farm 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 organisations 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 the cities and larger towns. So great is the scale of rural to urban migration in the developing countries and so low are the educational and skills levels of the newcomers that the 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 under-employed. 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 the 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 the cities and towns.

Other groups unable to access TVET appropriate to their development needs are those living in the 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; and 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; and 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, youths and adults with disabilities is also affirmed.⁸ 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 individualised support for their schooling and training.⁹ But in the developing world, 98 per cent of children with physical or mental impairments are not enrolled in schools, and consequently they 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 (Warmesley, 2013). The significance of this agenda 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

8 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).

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

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 help 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 in 2012, around one third of the prisoners in French prisons were able to undertake some kind of vocational training leading to a certificate that would enable them to embark on study for 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 Member States against gender-based discrimination, including encouraging their TVET institutions to change their admissions procedures, curricula, pedagogy, materials and work-based learning to assure gender mainstreaming and gender equality.

Greening, Climate Change and Sustainability

The ILO (2011), Skoufias, Rabassa, Olivieri and Brahmabhatt (2011) and many others anticipate that climate change, the need to reduce carbon emissions and the moves to cleaner energy will affect jobs in all sectors in developing and developed countries alike. Kastrop 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 the future labour market needs but also to make green skills, attitudes and knowledge part of work and life, 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, promote critical understanding of the relations between society and the environment and 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 “analytic 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 such countries 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 socially discredited, and even today, the participation rates vary considerably. 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, the colleges do their best, but they 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, the government takes responsibility for ensuring proper funding by levying companies for training costs, there is a codified system of vocational qualifications linked to both academic

qualifications and on-the-job experience, and there is a training system organised on the basis of lifetime 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 Chairman 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 stigmatised 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 policy making 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, funding for the sector and thus 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 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 globalisation and generic attributes required for working and living in the 21st 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 European Union (EU) has developed the Common Quality Assurance Framework (CQAF)¹⁰ to increase transparency and consistency in TVET provision between Member States. A set of coherent quality indicators including input, process, output and outcome measures enables 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 the Member States 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 Framework¹¹ 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

¹⁰ www.cqaf-online.eu

¹¹ www.asqa.gov.au/vet-registration/understand-the-requirements-for-registration/the-vet-quality-framework.html

¹² www.unevoc.unesco.org/tvetipedia.0.html?&tx_drwiki_pi1%5Bkeyword%5D=ISO%20standard

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 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 organisations 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 organisation, the learner, customers and other relevant interested parties.

The 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 organisational 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 the 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.

Learning Pathways

The Incheon Declaration (World Education Forum, 2015) highlighted the need to meld the various parts of education systems into a continuum with more clearly articulated learning pathways and career guidance systems to help learners and graduates navigate through and make well-informed choices about study, work and career progression. These pathways need to be flexible, linking informal learning and non-formal education and formal education through the accumulation, recognition and transfer of reliable, transparent, well-articulated outcomes-based qualifications (including at the international level). The development of such pathways calls for collaboration among all providers and stakeholders, up-to-date labour market information, and self-assessment tools to help individuals identify the skills, attitudes and knowledge they need to make sound career choices and effectively build their knowledge and skills.¹⁴

Conclusion

Governments talk about the importance of TVET to their economies, but when it comes to budgets, they tend to balk at the costs and give higher priority to

¹³ www.iso.org/iso/iso21001_briefing_note.pdf

¹⁴ For an example of this, see <http://docs.education.gov.au/node/36117>

increasing participation rates in higher education. Universities have an important role to play in economic and social development, but it might be argued that higher education currently receives a disproportionate degree of attention from governments around the globe. College and university education have an important role in human resource development, but a study by Harvard and the Asian Development Bank reveals that only around 6.7 per cent of the world's 7.2 billion people holds a degree (Wilson, 2010). Even in advanced economies such as the UK and the US, only around one third of the population aged 16–64 has a degree, degree-equivalent or other higher qualification (Ball, 2013; College America, 2011).

Virgin founder and entrepreneur Richard Branson comments,

Ten years ago it felt as though teenagers in Britain were being told that university was the “be all and end all,” whereas in reality, higher education wasn't of use to many of those paying for it. ... It's not a case of trying to make sure everyone heads off to university. For some people that's fine, but for a great many, including yours truly, it's just not the right fit. (Williams, 2014, paras 5-7)

Catherine Livingstone, President of the Business Council of Australia observes,

There are too many people going to university and not enough going through the TVET system. It does not preclude them from later entry into the university system. I just think some students would be better off with vocation and skill training and having work experience. (Gilmore and Knott, 2014, para. 6)

The validity of her remarks are borne out by the fact that many recent graduates in Australia are struggling to find full-time work and are being paid lower starting salaries than their predecessors (Lousikkian, 2015), many of the jobs held by college-educated graduates in the US are not worth the price of their diplomas (McGuinness, 2013) and almost half of graduates in the UK are in non-graduate jobs (Allen, 2013).

But the most important question is: How is the 93.3 per cent of the world's population, most of whom live in the developing countries, who will never have a chance of attending university, to gain the knowledge and skills to improve their lives and employment opportunities and how are the UN's 17 Sustainable Development Goals (SDGs) to be achieved? The answer can only lie in TVET becoming a truly transformative force and serving many more people around the globe. This chapter has shown that many parties are urging TVET to unleash its potential (Marope et al., 2015). The new SDGs set by the United Nations challenge governments to transform their TVET systems to provide lifelong learning. But then the question arises: How can the profound transformations on the scale required be implemented when funding for TVET in so many countries is already limited and international aid for education in developing countries is being affected by austerity measures or changed political priorities in the donor countries? These challenges can only be met by strengthening and widening TVET provision through multinational and cross-sector collaboration and applying the kinds of ICT-based methods described in the following chapters.

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ICTs, Blended Learning and TVET Transformation

Colin Latchem

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."¹ The organisation has been promoting the use of ICTs both in general and as a way of transforming Technical and Vocational Education and Training (TVET) (UNESCO, 2011). UNESCO-UNEVOC, UNESCO's specialised centre dedicated to developing and improving technical and vocational education through networking and the exchange of information in all Member States 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, considers that ICT has a crucial role in expanding access, improving quality and enhancing 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 organisation of the Commonwealth of Nations mandated to promote and develop the use of open and distance learning (ODL) throughout the Commonwealth's 54 Member States, has also been assisting ministries and institutions in Commonwealth countries with the Technical and Vocational Skills Development Initiative,² 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.

1 See www.unevoc.unesco.org/go.php?q=Upcoming:%20UNESCO-UNEVOC%20virtual%20conference%20on%20ICT%20and%20TVET

2 www.col.org/programmes/technical-and-vocational-skills-development

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 the only certainty is change, the challenge for TVET is how to transform its teaching and learning environments to achieve access, relevance and quality cost-effectively. 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

ICTs 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 video-conferencing, 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). And Kofi Annan, former UN Secretary-General, has 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 socio-economically 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 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 the 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 organised jointly with partner organisations, 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 innovatory projects by early adopters in the sector. But for all of their merits, these tend to be isolated, one-off, temporarily funded or supported and grassroots 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 the 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 British 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 eLearning 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 standardise and assure 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 out-sourced, 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 eLearning 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 organisations. 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). So there is 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 unpaid jobs as well as the micro, small and medium enterprises (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, there is high staff turnover and many of these small businesses fail to be sustainable or to maximise their potential. New workers and existing employees alike need familiarisation 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 group, family, online or mobile-based micro enterprises, and this is yet another transformative intervention that TVET must experience.

With the spread of smartphones and other mobile devices, MSME training can be delivered to the farthest corners of the earth. One example of how it can be delivered is the International Finance Corporation and IBM “SME Toolkit.”³ 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).⁴ 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-trainers 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 organisations and have served over 6 million trainees in the past 15 years. A global co-ordination team at the ILO headquarters in Geneva ensures sustainability, innovation and up-to-date knowledge sharing and provides quality assurance and certification.

ICT-based Applications in Teaching and Learning

The range of ICT 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 credible education for students who are unable to attend a campus for reasons of work, family, geography or other circumstances. In its earliest form,

3 www.smetoolkit.org/smetoolkit/en

4 www.ilo.org/wcmsp5/groups/public/---ed_emp/---emp_ent/---ifp_seed/documents/publication/wcms_175474.pdf

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 eLearning or online learning (see below). These ICTs have enormous storage, retrieval, transmission and processing capacity. Their multimedia, motivational and presentational capacities are superior to those of the 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.

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 Open University⁵ and open schooling systems such as India’s National Institute of Open Schooling (NIOS)⁶ operate in accord with a “quality out” rather than a “quality in” model. Rather than requiring entrants to fulfil certain academic requirements such as matriculation, 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 by 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 the face-to-face learning, or, in the case of “flipped learning,” studied prior to and in preparation for onsite teaching, tutoring or small group sessions.

Flexible Learning

Flexible learning places the learners in primary control. It offers them choices in the 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 accelerated or decelerated means. Flexible learning is useful for serving a wide and diverse range of students and achieving a competitive advantage for training organisations and employers by delivering training in international, national, regional and remote areas in forms and ways that best suit the learners’ styles, needs, work schedules and circumstances.

5 www.open.ac.uk

6 www.nios.ac.in

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 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 open educational resources (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.⁷ 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 of OER and OCW has been the development and distribution of Massive Open Online Courses (MOOCs), which are freely accessible via the Web and designed for the unlimited participation of 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 credit or transfer 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

⁷ See www.oercommons.org

administration. They are often used for storing OER, OCW and MOOCs and can be subject-focussed or institutionally focussed, 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 multisensory learning experiences and enable learners to explore otherwise inaccessible real-world phenomena.

Simulations, Games and Role Plays

ICT-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 having 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

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

Adopting New ICT-based Applications

All of the above ICT-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 specialised 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, and
 - provide links that enable the 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-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 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 for setting 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 by ICT-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 organisation trainers (Norton, 2013).

In some cases there will be a need for entirely new, specially focussed 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 organisation and management, safety, entrepreneurship, applied computer science, practical teaching and action research.⁸ COL also provides a guide for workshop activities (Romiszowski, 2013) and UNESCO-UNEVOC⁹ 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

8 <http://oasis.col.org/handle/11599/694>

9 www.unevoc.unesco.org/go.php?q=UNEVOC+Resources++Video

Guidelines for Open Educational Resources (OER) in Higher Education (UNESCO and Commonwealth of Learning, 2011, 2015) was the result of practitioners, researchers, policy makers, 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 eLearning 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)¹⁰ and virtual University of the Third Age (U3A).¹¹ 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 recognise 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-based TVET provision

¹⁰ <https://www.p2pu.org/en>

¹¹ www.u3aonline.org.au

due to location, social circumstances, age, education or income levels will only reinforce, exacerbate and add to existing socio-economic inequalities. Care must therefore be taken to ensure that the most vulnerable, most marginalised 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 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 raise 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).

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-government, not-for-profit or private sector organisations that enable individual students to progress in their education and training, earn academic credit 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 the existing silos in education and enable learners to access information and tools by which they can construct personalised 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, wherein 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 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 the mass media for the purposes of cognition, diversion, social utility and withdrawal. Cognition is the act of coming to know something, satisfying curiosity. The 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 the 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 in some form of technology-enabled informal learning (Hague and Logan, 2009), since which time 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 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 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 Open2Study¹² provides an example of how a TVET provider can capitalise on the concept of an ICT-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.¹³ 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),¹⁴ 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 which are the equivalent of their on-campus courses but in many cases free of any entry requirements. Learners can progressively amass credits to gain entry into undergraduate study, on-campus or at a distance in any of the participating universities.

TVET could follow the example of the UK Open University's OpenLearn.¹⁵ This is a repository that allows informal learners to freely download hundreds of bespoke or repurposed multimedia OER from iTunes U 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 for hundreds of free

12 See <https://www.open2study.com/courses>

13 <https://www.opentraining.edu.au>

14 www.open.edu.au

15 www.open.edu/openlearn

16 <https://www.futurelearn.com>

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 Statement of Participation, while others offer opportunities to take invigilated examinations at local test centres and receive a Statement 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,¹⁷ 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 – 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 recognised 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 curricula standards will lack quality and national consistency. Various national skills authorities, qualifications frameworks or sector 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 provision of continuing, demand-driven and quality-based TVET. Allais (2010) concludes that there is no single right model of national qualifications frameworks, but the policy making and diffusion can certainly benefit from the use of well-designed ICT-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

¹⁷ <https://www.tafensw.edu.au/career/pathways/#.VNGQsp2Udh4>

systems. These help reduce the mismatch between demand and supply, address skills shortages and bottlenecks and assist labour adaptability and geographical and occupational mobility. Watts (2013) observes that in general, career guidance 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 in the universities due to a lack of career services units with institution-wide responsibility for helping students or graduates. He suggests 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

As shown in Chapter 1, there is a worldwide need to counter the 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 the customers' needs and perceptions.
- Show why the product or service is better than everyone else's.
- Fit into the 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 a tempting 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 into the attitudes of the stakeholders — the learners, graduates, employers, trainers, parents and policy makers. When the UK's City & Guilds Centre for Skills for Development and Council for Technical and Vocational Education and Training in Ghana collaborated in countering the low esteem 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 (Bortei-Doku 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 stigmatised 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 the 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 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 reposition itself in the market. Collaborating with its key stakeholders, ITE redefined its products (creating new market-relevant programmes and pedagogic 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, corporate sector, prospective students, parents and 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, through 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 the 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 its 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 quality assurance (QA) in TVET (UNESCO-UNEVOC, 2013c). Governments, non-governmental organisations, international organisations, donors, the private sector and the public at large will expect accountability and proof that the transformations and use of ICT-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 policy making, 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 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 the 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. And cutting costs may well endanger both access and quality. So, in adopting these new digital technologies and methods, it is critical to develop strategic and business plans and determine the goals and priorities in regard to 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 standardisation organisation 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,¹⁸ which has been developed to increase transparency and consistency between the Member States of the EU 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),¹⁹ 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 Quality²⁰ assurance systems, whose use is gaining momentum in the sector.

When it comes to QA and eLearning, 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 eLearning 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 eLearning.
- Ensure maximum interoperability of VET systems and content.
- Maximise the viability, integrity and portability of eLearning 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 (eLearning, 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

18 www.cqaf-online.eu

19 www.eqavet.eu/gns/home.aspx

20 www.iso.org

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-based teaching and learning. And Kawachi (2013) 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 eLearning 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 socio-economically disadvantaged backgrounds; indigenous Australians; women; people from culturally and linguistically diverse backgrounds; new arrivals to Australia, refugees and emerging communities; people with 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 eLearning 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 organisations. It is an independent, non-governmental organisation whose members are the standards organisations 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 minimising 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),²¹ observing that this is likely to become the de facto reference point for QA in ICT-based teaching and learning around the globe (Ossiannilsson, Williams, Camilleri and Brown, 2015). ISO itself claims that the potential benefits for educational providers using this international standard are:

- a) better alignment of educational mission, vision, objectives and action plans
- b) inclusive and equitable quality education for all
- c) promotion of self-learning and lifelong learning opportunities
- d) more personalized learning and effective response to special educational needs
- e) consistent processes and evaluation tools to demonstrate and increase effectiveness and efficiency
- f) increased credibility of the educational organization
- g) recognized means to enable organizations to demonstrate commitment to education management practices in the most effective manner
- h) a model for improvement
- i) harmonization of national standards within an international framework
- j) widened participation of interested parties
- k) 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 policy makers, managers, practitioners and researchers and developing inter-sector, regional and international QA systems for ICT-based applications in TVET.

21 www.iso.org/iso/iso21001_briefing_note.pdf

Conclusion

This chapter has demonstrated the many ways in which ICTs 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 organisational ecosystem share and exchange information, resources and sources to each other's benefit. The opportunities for making best use of these media and modes range from opening up TVET learning opportunities for remote, disadvantaged and minority communities to meeting the demand from overseas students attracted to the opportunity to study globally provided online programmes of high proven standards. The challenges of harnessing the technology and achieving access, connectivity, content development, localisation and customisation to maximise capacity development are there waiting to be met. 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.

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PART

II

Case Studies

Case Studies

The following nine case studies illustrate the kinds of measures that can be undertaken to apply ICT-based, blended and flexible means of delivery to the transformation of TVET at the national, state and institutional levels.

Chapter 3 describes how The Federal Institute for Vocational Education and Training (BIBB) operates as a centre for vocational research and the progressive development of Vocational Education and Training (VET) in Germany. It works to identify future challenges for VET, stimulate innovation and develop new, practice-oriented solutions for initial and continuing vocational education and provides national incentives for transformative use of technologies and alternative means of delivery. It monitors and evaluates these projects which, if shown to be effective, are then adopted in the national system.

Chapter 4 describes the organisation and operations of the Open Training and Education Network (OTEN) in New South Wales, Australia, the country's largest distance education provider. It shows how OTEN transitioned from the correspondence model to online, multimedia and interactive provision and increased its national and international enrolments in 250 distance and online courses by ensuring quality and student responsiveness and partnering with SEEK Learning, a course aggregator service specialising in connecting adult Australians with career-related education (primarily online-based courses), and enables 22 Australian tertiary providers to provide access to over 350 nationally recognised online technical and vocational courses.

Chapter 5 describes the work of the Sri Lankan Ministry of Youth Affairs and Skills and Development, the National Competency Standards, the role of the Tertiary and Vocational Education Commission and how the Distance Education Modernisation Project was initiated to encourage and support distance education to increase access to post-secondary education. It then describes the development and functions of an ICT-enabled Career Guidance and Job Matching system designed to bridge the information gap between supply and demand in the labour market.

Chapter 6 is a case study of the Open Polytechnic, New Zealand's leading distance learning provider which annually enrolls 29,000 mainly adult students throughout the country and internationally. In its strategic planning, Open Polytechnic has identified advances in technology and the potential of pedagogically rich online learning as the key to its future. The later parts of the chapter show how the institutions considered the options for the transformations needed in its policies, procedures and uses of ICTs in order to capitalise on the new paradigms and maintain its competitiveness.

Chapter 7 explains how the University of Technology, Jamaica (UTech), the leading technological university in the Commonwealth Caribbean, developed and delivered four ICT-based, blended cross-Caribbean in-service TVET programmes. It describes the steps it took in creating and providing these programmes, why the various modes of delivery were chosen, the partnerships involved and the outcomes of these initiatives. It then examines the lessons learned, which may be helpful to other newcomers to online and blended learning, and describes the other steps it is taking to serve the region.

Chapter 8 explains how reforms over the past decade have improved the image of Finland's VET and helped to reduce unemployment levels. The chapter then examines Omnia, the Joint Authority in Education in the Espoo Region which the Finnish National Board of Education has appointed the national professional development provider. Omnia challenges TVET teachers to embrace 21st-century learning solutions, and in its entrepreneurial hub, InnoOmnia, it provides a unique learning environment combining the worlds of learning and work in which everyone is a learner and a teacher.

Chapter 9 reports on the Innovation in Vocational Education and Skills Training in Africa (INVEST Africa) programme supported by the Commonwealth of Learning in partnership with the Commonwealth Association of Polytechnics in Africa. It describes how this project has used Rogers's diffusion of innovation model, trained early adopters to become champions and used a model of cascading training to catalyse a shift to the adoption of flexible and blended means of delivery at two of the institutions involved in INVEST Africa, and the benefits gained from this initiative.

Chapter 10 shows how the TVET Academy, a French non-profit NGO, piloted the use of video-recordings of "benchmark" teachers and videoconferencing to help teachers in regional and provincial Cambodia training centres improve their teaching. The teachers could also use these materials in their teaching. The lessons learned from this project have encouraged the TVET Academy to explore the use of OER in TVET teacher training in Africa and Latin America by using languages with a large footprint and a "\$500 training centre" which requires neither a server nor an Internet connection.

Chapter 11 describes two pilot projects that provided e-apprenticeship programmes in Manitoba and Nova Scotia in Canada. Replacing classroom attendance with ICT-based instruction meant that apprentices could remain within their own communities, save on study costs and "earn and learn." Employers only lost the service of these apprentices for short periods every week rather than for block periods of study at colleges. The chapter examines the conduct and outcomes of these two projects and also the developments that have occurred since their introduction and evaluation.

Germany: BIBB

Michael Härtel

The German Dual System of VET

In-company training is “the heart, core and backbone” of Germany’s dual system of Vocational Education and Training (VET).¹ The OECD (2010) observes that Germany’s VET system is deeply embedded and widely respected in society, offers qualifications in a broad spectrum of professions and is responsive to changing labour market needs. It is characterised by an intricate web of checks and balances at the national, state, municipal and company levels to ensure that the short-term needs of employers do not negatively affect the broader educational and economic goals. The system as a whole is well resourced, combining public and private funding. Germany even managed to maintain its strong financial support for VET during the global financial crisis. The system is described as “dual” because vocational education and training take place at two learning venues: in the companies and in vocational schools offering part-time courses (Carroll, 2013).

In 2013, the federal ministry of education and research (Bundesministerium für Bildung und Forschung, or BMBF) and federal ministry of economic affairs and energy (Bundesministerium für Wirtschaft und Energie, or BMWi) mounted a major public information campaign to emphasise the benefits of VET. Entitled *Berufliche Bildung – praktisch unschlagbar* (Vocational Education and Training: Practically Unbeatable), this campaign reached out to youth, schools, parents, employees and employers. The promotional measures for the campaign included nationwide poster and press advertisements, publications, public events, social media, “Infomobiles”

1 For an overview of the German VET system as a whole, see [www.refernet.de/media/BIBB_ReferNet_barrierefrei\(1\).pdf](http://www.refernet.de/media/BIBB_ReferNet_barrierefrei(1).pdf)

travelling across Germany to provide on-the-spot answers to questions about VET and a WorldSkills² championship event in the town of Leipzig.

The federal government regulates the legal framework for VET through laws and training ordinances that lay down objectives and content and examination requirements for in-company vocational education and training (BIBB, 2014). The professional competencies to be acquired through in-company training are specified in training regulations and included by the training enterprises in individual training plans. The binding requirements of the training regulations guarantee a uniform national standard. For the vocational schools, a framework curriculum is drawn up in accordance with the training regulations for every recognised training occupation. Training in the part-time courses in the vocational schools provides the foundational knowledge (theory) and technical skills (e.g. operation planning, technical drawing, technical mathematics, business studies) to support the practical training (work-based learning) provided in the company.

The core institution at the national level for consensus building between all parties involved in VET is the Federal Institute for Vocational Education and Training (Bundesinstitut für Berufsbildung, or BIBB), which prepares the content of vocational training regulations for the federal government. As part of this process it develops drafts jointly with experts in training practice designated by the respective employer's association and trade unions. Representatives of the federal government and the Länder (federal subdivisions of Germany) are also involved in this development process. BIBB is recognised as the centre of excellence for vocational research and for the progressive development of VET in Germany. It works to identify present and future challenges in VET, stimulate innovation in national and international vocational systems, and develop new, practice-oriented solutions for both initial and continuing vocational education and training. BIBB has taken part in the methodological preparation and evaluation of the European Continuing Vocational Training Surveys (CVTS) being conducted in enterprises and has thus been involved in providing and analysing key data on in-company continuing vocational training for German and international vocational training research.

The success of this dual system is due in no small part to the high degree of engagement and sense of ownership on the part of the employers and other social partners and the employment of well-qualified in-company training personnel. By training the new generations and maintaining contact with schools and young people in general, these personnel demonstrate a sense of social responsibility, help rejuvenate the workforce, introduce new ideas into the companies, assure the long-term retention of employees and contribute to the commercial success of their companies. The nationally binding recognition of the training occupations ensures that the basic principles agreed with industry and the Länder are taken into account and that all training for recognised occupations is provided in accordance with the training regulations adopted by the federal government.

2 The WorldSkills Competition occurs every two years and is the biggest vocational education and skills excellence event in the world. The competitors represent the best of their peers and are selected from WorldSkills member countries and regions. They demonstrate technical abilities both individually and collectively, executing specific tasks for which they are studying and will perform in the future.

The 16 Länder have committees for VET, with equal representation of employers, employees and the Länder authorities, which advise on matters regarding vocational schooling. Once full-time compulsory schooling (general education) has been completed, students from any learning pathway (including students who have acquired university entrance certificates) may enter apprenticeships for two, three or four years and also develop their knowledge and skills by attending vocational schools for one day a week. Every year, around 50 per cent of young people develop occupational competencies in 328 recognised occupations through this long-standing, well-developed dual system.

Digitising the World of Work and the Impact on VET

Ever since the Hannover Trade Fair for Industrial Technology in the spring of 2014, the so-called Industry 4.0³ has become Germany's synonym for a new industrial revolution based on digitisation, automation, networking and flexible "intelligent" manufacturing processes in "smart factories." While the future nature and ramifications of Industry 4.0 cannot be predicted with any accuracy, the concept, together with such ideas as the "knowledge society," "service society" and "digital age," is giving rise to information and communication technologies (ICTs) becoming one of the strongest drivers of innovation in Germany. This technology-driven development is proceeding not in a linear manner but in a series of technological leaps, some of which are totally unpredictable.

The extent and nature of ICT use in the workplace in Germany has been documented by analyses conducted in the context of compiling the annual *BIBB Data Report* to accompany the *Report on Vocational Education and Training* (2013). These findings showed that in 2012, 81.2 per cent of the working population (about 29.2 million people) were working with computers and two out of three gainfully employed people (65.5 per cent) worked with computers frequently. Virtually all of those with university degrees (97.3 per cent), 77 per cent of those with VET qualifications and 59.4 per cent of those without any formal qualifications worked with computers. Those who did not use computers were predominantly in the production or simple service occupations. Computers were more frequently used in the civil service (87 per cent), industry (86.6 per cent) and retail sector (78.7 per cent), and less so in the skilled trades (62.3 per cent). On average, workers who used computers frequently at work spent 48 per cent of their working time on them (44 per cent in the case of men and 53 per cent in the case of women).

Weiss (2015) suggests that in a world of digitisation and automation, VET needs to be upgraded to what he calls Vocational Education and Training 4.0 and structured differently, with more of the learning provided through virtual learning environments. He also suggests that the learning opportunities need to be borne in mind at a very early stage — when the manufacturing facilities are being designed. This means VET must also be involved at this stage in order to assure effective and efficient ways of training the next generation of skilled workers. This calls for new forms of partnership with industry and new learning venues and hybrid qualification routes towards advanced vocational qualifications. It also

3 Industry 4.0, also known as the fourth industrial revolution, refers to a technology-driven industrial paradigm.

requires BIBB to engage in dialogue with experts from various fields and develop proposals for how these new training requirements can be satisfied.

In so doing, BIBB needs to establish whether VET faces a technology-driven or a pedagogically driven set of new challenges in its delivery systems. It is well known that Web-based multimedia tools alone do not result in greater success in learning. Only by embedding digital media within didactic concepts and frameworks that promote learning (e.g. ensuring stable technology, in-company organisation and education management and media competence on the part of the users) can digital media be useful for learning and continuing training. This link tends to be neglected, both in project planning and in many of the pilot projects for introducing digital media into in-company-provided VET. It needs to be understood that digital media can support dynamic learning processes in complex and constantly changing working environments by enabling just-in-time, self-paced and repeated study of training units, self-managed acquisition of information, online access to expert knowledge, and documentation of acquisition of competencies. Such Web 2.0 applications blur the boundaries between teachers, training supervisors and students, because everybody involved can collaborate on developing, adapting and updating content and learning tasks, and making work-based learning outside of formal learning venues a reality.

The Four Case Studies

In response to the increasing computerisation of skilled labour and potential for ICTs to transform VET, the BMBF regularly announces targeted competitive funding measures for applying “digital media in vocational education and training.”⁴ Invitations go out nationwide for the submission of ideas for the utilisation of ICTs in VET. The responses are reviewed by experts and, if judged worthwhile and deliverable, granted funding. BIBB then supervises and monitors these specially funded projects and, in the event of their proving to be successful and inclusive, converts the applications into products for general use in the sector. This is realised through an ongoing public campaign which focuses on what they refer to as a “roadshow.” The roadshow takes place in companies’ VET training centres and offers guidance for VET trainers and teachers to work with the products. A series of moderated workshops help the participants adapt the projects for their specific needs in their VET training environments.⁵

Four examples of ICT-based initiatives in the German VET system follow. The first three case studies are projects funded under the BMBF scheme described above. The fourth documents the well-established online community of trainers and teachers in VET, *foraus.de*, which was conceptualised and implemented by BIBB and is BIBB’s main communications channel with trainers and teachers in VET and its other stakeholders.

BLoK: The Online Report Book

All apprentices are required to keep a report book in which they record proof of their individual progress in training and towards their attainment of formal qualifications. Their teachers and training supervisors are expected to review this

4 See www.qualifizierungdigital.de

5 See <https://www.qualifizierungdigital.de/de/anwenderworkshops-heidelberg-21-6-2016-1740.php>

record regularly, and it must be presented for admission to the final examination and journeyman examination as per Article 43 BBiG (Berufsbildungsgesetz — German vocational training act) and Article 36 Section 1 No. 2 HwO (Handwerksordnung code — German trade and crafts).

One major problem with this system was that either the report books were in the hands of the apprentices or their records had been entered on local computer hard drives, so it was not always easy or convenient for the vocational teachers and in-company training supervisors to access the data when and where needed. Another major problem was that the obligation to maintain the report books was an unpopular requirement, and many of the apprentices neglected to keep their records up to date and complete. A further criticism levelled at these report books was that they were used for purposes of control and justification and revealed little or nothing about the quality of the actual training processes and thus failed to yield any useful data that could be used for improvements in training.

To address these concerns, the Technical University of Dresden, funded by the European Social Fund (ESF)⁶ and the BMBF, developed, piloted and evaluated an online report book. It was hoped that the book, known as BLoK⁷ (Online-Berichtsheft zur Stärkung der Lernortkooperation), which could be viewed and confirmed as accurate by teachers and supervisors irrespective of time or place, would better facilitate monitoring and quality assurance, be more convenient for, and thus motivate, the apprentices who were used to digital and online options and help promote the image of VET as an up-to-date sector. The online report book currently in use is a Web 2.0 application (the printed version is also still available). It enables the apprentices to record the time, nature and proof of their achievements in learning and how these accord with the requirements in the learning plan, and also to reflect on the nature and progress of their learning. Such reflection is regarded as a key requirement for the development of occupational competence and self-managed learning skills.

Being Web-based, the BLoK record-keeping system is immediate and ubiquitous. It enables apprentices, teachers, trainers and workplace supervisors alike to assess the current and target status of the apprentices' skills and competencies and discuss their strengths, weaknesses and needs. It also enables teachers and supervisors to examine the apprentices' workloads and absences (both sick time and holidays), for example, and how these fit in with the training schedules. BLoK also has messaging functions that help teachers, trainers and supervisors in different venues liaise and synchronise arrangements for training provision. For example, a supervisor can immediately see what theory or skills an apprentice is currently learning in the classroom and what particular knowledge and skills still need to be covered, and thus modify the next workplace training session accordingly to the advantage of all parties concerned.

Continuing evaluation of BLoK shows that it has a positive effect on apprentices' willingness to reflect on their learning and learning needs. This means that they are assuming a degree of responsibility for their learning, which is something that will serve them well in their future roles as responsible professionals. This

6 The ESF is Europe's main tool for promoting employment and social inclusion. Every year, it helps some 15 million people find work or improve their skills to find work in the future.

7 <https://www.online-ausbildungsnachweis.de/portal/index.php?id=home>

online tool also seems to be helping the apprentices develop their skills in time management, communications, decision making and working in teams, all of which are indispensable in modern-day work environments and for lifelong learning.

Statements made during interviews with the apprentices and their teachers and trainers attest to the value of BLoK in terms of providing a coherent overview of the training content and requirements. One apprentice commented:

I also thought the overview was really good; to now be able to really have the whole apprenticeship year illustrated at one glance and to be able to say, well, OK, or, no, I want to have another look at that week there, and then I just click on it and see what was done then.

One of the training supervisors described his experience with BLoK as follows:

With this, it is possible for an independently thinking apprentice to come up and say, instructor, there still is a big gap [in this assignment]. I have a zero, whereas here I already have 300 per cent; that's something we have to look into!

Following the initial pilot phase, the BLoK online report book was adopted for nationwide use and has been in operation since the 2012/2013 apprenticeship year.

Mediencommunity

The Mediencommunity⁸ is the online “knowledge network of the graphic arts.” Funding from the BMBF and ESF enabled the development and testing of this innovation. Following the pilot phase of the project, the Mediencommunity was adopted by the employer organisation of the print and media industry, Bundesverband Druck und Medien (the German Federal Association of the Printing and Media Industry), and ver.di (Vereinte Dienstleistungsgewerkschaft — the United Services Union) whose 2.2 million members are employees, freelancers, civil servants and students engaged in over 1,000 occupations in education, art, culture and the media, including digital and print media design, print media technology, screen printing and print processing.

The Mediencommunity operates on a “freemium” basis. That is to say, most of its products and services, including the course materials for preparing for examinations in the field, are provided free of charge while others, such as access to Web-based training programmes and the learning centre, incur a minimal fee. The income stream from the latter largely covers the cost of operating the system. The remaining costs are met by the central committee of training experts from the printing and media industries, the ZFA (Zentral-Fachausschuss Berufsbildung Druck und Medien).

The Mediencommunity operates at two levels: facilitating informal exchanges between individuals and groups at different locations — including vocational schools, universities and businesses — and helping to establish formal partnerships between institutions in VET and higher education. It offers a wide range of services:

8 <https://www.mediencommunity.de>

- The home page: This keeps users up to date on news, events and the various Mediencommunity and ZFA products and services.
- LernCenter (The Learning Centre): For an annual fee of 30 euros, users can register for self-study through this system which offers a range of Web-based interactive multimedia modules and multiple-choice tests to prepare for the interim and final examinations. The subjects covered include compositional techniques and typography, chromatics, advertising design and logos, image digitisation, offset printing and project management in media production. The website also provides advice on how to apply for internships, apprenticeships or permanent employment, and has a selection of teaching aids — presentations, scripts and task sheets, for example — that teachers and trainers in the industry can use.
- MedienLinks (Media Links): Simply selecting a topic or type of organisation and clicking on the “Anwenden” (“Apply”) button gives users access to a range of useful information resources about the print and media industry.
- MedienWiki (Media Wiki): Here users can refer to wiki pages with an alphabetised list of topics ranging from media design and bookbinding to micro typography and print finishing. Registered users can also edit, complete and correct these wiki pages. The older pages are then versioned or stored so that no information is ever completely lost.
- MedienLexikon (Media Glossary): This is a glossary defining more than 4,000 terms used in the media and print industry (in German).
- MedienEnglisch (Media English): This is a list of English translations of all the terms used in the media and print industry.
- Web.2 0 Glossar (Web 2.0 Glossary): This explains terms like Web 2.0 wiki, blog and mediacasting in words and pictures.
- Media Seminare (Media Tutorials): These typically take the form of five- to eight-week online conferences run by experienced media practitioners and teachers of graphic arts at universities, colleges and vocational schools. They deal with topics such as calculating printing costs, writing for media professionals, calculating digital media costs, learning about media law and Web-to-print processes.
- Gruppen (Learning Groups): Diverse learning groups and workers in the industry can form themselves into learning communities or communities of practice in order to discuss specific technical topics. Some of these groups also convene to prepare themselves collectively for the industry’s nationwide intermediate and final examinations. Learning groups can be led by one or more presenters, self-organised or created by experts, open to all or restricted to a certain number of participants, and temporary or permanent in nature. In addition, other learning groups organise themselves independently using Facebook or similar social media networks.

Mediencommunity is an industry-wide learning platform, so the range of topics and issues covered by it has to be extremely broad. In the area of printing alone, it covers the entire print workflow from the preliminary stage to processing and finishing. In regard to digital media, the focus is on design. Software training has

not been integrated into the system because of the wide range of commercial firms already providing training in this area.

The concept of the Mediencommunity is that professionals should be empowered to form learning groups to address specific specialist topics. The use of wikis, which allow meaningful discussion on evolving and complex issues and involve the different stakeholders in ongoing processes of creation and collaboration using a simple markup language and a Web browser, is ideally suited to this concept. Wikis are also invaluable tools for the Mediencommunity moderators, teachers and trainers to help trainees prepare for the industry's nationwide intermediate and final examinations. With the ever-accelerating changes in technology, practices and opportunities in the industry and the attendant need for the courses and examinations to be continually updated and amended, wikis are an invaluable means of creating and revising postings for the teachers and learners. Community moderators oversee the wikis and the workflow is managed as shown below.

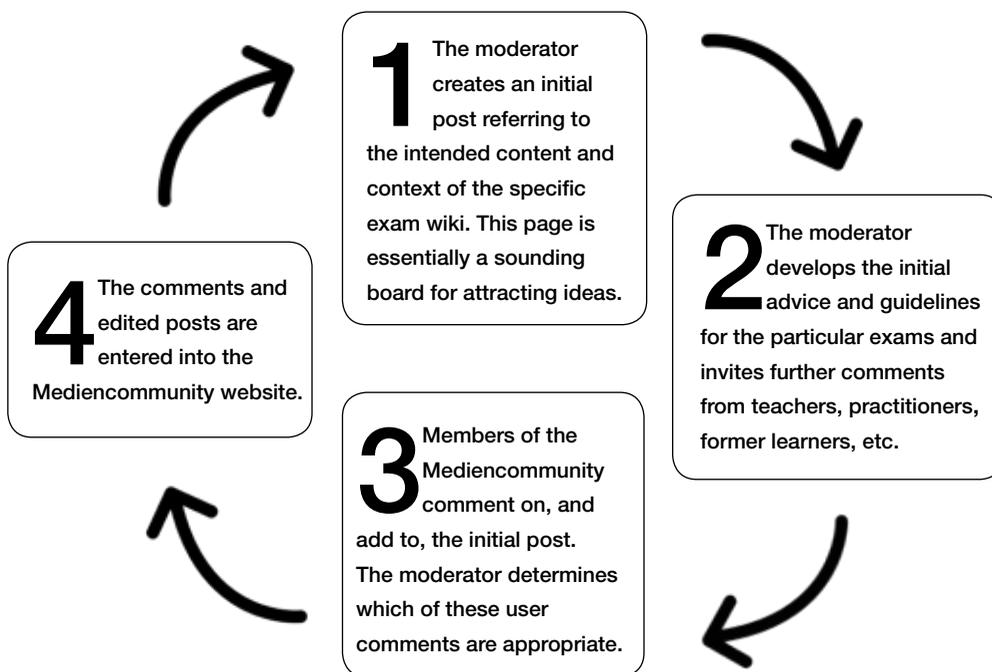


Figure 1: The Mediencommunity workflow process, including ongoing updates for members and quality management via a moderator

The effectiveness of these wikis is assessed on an ongoing basis. The results as of 2014 show that, as a consequence of using these wikis, the number of graduates in the digital and print media design occupations had increased by approximately 20 per cent and the industry was attracting more than 3,200 new apprenticeships annually.

Due to limited funding, the Mediencommunity has not been able to extend its penetration rates and extend its number of new users, but it has managed to maintain its level of use. It currently has more than 8,000 members, and on an average day the website has more than 1,000 visits with an average of seven page views per visit. However, at examination time, the number of visits rises to 4,000 per day. In 2013, 77 per cent of the registered users were initial trainees

(in-company trainers who are responsible for the organisation of in-company training) and those undergoing retraining, 7 per cent were teachers and trainers, 3.4 per cent were students in formal education, and 5.4 per cent were technicians and employees.

In 2015, there was a switch to a more responsive design, mobile-friendly access and the integration of new learning opportunities in connection with the Social Augmented Learning (SAL) project⁹ — all of which, it is hoped, will lead to renewed impetus for the Mediencommunity. The partners in this project, which was launched in 2013, are the Standing Expert Committee Vocational Education and Training Printing and Paper Processing (ZFA), the Fraunhofer Institute for Computer Graphics in Rostock, University of Wuppertal Department of Printing and Media Technology and the Institute for Media and Competence Research in Essen and Heidelberger Druckmaschinen AG, a well-known supplier to the global printing industry. The SAL project opens up new prospects for eLearning. For the first time in Germany, augmented reality (AR) technologies are being connected to social networks and enabling learning content to be accessed directly and explained in detail by means of smartphones or tablets, anywhere, anytime. The aim of this project is to develop and test digital teaching and learning methods in order to optimise the training of those entering or already in the industry by helping them visualise printing processes, maintenance activities or quality control requirements in addition to learning the theories behind such concepts.

The Mobile Knowledge Database for the Plastering Trade (WDB)

Accessing information from the Internet for personal or professional purposes is now taken for granted by virtually everyone. There is seemingly no limit to the subjects that can be learned free of charge in multilingual and multimedia formats from this global library. Such is the exponential growth of knowledge on the Internet that it is reckoned to be doubling every 12 months and soon to be doubling every 12 hours.

Contractors and their employees in the building and construction industry need to draw on the resources on the Internet to keep abreast of all the new developments, ideas, products and services in their businesses. However, while the Internet supplies masses of information, it also has some weaknesses when specific and relevant information is needed by tradespeople. Their searches may not have been formulated in the right ways, so the answers may not be comprehensive or give them what they really need. Furthermore, they have no guarantee that the information they have located has gone through any checks to ensure that it is reliable, impartial and current, and they may have no means of checking who authored or sponsored some of the websites. Until now, therefore, the skilled trades have not had what the larger companies have long been able to take for granted — a central collection of appropriately structured information and sources for their particular fields.

9 www.social-augmented-learning.de

Recognition of this problem led to the idea of creating an independent knowledge database (WDB)¹⁰ for the plastering trade that would bring together on one website all of the data that could directly benefit contractors and their employees, organised according to trade-specific criteria and made openly and transparently accessible. This project was initiated and supported by Kompetenzzentrum Ausbau und Fassade Rutesheim (Komzet), the finishing and facades competence centre in Rutesheim which is funded by the BMBF, BIBB and the ESF.

A large number of knowledge modules — so-called microcontent — had already been created prior to the start of the WDB project by Komzet. Text, images, videos, etc., had been stored as Word, PDF and mp4 files, but all of these potentially valuable information resources needed to be structured, indexed and presented in a way that they could immediately provide business owners, employees and trainees with all of the technical and product information, instructions and guidance they needed in the forms they required, regardless of location. It was also envisaged that VET teachers would find the items from this database useful additions to their teaching and learning resources.

Komzet ensures that all of the information in the WDB system is accurate, conforms to the relevant rules and regulations and is in every way entirely trustworthy. The information has to be available to everyone and anyone wherever they may be — on worksites, in offices, in classrooms or even on the move — so mobile access was considered essential. Therefore, the WDB system was designed so that users could download an app for smartphones and tablets as well as PCs free of charge via iTunes or Play Store, which is programmed for both iOS (Apple) and Android (Google) operating systems. An Integrated Access Management System (IAM) makes it possible to manage the authentication and authorisation of the user groups and determine who has a right to access the content provided. The respective accounts are stored in the app, so the users have fast access to the content without any need to log on. And because there may be locations or occasions where it is not possible to connect to the Internet, the informational modules can also be saved onto the end device so as to be available to the users any time they wish. As with iTunes playlists, users can combine particular modules in as many folders as they wish. Thus, plasterers can file all the guidelines, regulations, product information, etc., that they need for specific projects, and VET teachers and trainers can compile modules in ways that are relevant to their training or teaching needs.

The technical requirements are minimal and can be easily integrated within existing infrastructures. Internet access is all that is needed for maintaining, adding to and updating the WDB. The content is arranged thematically using a traditional headings/subheadings structure matched against common work processes in the plastering trade. Because time is of the essence for busy tradespeople, the system includes an autocomplete search, which users will already be familiar with from their use of common search engines. This allows them to quickly access any content they need by entering search terms; even as they type in the first letter or letters, the autocomplete algorithms will predict one or more possible words from which they can choose. The autocomplete system will also memorise new words after the users have entered them several times.

10 www.wissen.stuck-verband.de/Start_I19905.whtml

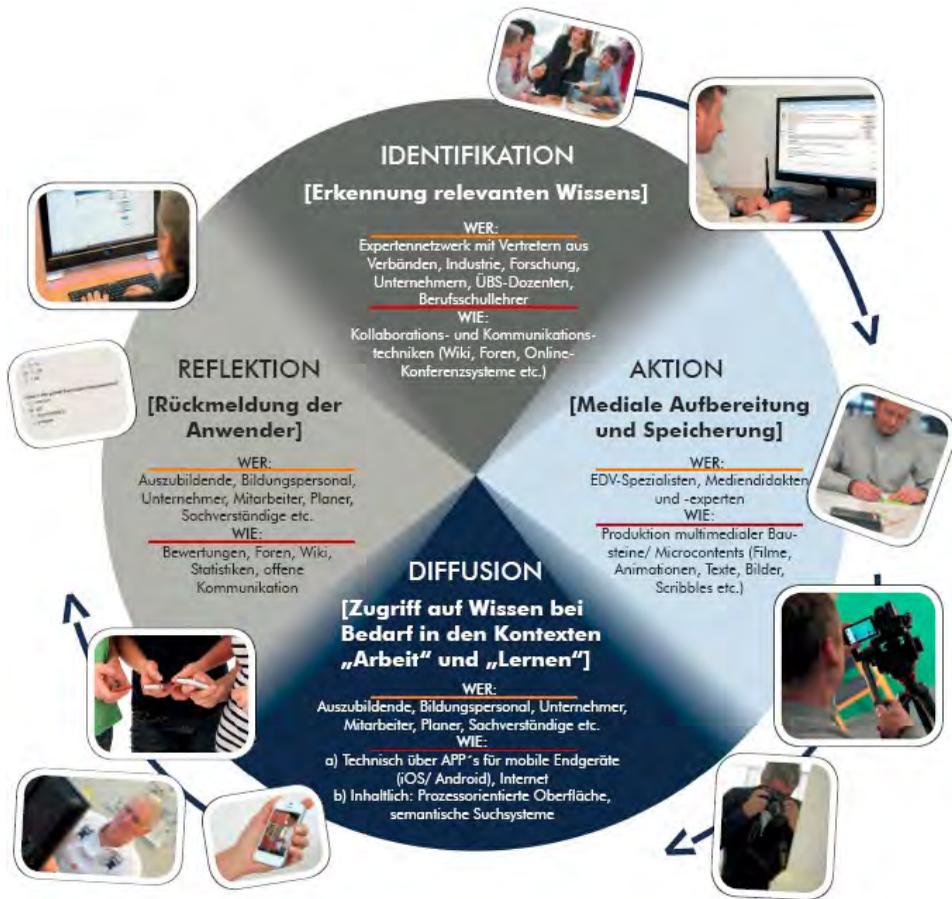


Figure 2: Main features of the WDB

The WDB content is continually monitored to ensure that it is up to date and in line with the users' requirements. All of the modules have an expiry date, after which time they are deleted to ensure that no outdated information remains in the database. The WDB mobile access technology has now been in use since 2013 and has received excellent feedback from contractors, employees and educators and trainers in the initial and continuing VET programmes.

foraus.de: BIBB's online portal for TVET teachers and trainers

TVET trainers and teachers can also sign up to become members of the teachers' and trainers' community forum, foraus.de (Forum für Ausbilderinnen und Ausbilder).¹¹ This portal, which is used by some 10,000 members nationwide, was developed and is managed by BIBB. Created in 2001 and redesigned in 2010, it provides free access to a range of training and information services and opportunities for exchanging ideas and experiences on all aspects of VET. It is used by in-company trainers and skilled workers who are acting as instructors, senior managers and trainers in initial-stage and continuing VET, vocational school teachers, staff with human resource management and organisational development responsibilities, and others interested in pedagogy and innovation in the sector.

11 www.foraus.de

Members and non-members alike can access the foraus.de learning centre which features training modules in the form of PDF documents, flipbooks and associated links and references on topics such as:

- Teaching and learning methods in VET (lecturing, forming learning contracts, motivating, moderating, tutoring, mind-mapping and ensuring learning success, etc.).
- Social skills (communication skills, dealing with learners with learning difficulties and behavioural problems, resolving conflict, intercultural skills and managing learners from immigrant backgrounds, gender mainstreaming, etc.).
- Selecting trainees and marketing VET.
- Communication and digital media in VET (creating Internet-based training materials; using new Internet technologies in education such as wikis, blogs and podcasts; autonomous learning using Moodle, etc.).

Users can also keep themselves up to date on trainer aptitude regulations (Ausbilder-Eignungsverordnung, or AEVO) which set out the conditions under which instructors are recognised under the Vocational Training Act (Berufsbildungsgesetz, or BBiG), and the modules on the action and process-oriented methods that can be used in education and training (Handlungs- und Prozessorientierte Ausbildung).

The website foraus.de also regularly hosts online seminars, forums and other moderated events on training matters in the various trades and on issues arising in in-company training. These are free and usually take the form of self-study materials plus two or more audio and whiteboard virtual classroom presentations. Members are advised of upcoming seminars through the foraus.de learning centre and newsletter, which also advises them about forthcoming events of interest, new publications, technological innovations, services, regulations, etc.

The foraus.de Infothek enables users to identify and link to publications, institutions and associations, eLearning and media databases, and BIBB's and other organisations' research findings on VET. And the foraus.de marketplace provides opportunities for users to post questions, exchange views and make suggestions and offers, etc.

Conclusion

The 21st-century industrial society is characterised by rapid technological advances which, if companies and economies are to remain competitive, mean that human knowledge and skills have to be constantly updated and expanded. Buzzwords such as “lifetime learning” and “learning-on-demand” reflect a trend towards change in approaches to training and the associated delivery methods. Globalisation has changed economic structures and the world of work, sometimes dramatically, and across the globe we can see a move from industrial societies to so-called information or knowledge societies. Consequently, enterprises (and national economies) that want to stay competitive need a highly skilled workforce that can adapt easily and willingly to constant change. Vocational education and training professionals must take this change into consideration when they are planning programmes.

Therefore, BIBB is active in various research and development projects, working closely with the federal government and the corporate sector. Such Public Private Partnerships (PPPs) offer one approach to addressing the most challenging problem of work-embedded learning processes — the permanent transfer of information and knowledge into practice. The day-to-day exchange of information with the corporate sector offered by a PPP is crucial in the search for innovative approaches to target-oriented modern training concepts that use ICTs as a tool for explorative learning that can be integrated into the manufacturing process.

These and similar projects have created new opportunities for companies in the form of new qualifications routes that not only place a greater emphasis on learning but also offer the possibility of learning in the workplace itself. However, there remain a wide range of issues to be addressed in terms of the actions that the companies themselves can take to enable them to use the developments described above to integrate new learning opportunities into their specific fields in a targeted way.

BIBB is therefore now looking into the possibility of integrating electronic information into a methodological and didactic concept, with the aim of using this as a basis from which to investigate the learning potential involved. Whether such electronic information can serve as learning modules for the purpose of (mobile) process-related qualifications is the subject of ongoing debate. Developments in media- and technology-based training are opening up opportunities to deploy digital media in the shape of a (mobile) configured information, teaching and learning infrastructure, particularly with respect to in-company qualifications and service processes and in the sales sector with its wide variety of service-related aspects.

For over 45 years, BIBB has been consistently seeking evidence of and case studies about innovations in VET in order to develop professional development processes for staff in schools and businesses responsible for the quality of the initial and continuing vocational education and training — and hence for the quality of the workforce in German business and industry. It is keen to find convincing solutions and justifications for the use of ICTs in VET and in the world of work. Working with the wider online community and partners in industry offers the best opportunities for such investigations and developing and piloting learning and media applications to help advance the sector.

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Australia: OTEN

Robyn Harriden

Introduction

This chapter describes how the Open Training and Education Network (OTEN)¹ in New South Wales (NSW) rose to become Australia's largest and most successful online education provider.

OTEN is a Registered Training Organisation (RTO) that is managed by TAFE NSW – Western Sydney. TAFE NSW comprises ten Institutes (including TAFE NSW – Western Sydney), all of which are part of the NSW Department of Industry, Skills and Regional Development. It delivers vocational education and training (VET) across the full range of regulated qualifications in the Australian Qualifications Framework (AQF) under which students attaining a VET qualification from any RTO can be confident that their qualification is both accredited nationally and also comprehensively recognised as such. Under a credit transfer agreement with Australian universities, students who successfully complete a TAFE diploma in certain areas qualify for credit transfer in some undergraduate degrees.²

As a state government-owned provider, TAFE NSW – Western Sydney plays an important role in enhancing the skills base in the fast-paced, ever-changing Greater West of Sydney, a regional hub that is projected to exceed 2.5 million residents by 2031 and to see both short- and long-term rapid expansion and diversification in its industry and employment opportunities.

OTEN provides more than 250 distance and online education and training courses to students in NSW, across Australia and overseas with annual enrolments that have grown exponentially (see Table 1).

¹ <http://oten.tafensw.edu.au>

² See http://oten.tafensw.edu.au/courses-and-careers/career-planning/tafe-to-university/#id_348, and http://TAFE NSW Western Sydney.tafensw.edu.au/courses-and-careers/higher-education-and-pathway-partnerships/#id_5390

Table 1: OTEN enrolments, 2007–2014

	Course enrolment count per year								
	2007	2008	2009	2010	2011	2012	2013	2014	2015
OTEN	31,922	35,462	42,292	59,474	80,957	96,667	108,896	113,731	111,382
Disability percentage	8.6%	8.4%	8.3%	8.4%	7.2%	6.9%	6.7%	5.8%	5.3%
Language other than English percentage	13.1%	15.6%	16.3%	15.3%	14.5%	14.3%	13.4%	13.3%	12.1%
Aboriginal or Torres Strait Islander background	4.0%	3.6%	4.0%	4.9%	4.7%	4.8%	5.1%	5.0%	5.3%

Table 2: Key findings for graduates, 2011 and 2013 (%)

(Source: 2013 NCVET Student Outcomes Research document: www.voced.edu.au/content/ngv%3A59760)

	Open Training & Education Network			2015	
	2011	2013	2015	All VET Providers NSW	All VET Providers Australia
Employment and further study outcomes					
After training (as at 29 May 2015)					
Employed	72.9	77.7	71.6	73.7	74.2
Not employed ¹	27.1	22.3	28.4	26.3	25.8
Unemployed	11.8	11.1	16.1	15.8	17.4
Not in the labour force	15.1	11.2	12.3	10.4	8.1
Employed before training	72.4	70.8	67.5	67.0	66.7
Difference in proportion employed from before training to after	0.5	6.9	4.1	6.7	7.5
Employed in first full-time job, started after training ^{2,3}	4.3*	2.0*	4.1	4.3	4.4
Employed or in further study after training	88.1	88.7	84.2	85.8	85.2
Enrolled in further study after training	43.4	40.5	35.6	34.6	32.6
Studying at university	7.2	8.6	9.6	8.4	7.9
Studying at TAFE institute	29.8	20.2	14.8	17.4	12.8
Studying at private provider or other registered provider	6.4	11.8	11.1	8.7	11.8
Training					
Main reason for undertaking training					
Employment-related	74.9	81.7	83.0	82.6	84.6
Further study	6.9*	4.2	3.9	4.8	4.1
Personal development	18.1	14.0	13.1	12.6	11.3
Training was part of an apprenticeship or traineeship ²	10.1	5.0	7.0	23.0	22.7
Satisfaction outcomes					
Satisfied with teaching ⁴	84.6	81.4	85.6	89.9	89.4
Satisfied with assessment ⁴	93.4	91.3	93.1	89.9	88.7
Satisfied with generic skills and learning experiences ⁴	79.3	79.8	79.2	80.2	77.2
Satisfied with the overall quality of training	90.3	87.9	90.6	88.5	86.7
Fully or partly achieved their main reason for doing the training	83.3	80.4	77.0	82.4	80.4

1. “Not employed” is defined as unemployed (looking for full-time or part-time work), not in the labour force or not employed.
2. These questions are not asked of students from community education providers. Therefore, the percentage reported represents the proportion of graduates or module completers, respectively, excluding those from community education providers.

3. In 2012, a new question was added to the survey to derive the proportion of students who started their first full-time job after training. Prior to 2012, students who started their first full-time job before or during their training were reported as "Employed in first full-time job after training." From 2012, a new variable, "Employed in first full-time job, started after training," was reported and estimates for previous years were derived. For more information, see Data dictionary: employment and further study outcomes (www.ncver.edu.au/publications/2677.html).
4. Satisfaction with teaching, assessment and generic skills and learning experiences figures are derived by taking the average of the items under each heading in the questionnaire. Percentages are the proportion of respondents with average scores of 3.5 or higher on each scale. For more information, see Measuring student satisfaction from the Student Outcomes Survey (www.ncver.edu.au/publications/2492.html) and Data dictionary: satisfaction outcomes (www.ncver.edu.au/publications/2677.html).

VET courses in Australia can be enrolled into straight after secondary school or at any point in life by people wishing to receive industry-relevant vocational education that can also be a pathway to a university degree. A TAFE NSW – Western Sydney graduate survey conducted in 2013 indicated that 40 per cent of 2013 TAFE NSW – Western Sydney and OTEN graduates had continued to study in 2014, with 24.8 per cent doing so at university. However, many university graduates also undertake VET qualifications in order to follow their chosen career paths. OTEN continually strives to deliver the highest-quality service to its students, its business partners and the community. The OTEN Customer Service Charter underpins this commitment. OTEN also has ISO 9001:2008 certification, and its quality assurance and quality enhancement policies and processes are in accordance with Australian and NSW legislative and reporting requirements.

The History of OTEN

The first use of distance education for Australian VET was in 1910 when Sydney Technical College launched an emergency correspondence course to train health inspectors at a time when the country was gripped by a typhoid epidemic. By 1917, what had become the Correspondence Division was offering more than 20 subjects to distance learners, using a mix of correspondence education and converted railway wagons acting as makeshift classrooms and workshops. It also later assisted Australia's Second World War efforts by training 100,000 Australian and 43,000 US service personnel. In 1978, the service became known as the College of External Studies; in 1991, it was renamed the TAFE NSW Open Training and Education Network, or OTEN as it is now better known.

In 1995, OTEN was relocated to a purpose-built facility in Strathfield, 14 kilometres west of the Sydney central business district. Since that time, it has grown exponentially. In 1998, it became a Registered Training Organisation (RTO). In 2000, it introduced a custom-designed Student Administration System (SAM), an integrated online student records, educational resource and materials supply chain management system. In 2002, it created an online tracking system to monitor students' progress. In 2010, it celebrated 100 years of public distance education in NSW. TAFE NSW and OTEN are proud of their reputation for delivering work-ready graduates to Australia's highly skilled workforce. A study by the Allen Consulting Group (2007) found that for every \$1 invested by the government in TAFE NSW, the return on investment was \$6.40.

OTEN offers a wide range of courses from vocational areas including:

- Education and preparation for employment.
- Business, management and technology.
- Communication and work skills.
- Construction and building design.
- Electrotechnology.
- Health and community.
- Land and the environment.
- Transport and public safety.

The various teaching sections responsible for course delivery in a particular industry or educational area are managed by head teachers. OTEN has more than 100 fully qualified full-time teaching staff, 200 part-time teachers and more than 550 offsite teachers. Employees who work in this specialised field require a variety of educational technology knowledge, skills and experience in order to be able to deliver this form of education effectively across a range of courses to a diverse community of students. It is also important that the teachers maintain their industry experience to ensure that the courses reflect the latest industry trends and developments. The Manufacturing & Distribution Unit manages the reproduction, duplication, manufacture, storage, distribution, ordering and purchasing processes for learning resources used by OTEN distance learning students. It is also responsible for distributing these learning resources directly to distance students.

TAFE NSW and OTEN are acutely aware that the nature and functions of VET need to be ever-changing in how they provide skills-based training and lifelong learning to meet the economic challenges of the 21st century. The demand for people in employment is projected to rise by 1,166,400, or 10 per cent, between 2015 and 2019. To ensure that this demand is met, the federal government has created a number of initiatives — including the Industry Skills Fund which will provide more than 250,000 training places and support services for industry — and the NSW state government has introduced a funding model, known as Smart and Skilled, through which students receive training vouchers to take to their education/training providers of choice. The implication for OTEN, like all RTOs, is a loss of funding should students decide to study elsewhere.

OTEN's Online Learning Systems

The rapid growth of the Internet coupled with the massive influence of social media has enabled OTEN to transition from what was essentially a correspondence school to an institution that offers online multimedia and interactive support for prospective and current students using such technologies as Moodle, Equella and Adobe Connect. This has enabled OTEN to increase its enrolments from 35,813 in 2006 to 118,060 in 2014. Students are attracted to OTEN by the flexibility of the study arrangements, the support of well-qualified and industry-focussed teachers and the ability to become members of online learning communities through the use of social media platforms such as YouTube, Facebook and Twitter. All of these information and communication technologies (ICTs), plus the innovative teaching and learning strategies developed by OTEN, put the learner right at the centre

of the learning experience. By constantly monitoring students' aspirations and circumstances and its operations, OTEN is able to see what new proprietary products and learning tools are needed to ensure that it remains the provider of choice.

In 2012, OTEN redeveloped its website to incorporate features such as Live Chat and an interactive world map showing how many people are accessing the online learning system. Its delivery of real-time experiences for students has resulted in even more students accessing the site, sharing resources, discussing content and supporting one another in their educational journeys. OTEN recognises that it is now dealing with a new, technologically savvy breed of learners who expect instantaneous means of learning and communicating and a sense of belonging to the online community.

The OTEN website claims: "You'll receive outstanding student support as you work towards your career-relevant, accredited qualification." OTEN backs this statement up with its 24/7 purpose-designed Online Learning Support (OLS) website, the students' gateway to learning. Accessible by mobile devices as well as PCs and tablets, this one-stop shop serves students' needs by enabling them to enrol and register/update all their personal details; access and send emails; access all the study and support materials they need, including study tips, quizzes, FAQs and links to useful sites; make use of an on-demand YourTutor service; submit and receive assessments and feedback on their assignments; contact their teaching sections to check on their progress; and join online forums. The OLS also enables offsite teachers to access student assignments, marking guides and other relevant resources anywhere at any time. Forty per cent of student assignments are now submitted via the OLS, thus ensuring a faster turnaround time for assignment marking, which is important for students studying by distance. Every month, students submit more than 8,000 assessments via the OLS and complete more than 4,000 assessments online.

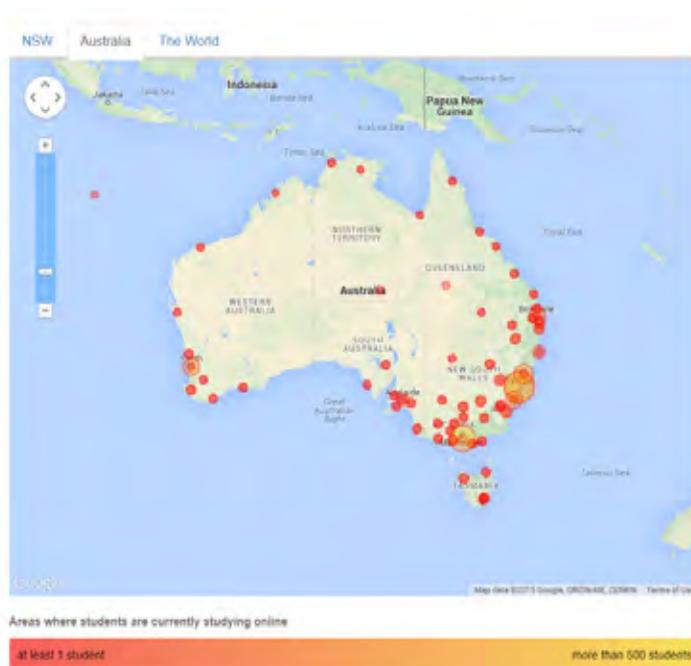


Figure 1: OTEN students' locations in Australia
(Source: <http://oten.tafensw.edu.au/about/whos-online>)

OTEN also uses virtual classroom and conference tools to conduct live orientation sessions and tutorials for students. These are recorded so that students can access them from the OLS whenever it suits them. A visit to the OTEN website will show that on a typical day, 4,450–5,000 students will have studied online using the OLS system in the previous 24 hours.

The Student Administration and Management System (SAM) enables OTEN to efficiently manage its distance students and on-campus and offsite teachers. It provides a comprehensive, auditable event and contact history for every student and manages the dispatch of well over 300,000 learning resource items per year.

Another OTEN custom-designed online tool is Your Decision, which helps prospective students assess whether distance learning is suited to their needs and circumstances. This interactive platform features videos, course tasters and self-reflection tools and enables people to sample short courses in the form of Massive Open Online Courses (MOOCs).³

To ensure the all-important human touch in managing large volumes of students while providing highly individualised and learner-centred approaches, a system of help desks provides telephone, email and Web support. The help desk network runs on a continuous roster of full- and part-time staff for 50 weeks of the year with extended business hours to ensure that there is a qualified person to respond to student needs Monday to Saturday. There are 43 specialist teaching section help desks providing counselling, mentoring, advice and information.

OTEN assessment procedures are in accordance with the national AQF Framework principles and have been developed to be applicable to online and distance learning, including online assessment by Adobe Connect sessions, telephone and video as well as assignments, work-based projects and end of unit tests. Most learners are assessed by a combination of the above. OTEN is also able to offer facilities to administer and supervise examinations.

Mix + Match®

Recognising that they are operating in a competitive VET training market, TAFE NSW – Western Sydney and OTEN continue to ensure that they stay one step ahead. Market research undertaken by the Institute’s Marketing Unit revealed significant levels of interest among prospective students in being able to choose between modes of study (online, distance, face-to-face or workplace-based) in units and electives, and for skills and knowledge gained through previous learning and life and work experience to be recognised. It was clear that “one size does not fit all,” so TAFE NSW – Western Sydney and OTEN developed a new initiative, trademarked mix + match®, to customise the range of qualifications and units of study to better suit the needs and circumstances of individuals and people who may not otherwise have been willing or able to study.

Mix + match® was needed not only to empower the customers but also to encourage the staff to re-examine their courses and services through the eyes of the learners or potential learners. Trial mix + match® programmes were produced in certain areas to demonstrate to staff how the principles and methods can be

³ Headstart into Health is an introductory course into the vocations of Audiometry, Dental Assisting, Optical Dispensing, Sterilisation and Practice Management. See <https://www.youtube.com/watch?v=-vOtzo3xviM&feature=youtu.be>

applied across the different disciplines to offer greater choices in what, how, when and where to study. The underpinning principles in the resulting mix + match® programmes are:

- Recognition of prior learning (formal, non-formal, life-skills, work-based, etc.).
- Flexibility in regard to time of enrolment, rate of study and completion dates.
- Choice in delivery mode, teaching and learning models, assessment methods, and place and nature of delivery and assessment.
- Quality and relevance in learning resources, including learner and technology support.
- Individual management of learner progress.
- Instructional design enabling faster course completion.
- Use of learning and business models that are customer-responsive, sustainable, scalable, simple and easy for all stakeholders to understand.

Subsequent research involving 5,000 TAFE NSW – Western Sydney and OTEN students resulted in 74 per cent of the respondents indicating a strong interest in the mix + match® approach.

Partnering with SEEK Learning

Getting the technology right has undoubtedly been an important factor in ensuring that OTEN meets students', employers' and other stakeholders' needs, but what really put OTEN on an upward trajectory was the decision to form a partnership with SEEK Learning (SKL).⁴

SKL is a wholly owned subsidiary of the Australian and New Zealand employment website SEEK Ltd and part of SEEK Education, a course aggregator service that specialises in connecting adult Australians with career-related education (primarily online-based courses) and has a strong brand and high visibility. SKL partners with 22 Australian education providers to offer learners access to more than 350 flexible, nationally recognised online courses in education, building and construction, design, IT, community services, business and accounting, health, and marketing. Specially trained SKL “learning consultants” help prospective students align course options with their career goals and personal circumstances and assist with their enrolment. Since 2004, SKL has enrolled well over 200,000 students. All OTEN courses on offer are marketed through the SKL website, which hosts around 70 per cent of all jobs on Australia’s major job sites and receives 13.7 million visits a month. In any given month, more than 150,000 job advertisements are posted on this website. This gives OTEN enormous exposure.

With OTEN’s well-established reputation and systems for delivering quality online and distance vocational and education programmes and SKL’s marketing abilities, well-established sales channels and capacity to help potential students navigate the confusing and often fragmented information surrounding options for studying online, this was seen as an ideal partnership and means of expanding

4 www.seeklearning.com.au

OTEN's business. OTEN and SKL managers and staff collaborate to ensure that potential students receive exactly the information, advice and support that they need to make the right decisions and receive a premium learning product and service. The partnership has also resulted in identifying new needs and in OTEN developing new courses to meet specific skills shortages.

The learners can "fast-track" through courses should they so wish. OTEN even introduced a "Fast Track On-Track" campaign called "All I want for Christmas is my Testamur" for those students who were close to completion and keen to "get over the line." The students who completed their qualifications before Christmas were entered into a draw for prizes donated by industry.

Service-level standards in regard to enrolments, learner support, turnaround times for assignment assessment and so on are incorporated in the agreement between OTEN and SKL to ensure a quality learning experience for all students and are continually monitored to ensure compliance. Much of OTEN's increase in enrolments, profile and access to the lucrative Australian job-seeking market is attributable to this partnership, which to date has enabled more than 50,000 students to upgrade their knowledge, skills and qualifications. OTEN has gone on to create other beneficial partnerships with industry which have not only further increased OTEN's enrolments but also helped to offer OTEN's students more authentic learning experiences.

Access and Equity

OTEN is acutely aware of its social responsibilities. It is the sole national distance provider of the Language, Literacy and Numeracy Program funded by the Federal Department of Education, Employment and Workplace Relations. By improving their language, literacy and numeracy skills, students are better equipped to gain employment or access further vocational study. OTEN's Outreach Youth Equity teaching area (a physical location) offers an entry-level Work Skills Course Outreach Certificate 1 in Access to Work and Training for young people, women returning to the workforce, mature students, people with disabilities and others who want to get back into education and employment.

One in four of Australia's 22 million people were born overseas, and OTEN works to ensure that VET courses and services reach out to multicultural communities and refugee groups. One of its blended learning courses is the Skilled Migration Internship Programme – Accounting, a nationally recognised 44-week programme for students from overseas backgrounds designed to enhance their language and communication skills and understanding of the Australian workplace culture and practices. This programme includes a minimum 12-week work-placement component. To date, 902 students have enrolled in this programme with a completion rate of over 90 per cent.

It is critical that claims made by OTEN in marketing and branding can be substantiated. The website states: "OTEN is committed to providing high quality service and support to people with disability." Students with disabilities may be eligible for a fee exemption or concession fee, and OTEN's Disability Support Unit's teacher consultants are on hand and online to help disabled learners with enrolment course advice; assist them with learning materials and strategies for study and time management; and organise special arrangements for examinations

and assignments such as extra time, rest breaks, readers or writers, and Auslan (sign language) interpretation. This unit will also lend students text-to-speech or voice recognition software, adaptive devices to assist with access to learning environments and course materials in a range of formats. In these ways OTEN is able to prove that it is open to students who are blind or visually impaired, or deaf or hearing impaired; have intellectual and learning disabilities, or neurological or acquired brain injury; or are suffering from mental or physical and chronic illness.

OTEN's Community Services section works with Youth Off The Streets, a non-denominational community organisation that helps young people aged 12–25 who are facing challenges of homelessness, drug and alcohol dependency, exclusion from school, neglect and abuse. To help the volunteer trainers in this programme, OTEN has developed a Certificate IV in Youth Work which was developed in partnership with Youth Off The Streets and combines distance education and monthly classes at OTEN. The programme is monitored by Youth Off The Streets staff and reviewed in consultation with OTEN teachers for relevance and effectiveness. No educational entry requirements or experience are needed to enrol in the certificate programme. Among his other qualifications, Father Riley, the CEO of Youth Off The Streets, holds a Diploma of Aboriginal Studies and Certificate IV in Alcohol and Other Drugs, both acquired through OTEN.

Meeting the Challenges

The picture painted so far could well be considered as glossing over the painstaking efforts required to achieve the level of success OTEN has reached. This section sets the record straight by reflecting on some of the major challenges that OTEN has had to overcome.

Compared to many countries, Australia has relatively few unemployed young people (Trading Economics, 2016) and its education system and labour market offer diverse, accessible and flexible pathways from school to work and further learning. However, there is always room for improvement through a focus on quality teaching, supportive learning environments and effective links to work and further learning. So, rather than remaining steadily on course and accepting minimal gains in enrolments and market share, OTEN made some pivotal decisions about its future directions based on environmental scanning.

Course Completion Rates

A globally recognised problem with online and distance learning is the low levels of student completion rates. OTEN was challenged to minimise the possibility of this in order to increase students' employability and/or further education aspirations and attract new students and advocates to its system. An equally important consideration was that in a contestable VET model, revenue is directly linked to high completion rates.

OTEN set achievable targets and established a project team to work with the various teaching sections to secure better completion outcomes. In so doing, it bore in mind Aragon and Johnson's (2008) observation that communication is the key to engaging distance and online learners and increasing completion rates, particularly in regard to advice prior to enrolment and regular contact

and feedback from teachers; Visser et al.'s (2002) advice on the importance of motivational communiqués on student engagement and participation; and Betts's (2009) advice on the merits of using multiple technologies to suit learners' various needs. To further identify ways of improving student outcomes, research was carried out into OTEN's completion rates to identify areas that needed to be improved in order to achieve higher student motivation and retention rates. OTEN found that the two critical factors were whether the students connected with the content and whether the instructional design and materials supported them in their learning journey.

The consequent Course Completions Project focussed on developing and implementing best practices to increase student participation and course completion rates across OTEN's range of programmes and courses. Some of the strategies adopted were generic and applicable across all teaching sections while others were specific to certain sections. Completion reporting tools were also developed to provide data on course completions and a basis for benchmarking.

An e-Correspondence system was developed to maintain communication with the students throughout their studies. Whenever students submit assignments, the system automatically sends them an email of encouragement. If a student is identified as not having completed an assignment within a set time frame, the system not only sends out an automated reminder but also prompts the student about the support tools available. If necessary, staff follow up with personal phone calls.

The need to be responsive to students' concerns has led staff to make use of social media platforms such as YouTube, Facebook, Instagram and Twitter. This enables online and distance students to join mutually supportive online communities. OTEN's Learning Support and Student Management Systems also enable highly personalised tracking of and support for students whether they are studying at a distance, on campus or through blended learning.

During the period 2011–2014, there was a 46 per cent increase in student enrolments at OTEN. With the implementation of the described multifaceted approach to completions, the Course Completions Project has resulted in continued improvement in the number of completed students. The period 2011–2014 realised an 87 per cent increase in course completions. Between 2008 and 2014, OTEN's average unit completion rate was 62 per cent.

Quality in Instructional Design

In terms of assuring quality and relevance in instructional and courseware design, OTEN undertook a "Looking Over, Looking Forward" comprehensive review of all current online resources to identify exemplars that could inform future learning design. In judging the courses and courseware, questions were set in regard to four criteria: performance outcomes, assessment, learning strategies and learning resources. This review identified the key elements that would guide the design of courseware templates and also unearthed previously unidentified but extremely useful small-scale innovations that were being used in isolation. OTEN's learning design team also conducted focus groups by such means as the Adobe Connect Web conferencing tool to try to discover what works well for students. The findings and ideas garnered from these studies were shared with

all OTEN staff in five forums designed to showcase best practices in teaching, learning and resource creation, and to share ideas and achieve a collaborative, cross-institutional approach to reform. To ensure consistency in course design and content scaffolding, templates applicable to the majority of OTEN courses were then rolled out for the OTEN Moodle platform, html and ePub formats, online marking tools and Adobe Connect Web conferencing. The learning sequences embody a task-based approach, requiring learners to apply knowledge and skills rather than simply absorb facts.

Strategic Planning

OTEN is acutely aware that it must continually align its training with the current and future skills needs of the Australian workforce. It is predicted that in the future, high-skilled jobs will grow at around 1.6 times the rate of low-skilled jobs in a wide range of industries, and OTEN needs to find ways of continually raising the levels of its qualifications. Other challenges facing OTEN include increasing its competitive edge, demonstrating quality, encouraging and supporting TAFE NSW – Western Sydney staff through effective leadership during times of major transition, improving business acumen, forming new partnerships, succession planning, and attracting and maintaining staff who perform at a high standard.

As the distance provider and online centre of TAFE NSW – Western Sydney, OTEN supports the strategic planning for the realisation of the NSW TAFE Commission's Statement of Owner Expectations (TAFE, 2013) and the TAFE NSW Strategic Vision, framed by the NSW 2021: A Plan to Make NSW Number One (NSW, 2013) initiative. It is also expected to meet the goals of the Department of Regional Development, Skills and Small Business and the NSW government's Smart and Skilled expectations which advocate that VET be the backbone of the NSW training system, set the benchmark for quality, play a critical role in meeting the government's economic priorities, operate responsibly within the current challenging fiscal environment and compete with private and community training providers for contestable government training funds (which means new funding and pricing arrangements for VET services).

TAFE NSW enjoys strong brand recognition, market penetration and widespread personal experience of its services within the NSW community, but there is still seen to be a need for its VET Institutes to transform and become even more responsive and flexible in making a wide choice of courses accessible across the state to meet the skills demands of enterprises and economic and social needs of communities.

TAFE NSW – Western Sydney and OTEN have adopted an integrated approach to strategic planning, linking every aspect of business planning, performance management, governance and reporting to the overall vision, mission and goals, both at the Institute level and the departmental and programme levels. The central goals encompass educational and service excellence; leading-edge and competitive products and services; connections with industry and the local community; and delivery of skills for the future. To achieve these goals, TAFE NSW – Western Sydney and OTEN conduct extensive external research into the VET market and customer expectations to ensure that all of its operations are underpinned by the productivity, participation and broad social inclusion imperatives that underpin

its values. To implement the strategic plan, the TAFE NSW – Western Sydney Board annually identifies a range of strategically significant projects that will help take the Institute forward. Each of these projects is then sponsored by a Board member and involves the expertise of a range of staff from across the Institute. Care is taken to ensure that TAFE NSW – Western Sydney staff have a sense of ownership in regard to the strategic directions by providing them with access to an interactive online plan that outlines the nature and goals of priority projects occurring across the Institute, how they are progressing, and how each unit and person is contributing to their realisation.

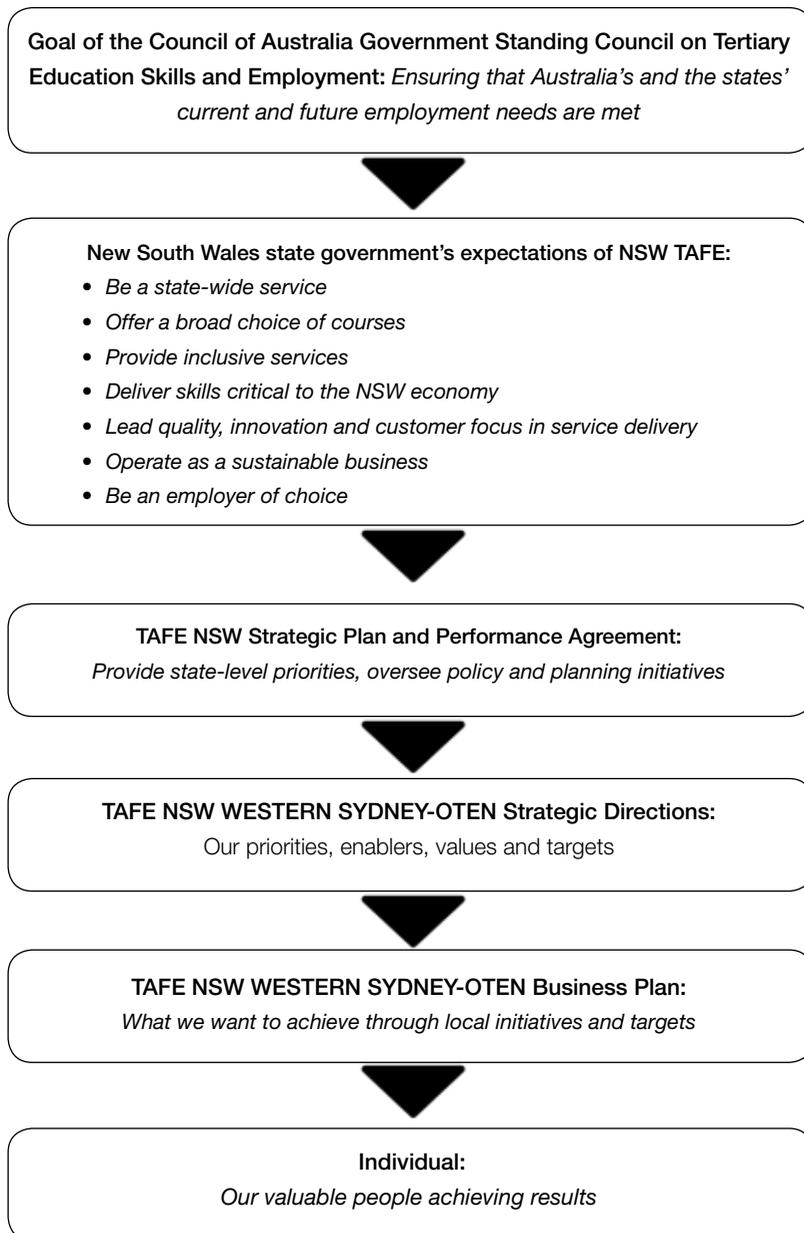


Figure 2: The TAFE NSW Western Sydney-OTEN Strategic Planning Process

Where to from Here?

OTEN's vision is simple: to remain the leader. One strategy involves expanding farther into the international market. According to Deloitte (2014), the competitiveness of Australia depends upon how quickly and efficiently companies can innovate and adapt to the needs of customers in new markets and the changing economic landscape, especially in the growth markets of Asia where prosperity will offer a raft of opportunities for those who move first. There are clearly market opportunities for OTEN here.

The world of work is changing at a faster and more dramatic pace than ever before. In Australia, as in other developed countries, there is a “hollowing-out” in the structure of the workforce, with rapid growth in high-skilled occupations, solid growth in some of the low-skilled occupations and a relative decline in the middle. There will also be a growth in non-routine occupations — creative, cognitive and manual — and so there will be a need for niche training. One consequence of this will be OTEN having to move beyond the traditional training model characterised by lengthy linear study for formal qualifications involving compulsory subjects that are often not needed by learners to short skills sets that enable learners to select relevant units from an array of qualifications that will meet both individual and industry demands. With many low-skilled occupations expected to disappear in favour of highly skilled occupations and the high correlation between higher-level qualifications and increased salary expectations (Business Council of Australia, 2013), OTEN will also need to consider providing learning pathways to degree study. Above all, OTEN will need to continue to grow and thrive through innovation and foresight and provide exceptional learning experiences for the VET students.

External Benchmarking and Recognition in 2016

At the 2016 NSW Training Awards, it was announced by the Hon. John Barilaro MP, Minister for Regional Development, Minister for Skills and Minister for Small Business, that OTEN was the winner of the 2016 NSW Large Training Provider of the Year award. TAFE NSW Western Sydney Institute Director, Robin Shreeve, graciously accepted the prestigious award, acknowledging and thanking the dedicated staff at OTEN for their contribution to the organisation's success.

I would like to thank the following for their contribution to this chapter:

- Cecelia Cilesio, Director of Education, Information Technology, Creative Industries and OTEN, TAFE NSW – Western Sydney
- Francesca Saccaro, Associate Director, Organisational Capability and OTEN, TAFE NSW – Western Sydney

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Sri Lanka: TVET and ICTs

Janaka Jayalath

Sri Lanka and the TVET Sector

Following a series of natural disasters and periods of conflict in Sri Lanka (known as Ceylon until 1972), the economy is experiencing robust annual growth, well above that of its regional peers, and the government is focusing on long-term strategic and structural development as it strives for Sri Lanka to become an upper-middle-income country. Twenty-five per cent of the population are aged 14 or under and 12.4 per cent are aged 60 or over, leaving a working age (15–59 years) population of around 13 million. Overall, unemployment is low, at 4 per cent, but around 18 per cent of youth (15–24 years) are unemployed and the female labour force participation rate is only 30 per cent.

Sri Lanka has met the Millennium Development Goal (MDG) target of halving extreme poverty — the proportion of people living below the poverty line declined sharply from 26.1 per cent in 1990/01 to 8.9 per cent in 2009/10 — and is on track to meet most of the other MDGs, outperforming other South Asian countries. It has achieved the targets related to universal primary education and gender equality, is on course to meet the goals of maternal health and HIV/AIDS and has been extraordinarily successful in reducing child mortality, but is still working towards overcoming urban malnutrition. It was an early achiever on indicators of protected areas, ozone-depleting substance consumption, safe drinking water and basic sanitation, but it is sluggish or has actually slipped back on forest cover and CO₂ emissions.

Sri Lanka has high literacy rates and a well-established policy of free education that has put the country in a strong position to benefit from the emerging global knowledge-based economy. The government's economic and social development framework aims for accelerated growth, sustainable development throughout the country and the creation of a knowledge-based economy.

In this context, Sri Lanka has identified the need for reforms, systems and incentives to ensure that education and training meet future labour market demands. Nearly 50 per cent of students completing higher education qualify in technical and business disciplines, and according to SLASSCOM (2014), the Sri Lankan business climate is rapidly catching up with that of the BRICS.¹

Sri Lanka has recently experienced a boom in the use and availability of broadband services, largely due to the high rate of adoption of third-generation (3G) mobile technologies, a trend typical of many other South Asian countries lacking access to widespread copper last-mile connectivity and therefore reliant on wireless networks.

Sir John Daniel, former President of the Commonwealth of Learning (COL), has commended Sri Lanka for its commitment to building an integrated system of Technical and Vocational Education and Training (TVET) (Daniel, Alluri and Mallet, 2008). One of the principal architects of the Sri Lankan TVET system has been the Ministry of Youth Affairs and Skills Development (MYASD), which has overall responsibility for formulating national policies and implementing youth development programmes. MYASD encompasses 16 statutory bodies, including:

- The Tertiary and Vocational Education Commission (TVEC), which engages in policy development, planning, co-ordination and the development of tertiary and vocational education at all levels. It is responsible for the national system of granting TVET awards and maintaining academic and training standards in institutes, agencies and all other establishments providing tertiary and vocational education.
- The University of Vocational Technology (UNIVOTEC),² which delivers 12 degree programmes, including a Bachelor of Education in Technology (BED Tech) for teachers in the TVET sector; short-term training courses for TVET trainers and assessors; and curriculum, teaching and learning resources for TVET courses.
- The Department of Technical Education and Training (DTET), which runs 38 technical colleges in all nine provinces and offers certificate and diploma courses in the technical education streams.
- The Vocational Training Authority (VTA), which provides skills training for rural youth through a network of four National Vocational Training Institutes (NVTIs) and 14 District Vocational Training Centres (DVTCS) and around 210 Rural Vocational Training Centres (RVTCs).
- The National Apprenticeship and Industrial Training Authority (NAITA), which conducts island-wide training programmes for small-, medium- and large-scale enterprises and is responsible for the development and assessment of competency standards for the industrial training of TVET students.
- The Ceylon-German Technical Training Institute (CGTTI), which is the foremost institute in Sri Lanka for the training of skilled technicians in the field of automobile engineering and allied trades.

1 The five major emerging national economies: Brazil, Russia, India, China and South Africa.

2 www.univotec.ac.lk

- The National Youth Services Council (NYSC), which provides youth programmes and TVET courses related to developing creative, artistic, technical and leadership skills in youth located mainly at district centres and rural centres in all 25 districts island wide.
- The National Institute of Fisheries and Nautical Engineering (NIFNE), which provides certificate and diploma courses for the marine and fishing industries and is poised to be upgraded to the Ocean University by an act of Parliament.

The formal TVET sector comprises about 635 public sector training centres and 718 private and NGO training centres. A large number of non-formal TVET providers also provide training in IT on a fee-for-service basis, and there is a widespread network of non-fee-levying institutions that are funded by various national and international charities. These providers educate people of all ages — from secondary school leavers to working adults, parents and others who have suspended their education for various reasons and need training or retraining. Unemployment is especially high among young people in the rural areas, and training is essential not only to help them improve their employment prospects but also to give them access to self-employment opportunities.

The private sector is already heavily taxed, which would make the imposition of training levies difficult. Moreover, skills training is most needed by the underprivileged in society who could never afford to pay for their training, and therefore, much of the training is provided free of charge, together with a daily allowance. Some public training institutions charge fees for high-demand courses, such as computing, but the state TVET sector depends heavily on treasury funds, donors and other sources of funding.

TVEC, in association with the Skills Development Project (SDP) and with funding from the Asian Development Bank (ADB), developed the National Vocational Qualifications (NVQ) framework and National Competency Standards (NCS) in consultation with industry. The curricula, trainer guides, trainee guides and assessment resources are all based on these standards. Assessments are competency-based and the system is benchmarked against qualification systems in developed countries. There are two routes to obtaining NVQ certificates: candidates can prove their ability with adequate evidence of their competencies pertaining to qualifications stipulated in the NCS, or they can follow a Competency Based Training (CBT) course relevant to the qualification accredited by TVEC. The public institutions conducting these CBT courses are NAITA, VTA, NYSC and the technical colleges of the DTET. Private and NGO sector institutions that have been accredited are entitled to issue NVQ certificates. The operational guidelines for the implementation of NVQ certification, describing the various qualification levels, learning processes and requirements, have been compiled by TVEC in collaboration with UNIVOTEC, DTET, NAITA, VTA and NYSC. TVEC has a regulatory role in the TVET sector, developing and implementing a quality assurance system. Assessments are conducted by licensed assessors hired by the accredited training centres. They examine the trainees' progress reports, practical and theoretical examination results, and other relevant documentation before admitting them to the NVQ assessments.

As indicated above, NVQ certificates can also be acquired without completing a formal competency-based course. Authorised training providers such as NAITA and other authorised NVQ-accredited vocational training centres can conduct an NVQ assessment through the Recognition of Prior Learning (RPL) process. RPL can take the form of informal workplace learning and life experience; self-directed study; informal, uncertificated and undocumented learning; formal, uncertified learning; in-service training; community-based learning; open or distance learning; or overseas education, training or work experience. Once the relevant information has been updated in the online system, the NVQ certificate is issued by TVEC. In the event of failure to demonstrate the required competencies, the candidates are informed about any shortcomings and advised on how to upgrade their skills in order to be reassessed and awarded an NVQ certificate.

The Distance Education Modernisation Project

The use of distance learning, blended learning and eLearning is becoming more popular in Sri Lanka, and wider use of these methods makes it possible to ensure equal opportunities for initial and further training for all, regardless of place of residence or social and economic status. The catalyst for all this was the Distance Education Modernisation Project (DEMP), which was initiated by the Open University of Sri Lanka (OUSL) in 2003 and aided by the ADB. The DEMP was created to establish a sustainable system of distance education and develop and deploy information and communication technologies (ICTs) to increase access to post-secondary education and improve the quality and relevance of the teaching and learning in specific institutions. With these objectives in mind, the DEMP initiated four projects: the Open University of Sri Lanka Capacity-Enhancement Project (OUSL-CE), Distance Education Partnership Programme (DEPP), Public Private Partnership Programme (PPP) and National Online Distance Education Service (NODES)³ and Network Access Centres (NACs).

A capacity-enhancement wiki was used as the support mechanism for the OUSL-CE initiatives. The DEPP programme was concerned with the development of a distance education model, the design and development of online courses, capacity building in partner organisations, training for tutors and mentors and marketing and administrative systems in the institutions. The PPP was intended to encourage public and private post-secondary educational institutions that had many students and had been in operation for a certain time to apply for grants to initiate or expand online distance education programmes in an effort to increase enrolment in bona fide diploma and degree courses. Around 2006, Internet facilities were largely limited to the capital Colombo and its environs on the west coast and major towns like Kandy and Galle; only 10 per cent of households had computers, and computer literacy and Internet usage were still relatively low. Therefore, in partnership with the Ministry of Higher Education, the NODES and NACs component of the project was concerned with developing the infrastructure to support access to post-secondary education countrywide. NODES is both the means of delivering ODL throughout the country and the provider of expertise and facilities for curriculum development through its Content Development Unit (CDU). At the time of writing, it was facilitating e-examinations for the Institute of Chartered Accountants of Sri Lanka and had just provided training in e-journalism

3 <http://nenasa.ou.ac.lk>

for 1,000 regional journalists, 400 schoolchildren and 200 teachers. All the NACs are equipped with high-speed Internet access, computers with multimedia capability, video conferencing and Web TV facilities, and software and hardware peripherals. In 2012, there were 26 NACs operating in an island-wide network funded by the ADB.

In 2002, the University of Colombo School of Computing (UCSC) established the National eLearning Centre (NeLC). This was designed to promote and support teaching, learning, research and evaluation in parallel with the government's e-Sri Lanka national development initiative which had the objective of using ICTs to foster social integration, peace, economic growth and poverty reduction. The NeLC has developed online programmes in English and Sinhalese in ICTs, language learning, e-governance and entrepreneurship, and student projects on providing safe drinking water, floriculture and healthy eating. The NeLC website⁴ also gives registered students access to classes in the UCSC Bachelor of Information Technology, Foundation in Information Technology, Certified Computer Assistant and Certified Computer User courses and NAITA Certification courses. The Foundation in Information Technology and Bachelor of Information Technology (BIT) programmes were particularly popular. From the beginning of BIT, the use of ICTs to deliver the programme was given special consideration in order to provide students with first-hand experience of the uses of ICTs.

Assuring Quality in eLearning

The TVEC is responsible for quality assurance (QA) of TVET programmes according to the requirements of the development plans, industry, learners and other stakeholders. Its main responsibilities in QA are:

- Registration of TVET centres.
- Accreditation of courses.
- Installation of the Quality Management System (QMS).
- Institutional quality audits.

After receiving the completed applications from potential TVET providers together with all the required supporting documents, the TVEC officials visit the training institutions to conduct onsite evaluations of the:

- Curriculum and course material.
- Training delivery and assessment.
- Qualifications, experience and pedagogical skills of the staff.
- Logistics and training facilities.
- Management and record maintenance.
- Student welfare and support services.

Satisfactory evaluation reports lead to accreditation. If inadequacies are found during the inspections, applications are rejected and the reasons for their rejection are explained to the aspiring providers who can then reapply for registration after the necessary corrective actions have been taken and a re-evaluation fee has been paid.

4 www.e-learning.lk/vle

The delivery of TVET courses through distance learning, blended learning and eLearning makes it possible to ensure equality in providing continuous further training for all people, regardless of their place of residence or social or economic status. However, it was also seen as important to assure quality in these eLearning programmes. TVEC has therefore developed QA standards for eLearning in consultation with public and private sector training organisations, industry and other stakeholders. TVEC is one of the 247 UNEVOC Centres in 167 Member States that link with the UNESCO-UNEVOC International Centre in Bonn and was thus able to also consult with international TVET providers in this project. Its QA model was developed in line with the European eLearning Capacity Building (ECB) low-cost, community-based certification system (Ehlers, 2010). The associated training on eLearning development and implementation and the ECB quality check was provided by GIZ (formerly InWent) in Germany.

The eLearning QA criteria evaluate:

- Information about and organisation of the programme.
- Target audience orientation.
- Quality of content.
- Programme/course design.
- Media design.
- Technology.
- Evaluation and review.

Adherence to the TVEC Quality Standards for e-Learning is now a requirement for all public, private and NGO training centres wishing to offer online or blended TVET courses. They must ensure that these courses meet the agreed specifications, are delivered on time and within the approved budgets and are managed appropriately. Special efforts are also made to ensure the sustainability of the courses, learning platforms, learning software, eLearning materials development, instructional design and tutors' skills.

TVEC has adhered to ISO 9001:2008 and has started to work towards achieving ISO 9001:2015 certification by meeting the requirements for a quality management system that demonstrates the system's ability to consistently provide products and services that meet customer and applicable regulatory requirements.

Online National Careers Guidance and Counselling

With the NODES and other ICTs in place, a top priority was seen to be the establishment of an online national Careers Guidance and Counselling (CG & C) system serving the TVET and school sectors.

Sri Lanka has been successful in embedding social protection measures in its economic policies, resulting in high human development indicator rankings, but it has been far less successful at generating productive employment for its youth. While the overall unemployment rate was around 4.3 per cent in 2014, unemployment among young men and women remained significantly high, hovering around 18–19 per cent.

It was clear that Sri Lanka's labour market was characterised by a skills mismatch, but the reasons for young men and women being disconnected from both the labour market and opportunities that promote future employability were complex. Lack of jobs, training and information are the obvious reasons. But other factors can come into play. Young people may not fully understand the demands of the world of work, may have misperceptions about occupations, or may lack the knowledge or confidence to move out of their comfort zones and therefore be left behind and unable to realise their potential. Some may have negative attitudes towards work, lack motivation and relevant or marketable skills, or have poor personal presentational skills, grooming or personal hygiene. As a top International Labour Organization (ILO) official states, one of the reasons youth unemployment is such a major issue in Sri Lanka is that many qualified youths may have the technical skills or appropriate academic qualifications for a job but lack the soft skills needed to convert their knowledge into something they can use in the workplace. This is more often an obstacle to many educated rural youth as they search for jobs, and many of Sri Lanka's youth have also grown up in an environment of war and conflict (Business Times, 2012).

The solution to inculcating these workplace-required attitudes and behaviours to help Sri Lankan youth transition into the world of work and stay in good jobs was seen to be the MYASD and TVEC co-developing a national Web-based CG & C system for the National Career Guidance and Counselling Centre and linking this to a network of careers guidance centres across the country. It was always recognised that while some of the socio-psychological matters identified could be addressed by the CG & C system, others might be beyond its scope and require more personal counselling. However, the overall aim of the CG & C system was to help individuals gain worthwhile employment that matched their training and qualifications and to help the country's economic development by providing information about training options and pathways for them to follow, whether as employees, in self-employment or overseas. The system had to be capable of enabling these individuals to assess their strengths and weaknesses and consider ways of developing their capacities for employment in their chosen fields. It also needed to give them ready access to information about local, national and overseas employment opportunities.

The CG & C operating model was therefore conceived as in Figure 1. The four essential requirements of the systems are shown in the centre of this diagram: services, community image, management/administration and physical appearance. These translate into a range of services and products as shown in the next circle. The two outermost circles represent the commitment and skills required by the staff; the institutions and stakeholders engaged in this system are noted in the box around the circle.

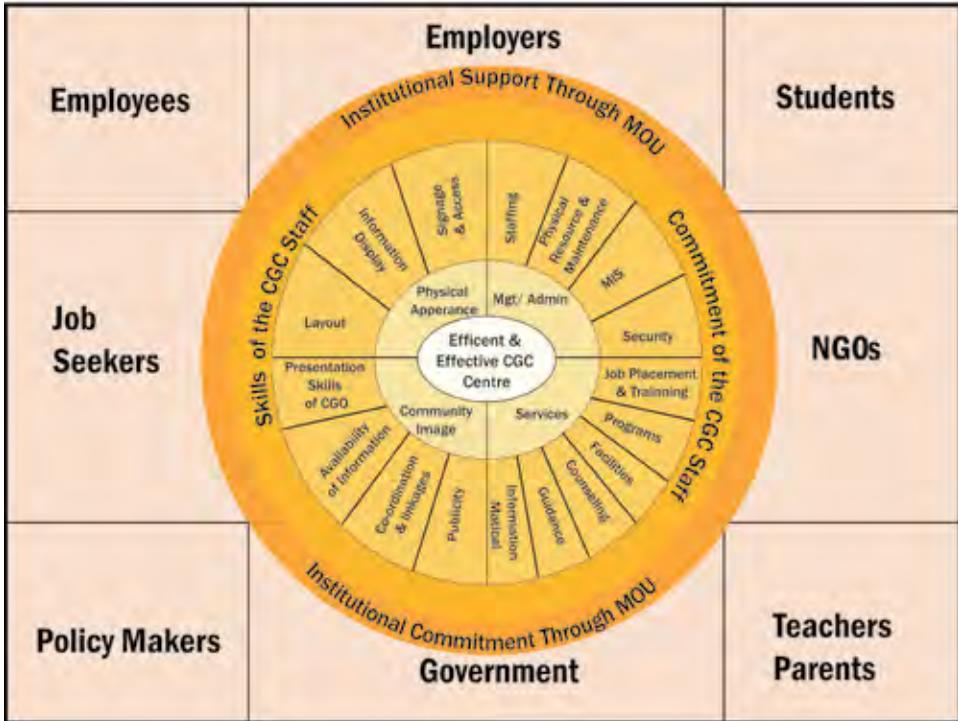


Figure 1: The CG & C operating model
(Source: Career Guidance and Counselling Operation Manual)

This ICT-enabled Career Guidance and Job Matching System⁵ is one of the efforts being made to raise awareness about the supply and demand of jobs within the local labour market. The project will improve access and strengthen the capacity of unified career guidance and labour market systems to match supply to demand for labour in Sri Lanka while attracting students for career guidance and counselling. In its pre-solution stage, ICTs were not adequately used in CG & C operations in the TVET sector. Therefore, this system is the first ICT-enabled Career Guidance and Job Matching System in the TVET sector in Sri Lanka.

The system is fully Web-based, hosted in a cloud environment and designed to support all three local language (Sinhalese, Tamil and English). Job openings and the skills/experience of potential employees are matched and combined into job-matching reports for both potential employees and employers. The system is open to both local and foreign job markets, with the potential to extend the service with email, SMS, postal system and the countrywide CG & C Centre network.

The system architecture, design and functions of the newly developed online CG & C system are shown in Figure 2.

⁵ www.youthjobs.lk

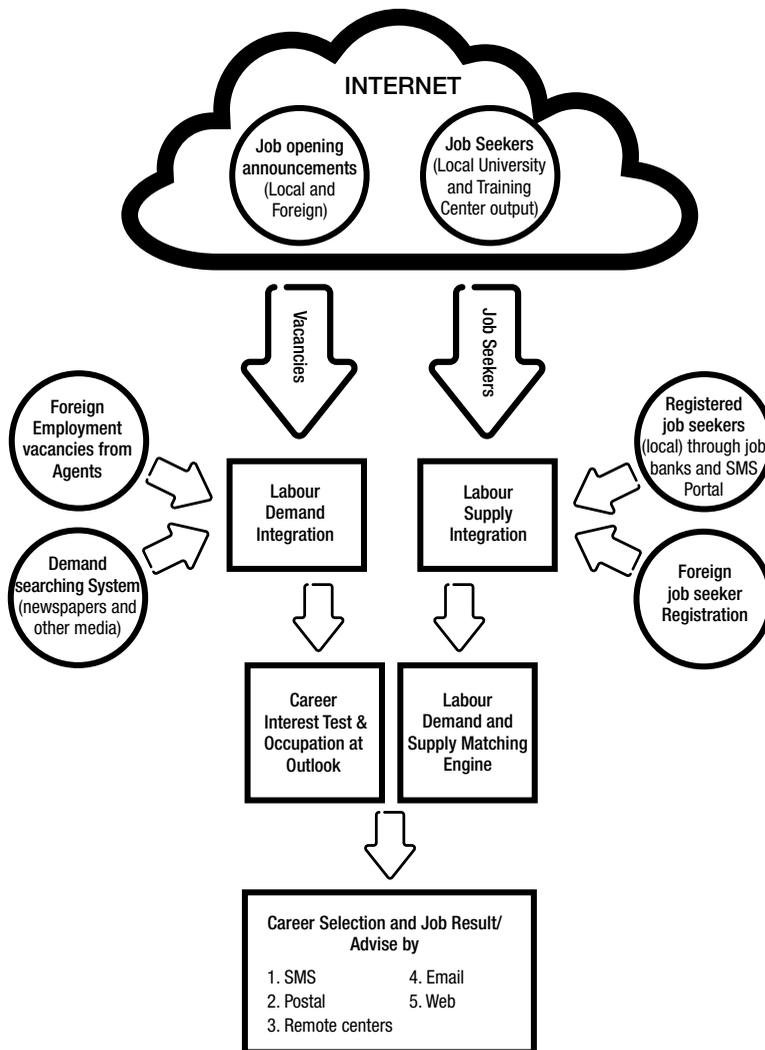


Figure 2: Online career guidance, job vacancies and job seekers matching system architecture
 (Source: System Architecture of Online CG and Job Vacancies, Job Seeker Matching Process)

Having logged in, there are various ways in which users can make use of this system. They can, for example, take the Career Interest Test to help them identify their particular interests and aspirations and find out what kinds of jobs and career paths they might be interested in. This test poses 63 questions regarding jobs and career options, and the users are asked to tick their preference from either group A or group B. If they are not sure about anything, they need to guess because they cannot leave anything unticked. Once they have answered all the questions, a bar graph will be automatically generated to show the scores for the seven main areas of interests. The two or three highest-scoring personal profiles indicate the kinds of jobs or careers that the user should considering exploring.



Figure 3: Screenshot of the online Career Interest Test page

Users can then click on the section providing information about the jobs and careers that match their particular interests and the required training, education or experience.

A CLASSIFICATION OF OCCUPATIONS BY INTEREST CATEGORIES

Listed below are many jobs and careers. They have been grouped into seven interest categories: Outdoor, Practical, Scientific, Creative, People Contact, Business, and Office.

To find the type of work you want, read through the different occupations in the job categories which match your interests.

As you will see, each category has been divided into four areas that indicate the training, education, or experience that each requires. The four areas are Degree/Diploma, Certificate, Trade, or Other (that is, jobs where experience may be important or where there are other qualifications).

Category	Jobs
OUTDOOR	Degree-Diploma Agricultural occupations * Civil engineer * Defence forces * Forester * Geographer * Geologist * Geophysicist * Health surveyor * Horticulture * Journalist * Marine scientist * Marine surveyor * Meteorologist * Naturalist * Pilot * Recreation officer * Surveyor * Telecommunications * Veterinary scientist
	Certificate Agricultural occupations * Ambulance work * Animal care * Builder * Health surveyor * Horticultural occupations * Landscape gardener * Mining occupations
	Trade Agricultural occupations * Boat building * Bricklaying * Building trades * Defence forces * Gardening * Green keeping * Merchant navy * Nurseryman/nurserywoman * Plant mechanics * Roof tiling * Shipbuilding * Signwriting * Stonemasonry * Wood processing occupations
	Other Agricultural occupations * Ambulance work * Animal attendant * Back hoe/Front end loader operator * Bricklayer's labourer * Builder's labourer * Bulldozer operator * Bus driver * Coach driver * Concrete worker * Courier * Crane operator * Dairy worker * Defence forces * Driving instructor * Farmer * Farmland * Fire fighter * Forester * Fruit picker * Furniture renovalist * Garbage collector * Groundsman/woman * Hire car driver * Horticultural occupations * Journalist * Merchant navy * Park ranger * Parking patrol officer * Photographer * Pilot * Postman/woman * Public transport occupations * Railway guard * Railway station assistant * Rigger and scaffolder * Rubbish renovalist * Security officer * Shearer * Steward/Stewardess * Taxi driver * Train driver * Veterinary nurse * Window cleaner * Wood processing occupations

Figure 4: Screenshot of the table of classification of occupations by interest categories

If they then wish to find out more about these jobs, users can continue onto Job Outlook and receive more detailed information about the nature of the work and working environment; the level of demand for employees in this field; the wages or salaries on offer; the education, training and experience needed; and links to further sources of information.



Figure 5: Screenshot of Job Outlooks search page

Users interested in following up on the formal courses that will enable them to qualify for the jobs and careers of their choice can then use the course guide to find suitable programmes among the range of TVEC-registered courses in the public and private TVET sector. They can make these searches by selecting their preferred province, field of study, qualification level or type of course.



Figure 6: Screenshot of online TVET Guide containing all TVET programme information

Users can then use the same system to enrol in the course of their choice by entering the course details and their personal details (including education and experience) and uploading their personal image file which is then stored in the system.

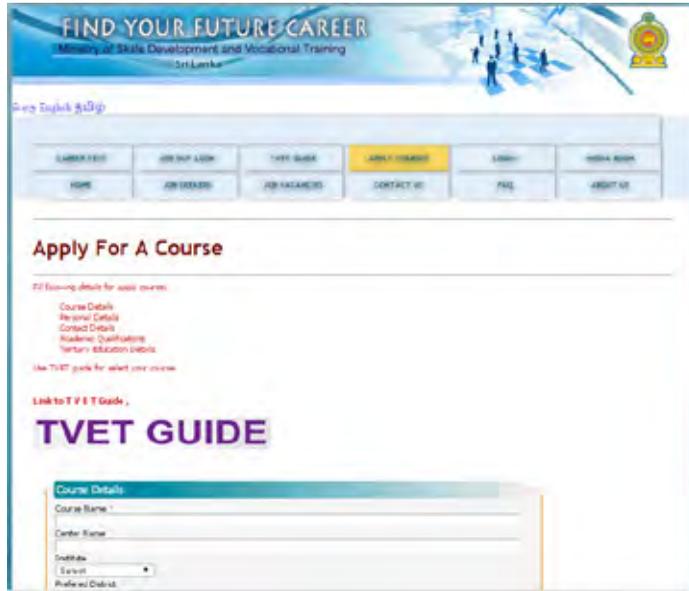


Figure 7: Screenshot of the Online Course Registration Application page

Students who have completed their studies can register for employment in this same system. They create a personal profile by describing their education, training and experience and stating their preferred job or career, location, terms of employment (e.g. contract, permanent, part-time) and wage or salary expectations, if they have not already done so.

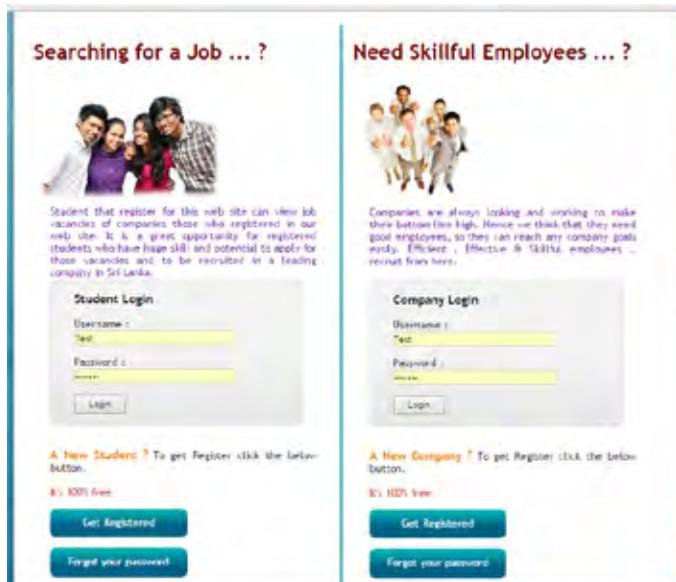


Figure 8: Screenshot of Job Seeker and Job Provider login page

Users can also use the online CG & C system to find out what jobs are available. Companies and employment agencies can publish their job vacancies in the system. There is a future requirement to introduce Web crawlers to search for and capture even more vacancy announcements from the Internet.



Figure 9: Screenshot of summary of job vacancies in various fields

The system allows the matching of job demand information with job seekers' CVs for the purposes of providing data to TVET providers, employers and other stakeholders and helping to generate statistical reports on system data and trends in vacancies and employment opportunities.



Figure 10: Screenshot of summary of job seekers in various fields

Users of the CG & C system have only to click on the Contact Us button and select the required province or district to have immediate access to a location map and all the necessary contact details.

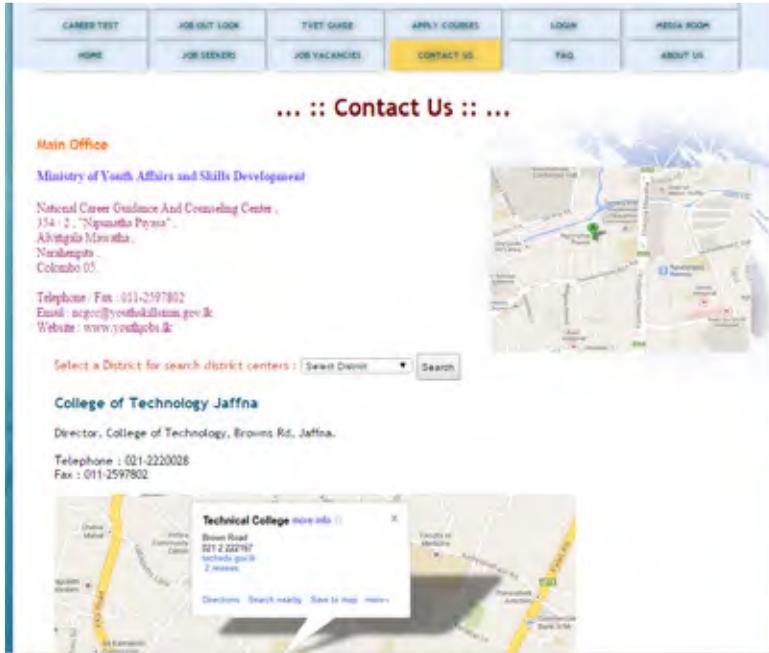


Figure 11: Screenshot of contact and geographic information on CG & C centres search page

The users can use an option in the CG & C system to describe their knowledge, skills, experience and qualifications when developing their CVs. This information can then be used for various automatic matching purposes. The classification system also serves other purposes. Employers can use it to develop job descriptions and job advertisements; organisations developing and/or awarding qualifications can use it to express learning outcomes in operational terms; educational and training providers can use it in planning and curriculum development and recognising foreign qualifications; and human resource managers and guidance officers can use it in connection with aptitude and ability tests.

The CG & C system is attached to the National Career Guidance and Counselling Centre. This in turn is linked online to 52 career guidance centres and via these centres serves about 1,000 public and private vocational training centres and 7,000 schools. All the staff involved in this network are specially trained to operate the system, which is hosted in a cloud computing facility to improve its accessibility, reliability and security. The intended users of this system are students and school leavers, TVET students and graduates, parents and teachers, unemployed young people and employees looking for better jobs, local government agencies, community groups and NGOs.

Each of these career guidance centres is equipped with ICT facilities to help the various users. Potential learners and job-seekers can use the computers and printers to prepare their letters, application forms and CVs; access the Internet to find information about courses, study options and employment opportunities; prepare for interviews and email and telephone enquiries; arrange for interviews; photocopy; watch educational, training and information videos; and attend information sessions and workshops. The general public is equally welcome to use

these facilities — the centres are regarded as open and free “one-stop shops” for communities.

The effectiveness of the centres depends to a large extent upon the relevancy and currency of their information services and materials. Some of these are supplied through the National Career Guidance and Counselling Centre, institutions, companies, etc., but the centres themselves are required to gather information on courses and jobs and ensure that they are locally as well as nationally relevant by trawling through sources such as local newspapers and disseminating information by SMS, email, telephone and the postal service as necessary.

The outputs from the different programmes are measured and the data collected by the National Centre for the purposes of monitoring and evaluation and network progress are considered in monthly meetings. The evidence shows that the CG & C system has many benefits. It has proved to be a turning point for addressing unemployment in TVET graduates in Sri Lanka. It provides a “connected” solution offering a range of services that together assist young people to make good transitions. It uses a multi-stakeholder approach which increases awareness, interest, support and usage of the system by the relevant parties in enabling unified career guidance and job matching. It is helping school dropouts and others to consider broader and more realistic career options and seek paths of study through the TVET system. It ensures equality of access for the vulnerable groups in society, including girls and women, it enables employers to find skilled employees free of charge, and it bridges the gap between the demand for and supply of human resources. The demands for its services are still increasing due to promotional activities within the TVET system.

Conclusion

The initiatives described above have improved access to TVET study and career options for many Sri Lankans. But more actions are needed to provide a comprehensive island-wide eLearning system in a country where the different population groups need to strive in the same direction to help the nation forward. As shown in this chapter, Sri Lanka has a comprehensive infrastructure for online TVET provision across the island and also possesses the means of developing and delivering online courseware. But for all that, it must be admitted that progress in embracing ICTs for transformation has been slow, and a 2010 study of trainees, trainers and administrators in public sector training (Jayalath, 2010) showed that the major barrier to achieving this goal is a lack of knowledge and skills in online and blended learning. However, the majority of those interviewed declared that they saw the importance of converting many more of the traditional training course modules to eLearning and about 80 per cent said that they perceived eLearning to have more value than traditional learning methods. Many positive responses were also received about the benefits of the new technology to the employers and students as well as institutions that use online career guidance and job-matching solutions. The current challenge for the TVEC is to develop the policies and systems to embed eLearning in formal TVET courses and promote such developments across the system.

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New Zealand: Open Polytechnic

Caroline Seelig and Mark Nichols

Introduction

Open Polytechnic is New Zealand's leading distance learning provider, and part of New Zealand's Institutes of Technology and Polytechnics (ITP) sector. Based in the country's capital, Wellington, the government-owned and funded institution delivers courses throughout New Zealand and internationally. Every year, more than 34,000 mainly adult students enrol to gain the skills they need to help them advance in or change their careers. Open Polytechnic began life as the Technical Correspondence School in 1946, providing resettlement training for returned servicemen and women following the Second World War. In 1963, it became the Technical Correspondence Institute (TCI) and began offering national training in trades subjects. In 1990, it was renamed Open Polytechnic of New Zealand and subsequently became the specialist national provider of tertiary-level open and distance learning (ODL). The following years were a period of profound transformation, with many new programmes and courses being introduced in response to market demand; internationally proven models for distance learning course design, student support and quality control being adopted; and an expanding range of online courses and services being offered. Care is taken to supply high-quality materials that are designed for independent study with minimal classroom supervision and enable students to progress at levels that suit their ability and work with outside commitments.

The programmes are subject to rigorous and transparent quality standard procedures. The New Zealand Qualifications Authority approves the programmes and accredits Open Polytechnic to deliver them. Industry is involved in the development of most courses and programmes, and close relationships are also maintained with appropriate professional and industry bodies. More than 100 qualifications and 1,200 courses staircase from certificate to diploma and degree

level (Levels 1–7 on the New Zealand Qualifications Framework) and from technical and vocational training to higher and continuing education.

Teaching is carried out by the following seven specialist schools integrated within a single faculty led by an executive director: Business; Commerce and Enterprise; Education Studies; Engineering, Trades and Construction; Science and Technology; Health and Community; and Social Sciences. This structure encourages interaction between disciplines, including shared responsibility for some programmes, while maintaining a coherent approach to the overall teaching programme. The 120 full-time academic staff and more than 320 individual adjunct faculty (mostly off-campus) are highly qualified and bring a wide range of industry experience to the development and delivery of the programmes. All academic staff are encouraged to maintain personal links with industry through a proactive development programme and the degree teaching is underpinned by an active research programme.

As in other countries across the globe, there are expectations that formal education can be transformed by the use of information and communication technologies (ICTs). In New Zealand, this expectation co-exists with a tertiary education sector that is experiencing change and uncertainty. A decline in school-leaver demographics is resulting in fewer school leavers seeking higher education; state financial support for tertiary providers is tightening; competition is being encouraged by the government via the funding system; and there is general uncertainty about how technology might be effectively enhanced for the purposes of tuition. Various New Zealand tertiary education providers are trialling Massive Open Online Courses (MOOCs), investing significant amounts in bricks-and-mortar infrastructure and pursuing the recruitment of international students in response to these changing conditions. It is clear that New Zealand institutions must transform themselves if they are to secure their future. This chapter explains how Open Polytechnic is seeking to prosper in the current conditions and why it believes the key to its future success is a bold investment in an innovative online platform that extends its services as an ODL provider of Technical and Vocational Education and Training (TVET) that is attuned to the needs of the learners.

The Changing Tertiary Environment in New Zealand

Reports such as *An Avalanche Is Coming* (Barber, Donnelly and Rizvi, 2013) suggest that higher education is due to be disrupted. Primarily, the rising costs of tertiary education limit the accessibility and scalability of tuition, while competition among tertiary education providers becomes more intense. Alongside these factors, MOOCs and online resource providers such as Udacity and Khan Academy are empowering self-directed learners to bypass the costs of formal education altogether. Calls for changes to tertiary education are both ubiquitous and explicit:

Tertiary education is facing a complex set of financial, technological and political challenges. These challenges are not only influencing the current delivery of tertiary education provision but are also likely to have a major effect on the future delivery and content of the teaching and learning experience ... One of the challenges relates

to the rate of change in technological development ... [which] can both significantly influence education delivery and address other important challenges, especially the costs and affordability of tertiary provision. (Shrivastava and Guiney, 2014, p. 7)

This quote from the New Zealand Ministry of Education's publication on MOOCs summarises the situation in regard to tertiary education globally. Political calls for more cost-effective, scalable and accessible education are at least partly fuelled by technological speculation. The changes cited here are relevant across New Zealand's tertiary education sector, including ITPs, universities and private training establishments.

In June 2014, the New Zealand Ministry of Education organised a summit for tertiary education decision makers from across the country. The purpose of this Innovations in Tertiary Education Summit was "to start a national conversation about innovative new ways of delivering tertiary education, the opportunities and challenges these present, and the future of tertiary education" (Ministry of Education, 2014, p. 3). The summit was driven in part by an interest in MOOCs and the massive worldwide success of online educational providers — such as the non-profit Khan Academy, an organisation created in 2006 by educator Salman Khan to provide "a free, world-class education for anyone, anywhere" — which were viewed as indicative of how the higher education sector might be transformed. Transformation is also a theme of the New Zealand Tertiary Education Strategy 2014–2019 which, in setting the international context for its direction, states:

While patterns of competition, demand, and work continue to change rapidly, geographical barriers to learning are reducing as a result of advances enabled by digital technologies. For example, super-fast broadband is supporting new modes of internet-based provision and a broader trend toward more flexible, less place-based provision. These technology-driven changes will require New Zealand's tertiary education sector to advance its thinking quickly on new delivery models. (Ministry of Education and Ministry of Business, Innovation and Employment, 2014, p. 4)

Implicit in this statement is that the time has come for online distance education to show how pedagogically rich, cost-effective, scalable and accessible education can be achieved. In New Zealand, it seems that the tertiary education providers are feeling threatened by the ubiquity, automation and flexibility of digital education technologies. It is certainly difficult to discern an institution with a coherent, confident and relevant strategy in place for navigating the changing — or even already changed — conditions. Some New Zealand providers are investing heavily in modern campuses (up to NZ\$650 million in one recently announced construction plan), securing lucrative international student enrolments and piloting MOOCs. With the (arguable) exception of the latter, such strategies are far from indicative of the level of transformation that the higher education context demands.

Foundations for Change: Lecture-based and Resource-based Institutions

The challenges the tertiary education providers face in transforming themselves in response to changing conditions are essentially the result of legacy configuration. Institutions founded on campus-based tuition, typically characterised by young, full-time students attending lectures, have a very different starting point for transformation than dedicated ODL providers such as Open Polytechnic. Open Polytechnic is not structured in the same way as a campus-oriented institution. Rather, its courses are prepared and taught in ways consistent with the classic ODL interpretation of distance education as an industrialised form of teaching and learning (Peters, 2007). That is to say, it uses centralised systems that recognise and co-ordinate a division of labour for the development of teaching resources that are in turn enriched by distance teachers. In conventional tertiary education, teaching is individualised to a great extent according to the personality and interests of the teacher. In industrial-age ODL, as Peters explained, mass production means are used to impart academic knowledge; there is a division of labour with the planning, development, delivery and assignment marking being carried out by different appropriately qualified experts at different times and at different locations; and the delivery of the subject matter is mechanised, standardised, normalised and formalised. The teaching and learning can be offered to all participants in a course in the same way, repeated at will and, like any industrially manufactured product, sold locally or in cross-border markets as a product that can be altered and optimised.

The other significant difference between Open Polytechnic and other New Zealand tertiary education providers might be broadly described as the difference between a resource-based provider of education and a lecture-based provider. The resource-based model is based on team-developed instructional materials, typically written along the lines of what Börje Holmberg (2007), whose theory dates back to the late 1970s, terms “guided didactic conversation.” That is to say, written materials are prepared as if the educator is sitting alongside a student and giving them one-on-one tuition. It involves writing in a narrative, conversational style that typically incorporates additional readings and various learning activities. In the case of Open Polytechnic, resource-based learning materials benefit from the input of a subject matter expert, educational design team, editors and content reviewers. The resource-based model is typically self-paced within a semester structure and assumes an independent learner. By way of contrast, the lecture-based model has at its core the verbal presentation of content by a subject matter expert. The lecture is a time-bound, explanation-oriented form of delivery, and its effectiveness relies upon the authority and presentation ability of the individual lecturer. Learning resources provided to students might consist of readings and prepared lecture notes that are all contextualised via the mechanism of the lecture.

The two models of resource-based and lecture-based provision typically seek to use technology in very different ways. Resource-based institutions are more likely to harness technology to improve communications and services for students and replace the traditional postal services. Discussion forums, online assignment submission, additional media (particularly video), self-marking tests and formative exercises are also used to extend the teaching and learning opportunities. Asynchronous or synchronous discussion forums can also be used, depending on

the desired independence of the students. Lecture-based institutions, by contrast, are more likely to invest in solutions designed to make the lecturers' presentations more accessible to students. This is essentially the model used by the producers of MOOCs, which typically consist of lecturers' presentations supplemented with additional learning activities — which is why they have come in for so much criticism from experienced ODL practitioners who see this as turning the clock back pedagogically. (It is also perhaps worth adding that the first US providers of MOOCs were essentially lecture-based institutions.)

While both resource-based and lecture-based institutions typically use Learning Management System (LMS) platforms such as Blackboard, Canvas and Moodle, the actual use of such systems will differ. Resource-based institutions will use the LMS for providing course materials and structured forums for engagement with students. They will tend to insist on a degree of centralised standardisation of course presentation and are likely to prevent staff from making unilateral changes to course materials. Lecture-based institutions, by contrast, will typically permit, and indeed encourage, lecturers to prepare and maintain their own online presence in whatever way they see fit. As a result, each course will vary in appearance and function in accordance with the preferences, expertise and applied effort of each lecturer. In simple terms, a resource-based institution will tend to adapt online learning to empower student engagement with learning resources; a lecture-based institution will tend to adapt online learning to empower engagement with the lecturer.

Introducing the resource-based and lecture-based models demonstrates how very different transformations are required in the current education context, depending on the nature of the institution. Khan writes that in the eLearning paradigm, students:

require rich learning environments supported by well-designed resources. . . . They expect on-demand, anytime/anywhere high-quality learning environments with good support services . . . they want to have more say in what they learn, when they learn, and where and how they learn . . . there is a tremendous demand for *affordable, efficient, easily accessible, open, flexible, well-designed, learner-centred, distributed and facilitated* learning environments. (Khan, 2015, sec. 1, paras 2–3)

Clearly the resource-based institutions have the advantage in orientating themselves towards what Khan terms the *eLearning paradigm*. Resource-based providers have long invested significant intellectual capital and funds in the development of learner-centred learning resources; their faculty have a great deal of experience in supporting the distance learners and are already attuned to the challenges faced by a distributed student body within which there are diverse needs and abilities.

The level of transformation that a lecture-based institution requires is significantly greater, because the learning environments and well-designed resources Khan mentions are not natural extensions of the lecture-based model. The empowerment of the lecturer in a lecture-based institution relies on a unanimous commitment by faculty and all departments to provide students with an effective and well-supported online experience. This constitutes a major paradigm shift.

Embracing Change and Creating Futures at Open Polytechnic

In its strategic planning, Open Polytechnic has identified advances in technology and the potential of pedagogically rich online learning as the key to its future. As a resource-based provider of tertiary education of long standing, Open Polytechnic is clearly in an enviable position when it comes to harnessing technology to provide more cost-effective, scalable and accessible education. However, transformation is still required in its policies and procedures to fully capitalise on the new paradigms of eLearning, including such features as service-oriented architectures and cloud computing, e-portfolios, which enable students to create and showcase their work, and Web 2.0 and social software that are more open, personalised, participative and social. As Jones (2009) observes, these developments challenge the institutional approach in terms of ownership of processes.

Fundamental to Open Polytechnic's transformation through technology were two key realisations that led to a series of strategic deliberations: the resource-based model is a distinctive strength in the era of online education and the "industrial" approach to education remains relevant in this changing environment.

The Strengths of the Resource-based Model

Not so long ago, Open Polytechnic was, according to some in the field, in danger of becoming irrelevant. In the 1990s and 2000s, as eLearning became ever more popular, many lecture-based institutions speculated that they could serve distance students themselves by placing their courses online. Some even argued that a separate distance-delivery polytechnic was therefore an "outdated" concept. The adoption of various types of ICT-based distance and flexible delivery, it was held, would become "business as usual" for at least the larger education providers, and there would be a rapid increase in blended learning. If these activities were successful, there would be no need for a dedicated national provider of distance education; the regional polytechnics and universities could serve their local populations themselves.

However, the results of these experiments conducted by new players entering the field conclusively demonstrated that eLearning and distance education are not the same thing, that the technology does not provide all the answers and that, whatever enhancements it provided for campus-based provision, eLearning as an extension of the lecture-based model could not match the success of the resource-based model *for distance learners*.

Some education providers suggested that it would be beneficial to use the central resource development capacity of Open Polytechnic but, it was added, with the proviso that Open Polytechnic was no longer able to deliver programmes to distance students itself. While this perspective was undoubtedly coloured by the other providers' desire to diminish competition and enhance their own institutional viability, it also resonated with a government imperative to reduce unnecessary duplication and expenditure in the education sector and seek collaborative ways of driving a more responsive, cost-efficient provision network. Experience has shown that distance and online education requires more than just

courseware; an effective student experience, tailored to the needs of distributed part-time adult learners, is also vital.

Throughout these discussions and manoeuvrings, Open Polytechnic was confident that it was in a strong position to apply all the knowledge and experience it had developed as a resource-based institution to the new forms of online provision, act as the leader for eLearning in the New Zealand tertiary sector and play a central role in the provision of high-quality courseware in TVET programmes. This encouraged the “collaborate and serve” strand in the discussions described below whereby Open Polytechnic would be poised to react in the event of a directive policy from the Ministry of Education or the emergence of a cohesive sector-level collaborative culture that would enable it to assume such a role.

The Industrial or Post-industrial Approach to Distance Education?

Adopting and adapting the new forms of ICT-based teaching in the resource-based model confronts institutions with an important choice. Should the pedagogy continue to reflect the industrial approach, where courseware development and the role of the teacher are two distinct yet complementary activities, or should post-industrialism be embraced? In post-industrial distance education, Peters (1993) suggested that there would be no such thing as the “typical student” and learners would accord equal importance to both academic goals of study that helped “self-realisation” and vocational or professional goals. He also posited that the learning would be more open, with the learners themselves acquiring whatever learning they needed in given situations rather than requiring painstakingly prepared, standardised courses and materials, and teaching institutions becoming primarily service agencies whose main role was to motivate, inform and advise the students.

The age of LMSs and every teacher having a PC, tablet or mobile device raises the possibility of a post-industrial model of distance education wherein teachers might develop their own distance courses and courseware without involving educational designers and the other members of the team typically responsible for preparing online learning resources. Online, teachers can create or update copy in real time and embark on extensive discussions with the students independently of others. In other words, the ICTs make it possible for resource-based providers to adopt teaching approaches more aligned with the lecture-based model.

However, Open Polytechnic has deliberately maintained its industrial approach. Ongoing student feedback indicates a strong preference for a consistent online experience, which is difficult to maintain in a post-industrial model. Further, a post-industrial model characterised by extensive online forum activity is less scalable and cost-effective. Open Polytechnic’s experience is that such engagement is not a critical component for student success in formal study. With resource-based courses well designed for the independent student, online forum activity can be limited to specific instances.

Strategic Deliberations

The enormous interest in online learning in the tertiary education institutions is driven by:

- Excitement about the new pedagogical methods.
- The potential reductions in the costs of higher education.
- The opportunities for innovative collaborations.
- Frustrations with the existing conventional system.

It is not just the face-to-face polytechnics, colleges and universities that feel threatened by the ubiquity, automation and flexibility of digital technologies in education. While the authors acknowledge that many teaching establishments have become perfectly adapted to an environment that no longer exists, traditional ODL organisations are having to reflect on their “learner-centricity,” business models, educational currency and relevance to the future workforce.

In light of the complex set of educational, financial, logistical, technological and political challenges influencing Open Polytechnic’s current delivery of tertiary education, it was clearly imperative for the future state of Open Polytechnic in the national education system to be defined. It was also clear that like all tertiary education providers, Open Polytechnic is part of a global community, something else to consider in positioning. As Open Polytechnic’s leadership team considered potential strategic directions, three options (not mutually exclusive) emerged:

- **Hold and enhance.** As a traditional provider of ODL, we could maintain our role as a specialist ODL single-mode provider, delivering courses and programmes nationwide. In this approach, our future would be dependent on our furthering our development of learner-centric, flexible courses.
- **Disrupt and grow.** This option would see us transform into a growth-focussed, commercially driven online learning provider, competing through responsiveness to client needs, pricing and product quality to attract both commercial and traditional students.
- **Collaborate and serve.** The opportunity here would be for Open Polytechnic to become a central curriculum and digital courseware developer, providing products and services to a network or consortium of lecture-based organisations to assist them in their own transformation.

Table 1 describes these three options and their respective considerations against key criteria.

Table 1: The three possible future states for Open Polytechnic in the national system

Category	Hold and Enhance <i>Traditional ODL tertiary provision</i>	Disrupt and Grow <i>Commercial online learning provision</i>	Collaborate and Serve <i>System-focussed courseware provision</i>
Compliance	Accreditations, approvals and regulation compliance are critical.	A varied compliance environment, including national accreditations and approvals, bespoke corporate training, and international accreditations become relevant.	The compliance environment needs to support the development of courseware to national standards specifications, with potential sector stakeholder contribution.
Culture and people	Culture has a pedagogical pre-eminence; valuing student-centric, methodical, systematic, predictable and cautious behaviours.	Culture has a commercial pre-eminence; being profit-driven, client/partner- and demand-focussed, and exhibiting flexible, dynamic, intolerant, adventurous behaviours becomes critical.	Culture must have a pedagogic and student-centric focus, but also needs to be client/partner- and demand-driven, flexible and dynamic.
Educational Performance Indicators (EPIs)¹	Achievement of educational outcomes remains a crucial objective, as Hold and Enhance relies primarily on ongoing government funding.	Educational outcomes would be an indirect target, but would be a crucial determinant of the clients' funding (likely using different measures).	Educational performance indicators would be a crucial determinant of both Open Polytechnic and partner funding.
Funding sources	Primary funding sources would be government and individual student fees.	Funding sources would be diversified, sourced from commercial and international revenues.	Individual government funding and opportunities for diversified and international revenues would exist. Licensing/hosting activities could also be funded by partners and clients; there is also a possibility for shared funding for partners and networks.
Infrastructure	Fit for quality. Sustainable, stable, effective, resilient.	Fit for purpose. Scalable, collapsible, efficient, dynamic.	Fit for quality and purpose. Scalable, effective and resilient, but also dynamic.
Mode of delivery	Open, distance and flexible learning, enhanced by online opportunities.	Online learning supplemented and enhanced by partner face-to-face support.	Online learning supplemented and enhanced by partner face-to-face support; likely broadening and enriching of Open Polytechnic portfolio in service to own students.

Category	Hold and Enhance <i>Traditional ODL tertiary provision</i>	Disrupt and Grow <i>Commercial online learning provision</i>	Collaborate and Serve <i>System-focussed courseware provision</i>
Roles for educational partners	Partners contribute or achieve one or more steps within the organisation's learner value chain (e.g. practical teaching components).	Partners could contribute to a wide variety of functions including international advocacy, sales, development and delivery.	Partners would be collaborating with educational providers that require access to online resources.
Politics, advocacy and lobbying	Active liaison and advocacy with government and central agency representatives by organisation management and board. Key messages relate to the educational and employment outcomes, value for money and public good contributions of ODL.	Appropriate advocacy and lobbying, directly or through agents, domestically and globally. Key messages relate to meeting client requirements, training efficacy, scalability of ODL solutions and private good.	Close engagement with government and central agency representatives by organisation management and governance, and also as part of a sector consortia (recall the earlier mention of tightening and competitively oriented government funding for the education sector).
Positioning	Strong organisational branding within the tertiary sector.	Ability to white-label ² or use a separate/sub brand to appeal to commercial partners; engagement on a client basis.	White-label branding that can be replaced by partners' requirements.
Product (academic portfolio)	Part of a strategic and cohesive portfolio, responding to national market demand and funding priorities.	Portfolio responds to market demands/ needs and contractual obligations, focusing on client objectives related to education, training and professional development.	Part of a strategic and cohesive portfolio, responding to both national market demand and priorities, and sector partner requirements.
Risk	Conservative risk appetite. Risk question: "Will our organisation make it to become 100 years old (currently 70)?"	High risk appetite. Risk question: "Will we generate enough ROI to be sustainable in the market?"	Conservative risk appetite. Risk question: "Will the collaboration-seeking concessions and compromises sink our existing core business of ODL provision?"
Sales	Retail, to individual nationwide students.	Wholesale, customisation or contracts for service based either on existing courseware or on development of new courseware.	Wholesale, to education providers nationally.

Category	Hold and Enhance <i>Traditional ODL tertiary provision</i>	Disrupt and Grow <i>Commercial online learning provision</i>	Collaborate and Serve <i>System-focussed courseware provision</i>
Stakeholders	Intense stakeholder connectivity at all levels of government and central agency representatives. Ongoing liaison with all industry, community and professional body representatives that influence or engage with the organisation's qualifications and learners.	Proactive engagement with potential purchasers, current clients and influencers of training products and services. Ongoing engagement with current clients or influencers of training products and services.	Partner providers, who must be able to effectively critique, evaluate, appraise and contribute to courseware. They must also be able to customise and contextualise courseware to their own conditions. Stakeholder engagement at all levels of government and central agency to influence funding practices in support of collaboration. Ongoing engagement with all education providers at governance, management and staff levels.
Strategy	Largely defensive, maintaining market share within funding allocations.	Offensive, with aggressive positioning and growth.	Both defensive and offensive.
Value chain	Organisational control of overall components in the learner value chain.	Potential partner control of value chain elements. Organisational quality assurance becomes key.	Organisations negotiate components of value chain that each partner controls. The Open Polytechnic quality assurance role becomes critical.

1. Education Performance Indicators (EPIs) are formal measurements of performance applied by the New Zealand Tertiary Education Commission to institutions they fund. Ongoing government funding relies to some extent on EPI results.
2. "White-label" refers to a fully supported product or service made by one company but sold by another without branding. In that way, the reseller can customise the product with their own brand, logo and identity, allowing customers to associate the product with the reseller.

Upon further deliberation, it became clear that central to each of the opportunities presented was the need for a technological platform that supported the respective products and services (whether traditional, commercial or collaborative).

The traditional LMS, built largely in response to demand from lecture-based institutions, would not be sufficient for any of the three opportunities. For Open Polytechnic to be successful, it would need to have access to a technical solution that would enable a resource-based online experience, the opportunity to develop and share white-label course materials, and the potential to engage with a flipped-classroom approach to partner delivery.

A Platform Suitable for Institutional Transformation

Open Polytechnic is pursuing each of these opportunities and is confident that its new online platform coupled with a rethink of its courseware development function makes each possible. In the search for a new LMS, it became clear that the existing LMSs are actually designed for lecture-based institutions.

Corbeil and Corbeil (2015) suggest that the 1990s might be described as “the era of the learning management system” (sec. 4, para. 1). Popular LMSs developed before the current millennium continue to dominate online learning. While these systems have continued to evolve, they suffer from three distinct problems from the online learning systems perspective. They:

1. Tend to be based on older technologies and approaches.
2. Assume that the teacher is solely responsible for the learning experience and working within the lecture-based model.
3. Assume that online learning should involve formal online collaboration and communication.

As Open Polytechnic deepened its understanding of the online learning activities needed and explored its transformational options, it became clear that a traditional LMS was unsuitable for industrialised online learning because it was not developing in ways that would enhance a genuine online student experience. From our experience with cumbersome courseware development interfaces, separation of engagement tools from the provision of study materials and lecture-based development assumptions, it became clear that a new platform would be needed if Open Polytechnic were to achieve its objectives — one that emphasised student engagement with online resources and was underpinned by powerful analytics. Online resources and analytics¹ are, in fact, interdependent. Online resources rely on analytics if students are to be successfully supported; analytics rely on online resources if the right sort of data are to be gathered to enable meaningful support interventions.

Open Polytechnic now prepares courseware on its new platform specifically for online engagement. In other words, students printing out courseware are now at a distinct disadvantage. Therefore, a print version of courseware is not offered.² Our online courseware includes embedded activities that can only be engaged with online and video clips, links to external readings and social notes that are likewise inaccessible offline. Such design encourages and rewards students for studying online, which in turn generates effective engagement analytics.

Open Polytechnic’s new online learning system, called iQualify, is built from a resource-based perspective. Foundational to its development is what we have learned about our learners, who are predominantly adults combining work and study. Studies show that they are increasingly accepting of an online-only study experience (some 19 per cent of our learners prefer an online-only study experience, with a further 60 per cent wanting additional offline and print resources); prefer a consistent online experience as they advance from course to course; like a smooth and integrated online experience; and are largely

1 The measurement, collection, analysis and reporting of data about learners and their contexts for the purposes of understanding and optimising learning and the environments in which it occurs.

2 There are some exceptional circumstances where print versions are made available.

autonomous learners. We have also found that as independent learners, they like to proceed through their studies at their own pace and perceive time-bound, highly structured online discussion and group work as a serious inconvenience. Furthermore, they like to progress through online materials seamlessly, without having to leave off where they are in order to, for example, engage with a discussion and then find their way back to where they were. And upon entering the online system, they want to be able to go back immediately to where they last left off. They also like to have opportunities to comment within the course materials themselves, alongside paragraph text. Each of these student-oriented factors influenced the development of iQualify, and each challenges the underlying assumptions implicit in alternative LMS platforms. Further features are constantly being added to the system, and improvements such as providing offline mobile-based access to courses (with synchronisation of analytics and student interaction when a connection is available) are also planned for. It is important to note that these systems are designed to serve the empirically evidenced needs and characteristics of our students. Postgraduate students or students studying less vocationally aligned courses may well prefer different approaches.

Table 2 illustrates in simplified form the differences between the LMS paradigm and the iQualify platform.

Table 2: The differences between the LMS paradigm and the iQualify platform

LMS paradigm	Student preference	LMS problem	iQualify solution
Core technology pre-social Web.	Online-only study experience.	LMS as repository and tools.	iQualify as rich study platform.
Online learning tools as specialised options.	Integrated study experience.	Tools separate from courseware.	iQualify as seamless experience.
Independent teacher.	Consistent design and support.	LMS as teacher-customisable.	iQualify as published course.

Conclusion

At Open Polytechnic, we see our transformation not as technology-led, but as technology-enabled. Our opportunities in the current higher education context require us to be bold, confident and strengths-based. Our resource-based heritage provides a distinctive advantage in an environment seeking scalability, accessibility and flexibility in higher education.

We are conscious that we have more institutional transformation ahead. Adopting the collaborative and commercial values required for the opportunities we have is one element; upskilling staff and developing courseware for the iQualify platform are others. We are confident, though, that resource-based Technical and Vocational Education and Training is extremely well-positioned to demonstrate how an innovative, learner-centric, collaborative and cost-effective higher education system might be found.

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Jamaica: UTech

Jeanette M. Bartley-Bryan

Introduction

Over the past decade, Technical and Vocational Education and Training (TVET) has been undergoing significant change in the Commonwealth Caribbean countries¹ as the region has grappled with shortages of skilled workers, the need to expand access to tertiary education and the challenge of an increasing number of young people joining the workforce without any post-secondary schooling. This has given rise to the development of regional and national TVET initiatives, partnerships and vocational qualifications frameworks; the expansion of the range of TVET subjects in the Caribbean Secondary Education Certificate (CSEC) and Caribbean Advanced Proficiency examinations; and growth in the number and range of postgraduate studies in TVET. However, the TVET sector in most of these countries is still extremely under-resourced and requires significant ingenuity and innovation in the use of the limited available resources to provide the necessary knowledge and skills development for nation building. Applications of information and communication technologies (ICTs) and blended learning are seen as one of the ways of overcoming these limitations.

The University of Technology, Jamaica (UTech) and Its Role in TVET

The University of Technology, Jamaica (UTech), was established in 1958 as the Jamaica Institute of Technology. In 1959, the name was changed to the College of

1 The Commonwealth Caribbean refers primarily to the ten independent island-nations — Antigua and Barbuda, the Bahamas, Barbados, Dominica, Grenada, Jamaica, St. Kitts and Nevis, St. Lucia, St. Vincent and the Grenadines, and Trinidad and Tobago — and two mainland nations — Belize and Guyana — that once constituted the Caribbean portion of the British Empire. As the inhabitants are English-speakers, they are also called the Anglophone Caribbean. Excluded from this grouping are the five British Caribbean dependencies — British Virgin Islands, Anguilla, Montserrat, Cayman Islands, Turks and Caicos islands.

Arts, Science and Technology. The institution was formally accorded university status on 1 September 1995, and became fully chartered on 29 June 1999.

The history of UTech is intimately connected with the social and economic development of Jamaica. From just over 50 students and four programmes in 1958, the institution has grown to become a major national institution with over 11,000 students and more than 100 different programmes on offer at certificate, diploma and degree levels. Its academic offerings and development have been modelled on the English polytechnic system, with an emphasis on flexibility of approach, work-based learning and relationships with business and industry. Flexibility in its academic offerings is reflected in the various types of programme schedule and credit load, co-operative work-based programmes, and more recently, use of online and blended learning modes of delivery. Several of UTech's programmes are also franchised in a number of community colleges and other Caribbean islands.

Over the past 20 years, UTech has become one of the leading technological universities in the Commonwealth Caribbean. Of particular significance has been its conceptualisation of TVET as an engine of sustainable growth and development, adoption of innovative technological solutions for the region and contribution to the *academisation* of TVET to make it a legitimate field in higher education (Kyvik, 2009).

As Johnson (2004) observed, before UTech introduced its post-diploma Bachelor of Education programmes in Home Economics (1985), Industrial Technology (1987) and General Technology (1991), there was little opportunity in Jamaica to study for a first degree in a technical field or to upgrade vocational and industrial technology teaching competencies. Apart from a few teachers who were able to study overseas, most TVET teachers had only completed a two-year certificate or three-year diploma course. Since 1995, UTech's School of Technical and Vocational Education (SOTAVE) has seen hundreds of teachers from across the Caribbean graduate in TVET specialisations — including Business and Computer Studies, Family and Consumer Studies, Food Service Production and Management, Apparel Design, Production and Management, General Technology — and concentrated programmes in Construction, Electrical and Mechanical Technology.

Within the last seven years, postgraduate programmes in TVET have helped to rebrand the field as an academic discipline. They include a doctoral programme in Career and Technical Education; four master's programmes in Workforce Training and Education, Career and Technical Education, Educational Leadership and Management, International Service, and a postgraduate diploma in Education. In October 2012, UTech joined the UNEVOC Network. UTech has also established the following faculties that focus on science, technology, engineering and mathematics (STEM) careers — Architecture, Engineering, Computing, Health Sciences, Medical Sciences, Natural Sciences and Education — and its reputation for producing work-ready graduates is acknowledged throughout the region and beyond.

UTech's Applications of ICTs

The dominant mode of delivery at UTech is still traditional face-to-face teaching and learning, but more than 100 TVET modules, units and topics now use ICT-based and blended learning, digital libraries for research, chat and Web-

conferencing for meetings, and social media for networking and information sharing. The paradigm shift in and impact of ICT-based and blended learning are greatest in the emerging distance learning programmes that UTech has been developing to achieve more flexible access, respond to the needs of prospective students, provide in-service training and lifelong learning, make better use of the specialisms of faculty members, collaborate with other institutions, enter into international markets and increase UTech's competitive advantage.

UTech's first four ventures into delivering technology-mediated cross-Caribbean TVET programmes were classified as "special programmes." This was because while they were consistent with the university's curriculum and teaching and learning standards, their structure, pace, duration, learning activities, credit value and targeted groups differed from the traditional face-to-face offerings within the designated category of diploma or certificate.

This case study describes the development, implementation and outcomes of UTech's first four ventures into distance and online learning and the lessons learned from these experiences in the hope that they may provide useful guidelines for others embarking on online and blended learning in TVET.

Special Diploma Programme in TVET for the Caribbean (2001–2007)

The idea of this programme, which was one of the first ICT-based TVET programmes in the Caribbean, arose as a consequence of concerns about the low status of TVET in the region and recognition of the need to improve the pedagogical skills of TVET teachers and provide them with a recognised base qualification (Thomas-James and Hodelin, 2006). This two-year pilot UTech-certificated programme was initiated by the Commonwealth of Learning (COL) for teachers in vocational schools and colleges lacking any formal qualifications. The 12-module curriculum included general subjects such as educational theory and practice, language and communication and educational technology as well as TVET-specific modules such as administration and management of TVET, workshop organisation and management and safety (Bartram and George, 2000). Delivery to the learners in the Bahamas, St. Kitts and Nevis and Grenada was by means of CD-ROM, email, telephone and in-country face-to-face tutorials. Fifty TVET teachers graduated from this initial programme, 16 from the Bahamas, 14 from St. Kitts and Nevis and 20 from Grenada (UTech, 2007, 2011). Five of these graduates then went on to complete the UTech Bachelor of Education in Jamaica between 2007 and 2010. The course materials are still available online in COL's open educational resources for the *Technical and Vocational Teacher Training Core Curriculum* (Commonwealth of Learning, 2002).

Associate Degree in TVET Teaching (2008–2010)

In 2007, the Special Diploma programme was upgraded to an Associate Degree in TVET Teaching, with six modules being added. This was offered online to TVET teachers and trainers in Grenada through UTech's Learning Management System (LMS) (Moodle), Web-conferencing and in-country support. Twenty-six of the 31 participants in the 2008–2010 intake graduated from the programme. These online course materials are also available from COL.

Special Postgraduate Diploma in Educational Management (2006–2007)

This nine-month programme was developed at the request of the government of St. Vincent and the Grenadines and again involved a mix of online course delivery, Web-conferencing and regular in-country face-to-face sessions. It was taken by 30 school principals, senior staff and education officers and it covered educational management and leadership, staff development and preparation of school improvement plans. The course content was drawn from other UTech graduate courses and adapted for ICT delivery and the specific needs of the target group.

Special Certificate in Adult and Continuing Education (2008–2009)

This eight-month blended learning programme was developed at the request of the government of St. Vincent and the Grenadines and designed for 20 adult educators in community training centres. It concerned the management and delivery of adult education centres and programmes.

UTech's Journey into Online and Blended Learning

Each of these ventures into technology-mediated delivery was undertaken as an academic project involving much reflection-in-action and reflection-on-action in regard to achieving the appropriate responses to learners' needs (Mullinix and McCurry, 2003). All of these programmes involved partnerships with the governments of the Caribbean countries and international development agencies, including COL and the European Union (EU). These organisations helped with the funding, training, in-country logistics, online delivery and provision of technical and personnel support for the learners. UTech was responsible for all the subject matter content and expertise, course writing and delivery, online support services, assessment and certification.

Stage 1: Determining the Learners' Needs, Learning Outcomes and Means of Assessment

Appreciating the learners' requirements and prior learning was critical to determining the content, learning activities and learning outcomes necessary for each programme. The teachers taking the TVET diploma programme had varying qualifications, experience, knowledge and competencies, and adopting an open-entry approach created problems for those graduates then wishing to progress to UTech's associate degrees or postgraduate diploma courses in TVET. Some had to take bridging courses and others had to have their prior learning assessed on an individual basis (Thomas-James and Hodelin, 2006). Entry into the other three programmes required a minimum of four subjects in the regional CXC-CSEC examinations and at least two years' experience in teaching and/or educational management.

A learner profile instrument was developed for each programme to capture such data as learners' locations, circumstances, experience, prior learning, access to computers and levels of ICT literacy. This information was critical for providing student-centred learning, but some extra help was still needed during the course

of the programmes when individuals were found to be less competent than anticipated.

All four programmes were competency-based. The learners' knowledge, skills and attitudes were subject to continuous assessment by tutors and peers and they were required to demonstrate their capacity to apply their new learning in their workplaces, portfolios and final capstone projects/presentations. Those taking the TVET diploma also had to engage in some action research to test their pedagogical skills (Thomas-James and Hodelin, 2006), and those taking the Educational Management Diploma and Adult and Continuing Education Certificate were required to demonstrate their ability to improve the management of their institutions or facilities. All participants were also required to demonstrate their ICT competencies and their ability to use the technology to show evidence of their learning.

Checklists of the accomplishment of the competencies outlined in the curriculum resources (Commonwealth of Learning, 2002) were used for assessment purposes by the in-country tutors. To ensure quality and consistency in performance assessment, UTech's validation teams visited the sites during the final capstone presentations by the students, and the various performance measures were continually reviewed by the external examiners.

The choice of delivery modes was determined by the available technology and infrastructure, levels of access for learners and instructors, affordability, technology fit to curriculum requirements and technological and support readiness at UTech and in the in-country sites.

In the case of the TVET Diploma Programme in the Bahamas, St. Kitts and Nevis and Grenada, the learning and assessment materials were essentially print-based, because this was an era when Caribbean students had only limited and expensive access to computers and the Internet (Thomas-James and Hodelin, 2006). Later, CD-ROMs were used for distributing the texts, which was cheaper for UTech but entailed additional printing and computer costs that had not been allowed for in the participating countries' budgets. Some of the students in the Bahamas were able to access the materials at the Ministry of Education's Resource Centre, but this meant they incurred additional travel costs. The TVET Diploma programme made extensive use of email and telephone calls to reduce the need for face-to-face meetings and site visits. Monthly teleconferences were held between all the UTech and local providers and the COL educational specialist. COL also enabled four eList servers to be installed, enabling academic and administrative staff with email access to liaise on programme matters, post grades and support students. Those without email access relied on faxing (Thomas-James and Holdelin, 2006).

By the time of the launch of the other three programmes in Grenada and St. Vincent and the Grenadines five years later, it was possible to make more extensive use of ICTs. The courseware was delivered online by means of Moodle, and online chats, tutorials and conferencing were also possible through various open source applications. Again, the regional co-ordinators and in-country tutors made arrangements for periodic face-to-face sessions. UTech had conducted cost-benefit analysis and site visits prior to the launch of these Web-based programmes, and the programme delivery costs were covered in Grenada by a local college and in

St. Vincent and the Grenadines by the government with support from the European Development Fund.

Stage 2: Course Planning and Creation

A team approach was found to be necessary for all the course planning and creation because the work called for expertise in content creation, instructional design, learner support, assessment, evaluation, technology and infrastructure, logistics and administration.

Site visits and meetings were also held with the various external stakeholders to gain agreement on the learners' needs, course objectives and resource/technology requirements. The stakeholders' different levels of understanding, experience and expertise meant that many of these meetings more closely resembled workshops.

In the case of the TVET Diploma, COL played a lead role in the planning. It also organised workshops for representatives from the various Caribbean countries, provided technical assistance to expedite the development of the course materials, and helped negotiate the franchise arrangements between UTech and the Caribbean countries to ensure the necessary tutorial and logistical support. Some of the other partners included Open Polytechnic of New Zealand, the Adelaide campus of TAFE in Australia, Bangladesh Open University, Regional Training Council on TVET and International Labour Organization (Bartram and George, 2000). In all of the programmes, local agencies or partners provided the logistical support and in many instances helped to cover the costs. Those helping in these ways included the Department of Education for the Bahamas, the Clarence Fitzroy-Bryant College for St. Kitts and Nevis, the T.A. Marryshaw Community College for Grenada, and the St. Vincent and Grenadines Ministry of Education.

The work also called for collaboration between various academic, administrative and technical units at UTech and, in particular, SOTAVE within the Faculty of Education and Liberal Studies (FELS). The earlier initiatives in the years 1999–2006 were co-ordinated by the Office of Curriculum Development Evaluation (OCDE). The Associate Degree in TVET was fully co-ordinated by SOTAVE. The later programmes were co-ordinated by the newly established Office of Distance Learning (ODL).

Stage 3: Developing Competencies in Blended Learning

As Mullinix and McCurry (2003) and Mishra and Koehler (2006) observe, there can be a steep learning curve in designing and developing blended learning programmes. The developers must have the right mix of content knowledge, pedagogical knowledge and technological knowledge, which typically means that a team of subject matter experts, course writers, instructional designers, media specialists and technical support personnel is required.

Converting existing courses and courseware into ICT-based and blended learning programmes often requires retrofitting the content, pedagogy and nature of the learner-content, learner-teacher, learner-learner, learner-resource and learner-technology interactions. The task can become somewhat daunting as the numbers in the course teams increase, given the need for synergy, consistency of writing standards, working within budgetary constraints and adherence to timelines.

The first draft of the TVET Diploma courseware was developed by a diverse group of writers contracted by COL across the Caribbean, and the materials were developed incrementally by units. As a consequence, inconsistencies and variations in the standards of the courseware were found and COL had to intervene to help with the revisions and train the course writers, instructors and tutors. It took two years before all the materials were complete and up to the required standard and the programme could be launched (Thomas-James and Hodelin, 2006).

By the time the later TVET programmes were developed, the UTech lecturers or adjunct instructors were more experienced and capable of adapting their existing modules to the requirements of online or blended learning. However, while quality was achieved in these programmes, their development created considerable stress. Many of the course developers/writers already had full workloads, and with little in the way of release time, this was a massive undertaking for them — especially if they were also the course facilitators. As a result, there were a lot of last-minute changes and even changes to and completion of materials during the actual delivery of the programmes. In the case of the Diploma in Education Management and Certificate in Adult and Continuing Education, there was so little time between the signing of the contracts and programme start dates that the modules and methods were not even pilot-tested before delivery. Fortunately, by this time the instructors had become more experienced, and through tremendous effort and teamwork they were able to meet the learners' needs. But ideally, such pressures are to be avoided to get the best results.

Stage 4: Delivery and Implementation

After every programme's launch, involving government officials, sponsors and other VIPs, there was a live orientation session involving the students, tutors and co-ordinators. These sessions were important for helping to develop common understandings about the programmes, the nature and demands of the study and the various stakeholders' roles and responsibilities. These events also enabled the tutors and co-ordinators to verify the learners' profiles, circumstances and learning readiness.

There were two forms of local oversight for these blended learning programmes. Where there were franchise arrangements with in-country institutions, as with the Special Diploma and Associate Degree in TVET, the administrative responsibility for the programme was twofold, because here the students had dual registrations and access to services at the local institution and with UTech. The in-country co-ordinators ensured that the programmes adhered to the standards and guidelines established by UTech and the local tutors conducted the face-to-face sessions and assisted with assessments. Where there were no partner institutions, as in the case of St. Vincent and the Grenadines, UTech-ODL collaborated with the countries' ministries of Education and hired an in-country co-ordinator to provide oversight.

At UTech, the Office of the Deputy President through the OCDE and later the ODL had overall responsibility for negotiating institutional approvals and protocols; liaising with all academic, administrative and technical units within UTech and all government ministries and partners in the other countries and COL; co-ordinating all the online and blended learning development and delivery services;

managing the quality assurance systems; and reporting on the operations to all of the stakeholders. The academic oversight of the programmes was primarily the responsibility of the UTech-FELS, which was involved in academic advising, ongoing moderation of student achievement, assessment of teaching practice and programme quality assurance. The faculty dean had ultimate responsibility for the management of the programmes, the head of SOTAVE managed the delivery of the programmes and assignment of the instructors and tutors, and the FELS distance learning liaison officer assisted with the co-ordination and communication flow between the team at UTech, the students and the in-country co-ordinators.

In the case of the St. Vincent and the Grenadines programmes, there were two UTech instructors per course. This team-teaching approach ensured that participants were exposed to and challenged by diverse perspectives. The learners could consult with their instructors and tutors by means of email, Net messaging, telephone or fax at designated times or during virtual office hours; periodic face-to-face sessions also helped to mitigate the sense of distance. A FELS advisor was also always available for email or teleconference contact with the in-country co-ordinators, tutors and students.

The in-country co-ordinators were the main liaisons between the students, UTech and the national governments and other partners. They were also responsible for organising the face-to-face sessions; arranging access to computing and other facilities; submitting and recording assignments; documenting issues, discussions and decisions; and obtaining and forwarding feedback from the learners. There is evidence that the effectiveness of the in-country co-ordinator had a strong effect on the learners' motivation, welfare and performance and the overall success of these programmes.

Stage 5: Learning Outcomes and Feedback

It had been anticipated that learning through ICT-mediated environments would prove challenging for the learners, who were more accustomed to being in a traditional classroom environment with their teachers or instructors. Other factors that were seen as possibly affecting the learning outcomes were the degree of motivation and willingness to engage in learning on the part of the students, the nature and quality of the online and face-to-face support systems, the degree of support from the learners' employers, the appropriateness of the programmes' duration and study workloads, and the relative inexperience of the teachers, tutors and in-country support staff in blended learning.

As Table 1 shows, the completion rates for the four programmes ranged from 55 per cent to 93 per cent, an outcome that compares very well with the completion rates of many ODL programmes, which are typically lower than for face-to-face teaching and learning.

Table 1: Student completion rates of UTech –TVET blended learning programmes

TVET Programme	Duration	Total number of students	Number of students completing the course	Percentage completion rate
Special Diploma for TVET				
Bahamas	2001–2005	29	16	55%
St. Kitts & Nevis	2002–2006	20	14	70%
Grenada	2005–2007	30	20	67%
Associate Degree in TVET				
	2008–2010	31	26	84%
Special Postgraduate Diploma in Educational Management				
	2006–2007	30	28	93%
Special Certificate in Adult and Continuing Education				
	2008–2009	20	18	90%

The all-important feedback and qualitative evidence about the programmes were derived from the students' evaluations of the courses; instructors' accounts of their experiences; co-ordinators' reports; support services logs and reports; focus groups; and correspondence with, visits from and formal evaluations by government agencies and partner organisations (e.g. Commonwealth of Learning, 2004, 2008; Thomas-James and Hodelin, 2006; UTech, 2007).

One of the findings was that being a member of the UTech community meant a lot to students. The students reported that they had found the programmes instructive, and some said they were even applying their new learning before they had completed the programmes. Some of those who had dropped out indicated they would re-enrol if the programmes were repeated. The use of group work was seen as a useful way of reducing dropout rates. The learners also commended the responsiveness of the co-ordinators and in-country tutors who communicated regularly through various channels, including email, ListServ and telephone.

In the case of the Special Diploma, the general feedback was that the flexible and modular design allowed the learners to select the sections that met their particular needs, and the CDs made them less reliant on remote libraries for books and articles. Being essentially print-based, save for a few basic audio and video support materials, the programme raised no technical concerns (Bartram and George, 2000). In the case of the later Web-based programmes, it transpired that most of the learners had had to share access to the Internet and only a few had totally unrestricted access to the ICT facilities. Although this had been anticipated when planning the introductory courses focusing on ICT in education, a number of the participants initially found the online environment challenging and various remedial actions had to be taken during the course to help these learners.

At UTech, the programmes were seen to have developed a cadre of TVET instructors, course writers and others who were capable of applying their new

pedagogical and course management skills in online and blended learning. They were also shown to have helped develop not only awareness, knowledge and skills in distance learning for TVET delivery in the four participating countries but also a new spirit of collaboration between the countries (Commonwealth of Learning, 2008). The evolution from the Diploma Programme to Associate Degree also bore testimony to the increased confidence being placed in online and blended learning. Thomas-James and Hodelin (2006) concluded that despite all the challenges, distance education provided real opportunities for TVET in the Caribbean.

Lessons Learned

Several lessons have been learned in facilitating ICT-enhanced TVET programmes across the Caribbean. While the impact of some factors may not be specific to technology-integration, their relative absence or inadequacy in this changing environment may have more adverse effects than in conventional learning.

Partnerships for Building Capacity

The increasing levels of exposure and interest in technology-mediated learning have been primarily driven by external partners. They have facilitated the capacity-building processes of preliminary planning, training, resource acquisition, material development and delivery, given the relatively high levels of investment and switch to the “total systems” approach required for ICT-integration in teaching and learning. There is much to be gained from both internal and external partnerships, but the varying human resource capacities, interdependence of organisational systems for decision making and related procedures and work flows must be carefully managed. Clear expectations and terms of references need to be negotiated and formalised between the various partners to ensure positive returns on the ICT investments and sustainability of initiatives.

Co-ordination and Communication of Requirements

People unfamiliar with online and blended learning may have many initial misunderstandings about and misinterpretations of the related paradigm shifts in learning with ICT. Therefore, there needs to be one central unit to oversee the entire process of change and clearly communicate all the essential information about plans, sources of expertise, resources, budgets, timelines and contingencies in order to ensure that all the stakeholders understand their roles for every stage of the process.

Learners' Profiles for Designing with ICT

Providers can never have too much information about the learners and their needs and circumstances to guide the design and development of resources for ICT-enhanced learning. Of particular importance are the aspects of learner readiness in relation to technology access and ICT-literacy levels. Learner profile surveys need to be undertaken and the data from these carefully considered well before the launch of online-blended courses to ensure appropriate product and service delivery.

Selecting ICTs for Blended Learning

The choice and combination of technologies employed in blended learning need to be guided by:

- The nature of the target groups and their circumstances.
- The course requirements.
- Issues of access, availability, affordability, reliability, security, technical support and maintenance in the technologies.
- Their capacity to be adapted and customised for specific local learning contexts.

Professional Development for Increasing Competencies

Professional development is essential to ensure consistency, quality and learner-centredness in course design, development and delivery. It should be mandatory (and ongoing, since methods and technologies are ever-changing) for all course managers, instructors, tutors and others involved in online and blended learning. Such training is required in course and materials design, teaching and learning, and learner support as well as in ICT applications. It can also be very useful to provide staff with templates for designing learning modules/units that define the objectives, learning outcomes, content/resources, instructional/learning activities, nature and role of the media/technologies, and assessment methods and criteria.

Time Management in a Changing Environment

Teachers and trainers may become demotivated and experience burnout if they are expected to develop and deliver ICT-based and distance education programmes in addition to their everyday teaching and other duties. Adequate time-release needs to be organised for course/courseware development and the associated professional development and team meetings, piloting, evaluating and researching their programmes and reflecting upon their work.

Preparing Local Co-ordinators, Facilitators and Tutors

Facilitating ICT-integrated learning usually requires both extensive and intensive efforts, given the paradigm shift to learning across time and space. The time requirements and workloads of the local co-ordinators, facilitators and tutors can also be underestimated. This sometimes happens because job descriptions have not contained enough detail or laid out expectations clearly enough. Local personnel must also receive the training and time they need to acquire and apply the required expertise and experience in the subject areas and management of the learning processes associated with particular technologies.

Balancing Student Workloads

Online and blended learning allow for great flexibility in programme schedules, but institutions need to ensure a balance between responding to the natural desire of students to complete their courses in the shortest time possible and presenting them with heavy study loads, particularly in the case of those who are

juggling their studies with work and family responsibilities. Employers also need to recognise the need for negotiated time-release of students. Study schedules need to allow for contingencies, but flexible learning, which allows students to take breaks from their studies whenever they feel like it, can result in haphazard completion of assignments or entire courses which in turn may make unrealistic demands on their instructors. Having identified this as a problem, UTech's study schedules for online-blended learning are now more structured with special times for breaks from study which are made known well in advance to employers as well as students.

Student Support with ICTs

With the increasing use of advanced technologies to facilitate learning across vast distances, there is also a greater need to ensure that students feel connected to the institutions, their tutors and their peers. Today's online tools can enhance students' sense of being members of a learning community. Personalised welcome letters, announcements and reminders, and acknowledgements of students' contributions can also help in this regard. Student orientation and induction programmes, whether online or face-to-face, are equally important. There may also be a need for special ICT training or support for some learners.

Programme Monitoring and Evaluation

The "total systems" approach proposed for ICT-enhanced learning requires careful monitoring and evaluation that must be planned for and budgeted for from the very start as part of the development strategy and must involve formal and informal feedback, qualitative and quantitative evaluation, and formative and summative phases. It requires a means (e.g. a Gantt chart) of systematically tracking the progress of all the implementation deliverables, providing status reports and devising mitigation strategies. It is also important to define all objectives, learning outcomes and performance indicators for such monitoring and evaluation and where, when and how they will be conducted, analysed and reported on and by whom. Many of the ICT tools for learning also facilitate documentation processes for tracking and analysing progress.

Conclusion

UTech continues to assess the needs for further blended or wholly online TVET programmes throughout the Caribbean. It has developed and delivered an online post-diploma programme in Pharmacy to 27 students in five Caribbean countries, and at the time of writing has a second cohort in the programme. It is also offering a fully online, self-paced certificate programme in Herbology, an online blended postgraduate diploma in ICT, and a Web-conferenced master's degree in Health Administration using FuzeMeeting. It is also helping to develop the capacity of other institutions across the region to deliver online and blended learning programmes.

In addition, UTech faculty members have been adapting more than 90 courses and modules of existing undergraduate and postgraduate TVET programmes for UTechOnline LMS on-campus delivery. Since 2010, UTech has also been exploring

a non-formal community approach to TVET through its CommUniversity initiative. This outreach intervention is designed to develop and sustain local community-university networks for collaborative learning and knowledge exchange in partnership with public and private agencies. To encourage and support such networks, UTech facilitates access to ICTs and educational resources, enables communities to explore learning options and pathways and empowers them to accept collective responsibility for their learning and follow-up actions.

Despite all the technological advances, the region still faces the problem of the digital divide. It is one thing for institutions to have advanced computer and networking capabilities to deliver cyber-learning packages and stimulate virtual interaction but quite another to provide them to the people who have the most to gain from them but lack the financial resources or infrastructural requirements to access them. Therefore, sometimes distance education still needs to use older technologies such as print, audio or video distributed on CD-ROM or SD card. As shown above, UTech was driven by necessity to develop flexible and modular blended learning programmes that meet the needs of learners with relatively basic technology. Instructional design and learner support make all the difference. Fortunately for the Caribbean, there are now emerging low-cost mobile technologies that can harness the benefits of the virtual landscape. The future for ICTs and blended learning for TVET and STEM is rich with possibilities, and UTech will continue to strive to be one of the region's leaders.

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Finland: VET and Omnia

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Introduction

Until the economic crisis of 2008, the growth of Finland's GDP was faster than in the EU in general. During the last few years, however, the economy has been in recession. While this has led to the need to reduce public sector costs, it has also been a driver for overhauling the education system. The country has few natural resources and so has long emphasised the importance of maximising educational opportunities; its best capital is knowledge capital, as shown in its highly skilled labour force.

There are no tuition fees in the Finnish education system and the publicly funded comprehensive school system has no selection, tracking or streaming of students. The higher education system is divided into universities and polytechnics (also known as universities of applied sciences). The Education Index, published with the UN's Human Development Index in 2008,¹ lists Finland as one of the highest-ranked countries in the world in terms of education. Finland has also consistently ranked high in the PISA (Programme for International Student Assessment) study — and at one point was ranked first — prompting widespread international curiosity about its formula for success. The Finnish Ministry of Education attributes its success to the innovative basic education provided to all school-aged children, highly competent teachers and the autonomy granted to schools.

The Finnish VET system

As UNESCO-UNEVOC (2013) reports, reforms to the sector over the past decade have improved the image of Finland's Vocational Education and Training (VET) system; increased its popularity with students, parents and employers; and helped to reduce unemployment levels. VET study is undertaken in three ways:

1 http://hdr.undp.org/sites/default/files/reports/268/hdr_20072008_en_complete.pdf

through school-based education and training (about 50 per cent of the students take this route), apprenticeship training (about 22 per cent opt for this) and entry into formal VET studies by adult students who can demonstrate vocational skills regardless of how and where these were acquired (28 per cent enter by these means).

After their nine-year basic education in a comprehensive school, students aged 16 can choose to continue their secondary education in a general track or a vocational track, both of which typically take three years. Today, more than half of Finnish youth apply for the vocational track. One of the reasons for this, and something that distinguishes Finland from many other countries, is that completion in both general and vocational studies qualifies students for further study at university level. Around one fifth of those going on to study at a university of applied science have previously completed a vocational qualification. It is also possible for the students from vocational upper-secondary schools to enter an academic university.

In marked contrast to many countries, in Finland the VET qualifications are held in high regard by both employers and students. This is because of the close match in the curriculum between the higher-order skills that are taught and the higher-order skills that the economy needs. The students are not simply taught to become “compliant employees”; citizenship and learning to learn are part of the core curriculum.

Teachers in Finnish schools must hold a bachelor’s or master’s degree, but 85 per cent of the VET teachers also have a formal vocational teacher qualification. While those aiming to teach in general education are trained in the traditional universities, those planning to teach in the VET schools and colleges receive special training in the vocational teacher training units in five universities of applied sciences. In most cases, the essential entry requirements for vocational teacher education are a relevant university degree and a minimum of three years’ work experience in the field in which the teachers will specialise. The Vocational Teacher Education Programme involves one year of full-time study or two years of part-time study and includes basic studies in educational sciences, vocational pedagogy studies, teaching practice and other subjects.

The institutions promote their courses and services to parents by arranging parents’ evenings and regular visits for parents and prospective students. Deputy Mayor Sampo Suihko, Head of Education and Cultural Services in the City of Espoo, says:

VET used to be seen as for losers. Affluent, highly educated parents would never dream that it was for their children. But now, with the competition for places, you have these parents phoning up and demanding to know why their kids couldn’t get in! There’s a new pride too. The brand has changed. “VET” used to be a pejorative term — not anymore. (Hannon, Gillinson and Shanks, 2013, p. 42)

Preparatory education for upper-secondary vocational education and training is provided for special needs students, those without compulsory basic education, immigrants and people of immigrant origin (including children who were born in Finland after their parents immigrated). This programme helps them develop the abilities needed for their individual study plans. Participation in upper-secondary

vocational education and training requires basic Finnish or Swedish language skills, and so learners need to take a language proficiency test.

There are also opportunities for the VET students to include international study in their schooling. Around 13 per cent of the students take the opportunity to spend some time studying in other countries. During the past 15 years, the Leonardo da Vinci programme, the European Commission-funded programme focussed on the teaching and training needs of those involved in VET and on building a skilled and mobile workforce across Europe, has funded 1,500 VET development and mobility projects as well as 15,000 mobility periods for Finnish students and experts. Finland also welcomes a very high number of VET students and experts from all over Europe every year.

The VET system accords with the five EU2020 objectives on employment, innovation, education, social inclusion and climate/energy and with the aims of the Copenhagen Process and Bruges Communiqué, which are to improve the performance, quality and attractiveness of VET through enhanced co-operation with the world of work. It also participates in the European Credit Transfer System for VET, utilising the National and European Qualification Frameworks and developing the European quality assurance systems.

Around 146,000 students enrol in initial VET every year. The main subjects taken are technology and transport (around 36 per cent), business and administration (19 per cent) and health and social services (17 per cent). The other fields studied are tourism, catering and home economics (13 per cent), culture (7 per cent), natural resources (6 per cent) and leisure and physical education (2 per cent). There are 119 study programmes leading to 53 different vocational qualifications recognised by the Ministry of Education and Culture and 305 higher-level and specialist competency-based qualifications.

Apprenticeships are another form of secondary-level vocational education and training, an alternative means of obtaining a vocational qualification with the same access to further education as other trainees. Apprenticeships are financed by the state, and newcomers to apprenticeship training are given a fixed-term employment contract for the duration of the training period. Finnish apprenticeships differ from those in the traditional European dual-system countries in that apprentices are mostly adults; about 80 per cent of them are over 25 years of age.

A variety of opportunities are also available for adults to maintain and enhance their knowledge and skills and to study for further qualifications or parts of qualifications through continuing education at various formal and vocational adult education centres or other learning providers. Municipalities or federations of municipalities own almost 80 per cent of VET institutions; the rest are owned by private organisations, foundations and the state.

The sector uses ICT-based and blended learning, relying largely upon the local institutions' own resources and expertise, but does not make much use of distance education because, although Finland occupies a large extended territory, the vast majority of its people live in or fairly close to cities and towns with VET schools and even universities, so there is little need for this form of provision. However, the country is transforming its VET systems to equip students with the knowledge and skills needed in the ever-changing and ICT-based world, and this is best

exemplified by the case of Omnia, Joint Authority in Education in the Espoo Region.

Omnia

Omnia was established to serve the VET needs of people of all ages in three neighbouring cities: Espoo, Kirkkonummi and Kauniainen. Espoo is the second-largest city and municipality in Finland. It is part of the Capital region with a population of over 265,000 residents, most of whom live in the inner urban core of the Helsinki metropolitan area. Several major companies are based in Espoo, including Nokia Solutions and Networks, Microsoft Mobile, KONE, Neste Oil, Fortum, the Orion Corporation, the Outokumpu Group and the video game developers Rovio and Remedy Entertainment. Kirkkonummi has a population of around 38,000 and Kauniainen has around 9,000 inhabitants.

It is said that education is in the DNA of Espoo. The mayor of Espoo, Jukka Mäkelä, stresses the strategic and economic importance of Omnia, saying:

The City of Espoo invests heavily in educational development [and] the image of Espoo is a city of high-quality education and competence and an innovative builder of the future. Learning and education have always been held in high esteem by the people and the City of Espoo city. Espoo is building its future success on a foundation of skills, education and innovation. (*Forerunner Magazine*, 2016)

Omnia has become a pioneer in and a catalyst for bringing in online VET teaching, learning and digital and other technological solutions to changing classrooms and what goes on in them. The Omnia vision is that learning can happen anywhere, can be personalised and is linked with social learning, co-operative learning, problem solving and development. It is a regional education development centre with five campuses and 860 staff serving around 40,000 learners (10,000 of whom are VET students). Its services include:

- An upper-secondary vocational school: offering upper-secondary and vocational training for young people.
- Vocational adult education and training: offering basic, further and specialist vocational qualifications and bespoke courses for adult students.
- Apprenticeship training: offering vocational education in the workplace supplemented with theoretical studies.
- Youth workshops for young people who are unemployed or not engaged in a course of study.
- A liberal adult education centre for open studies, personal development and lifelong learning, serving 30,000 students annually.
- A general upper-secondary school for adults: offering studies for the matriculation certificate and general education for people of all ages throughout the day, serving 2,000 students.
- InnoOmnia, the development unit of Omnia and a nationally and internationally recognised lifelong learning and entrepreneurial hub.

The Finnish National Board of Education (Opetushallitus) has made Omnia one of the national professional development providers for VET. It uses peer-to-peer learning and practical, hands-on training to extend teacher training beyond the traditional methods and provides in-service programmes for teachers and school leaders on:

- Digital learning environments.
- The use of game thinking and game mechanics in solving problems.
- Mobile learning.
- Entrepreneurial teaching and learning.
- Leading the 21st-century school.

Omnia challenges its own staff and students as well as teachers from other schools to step outside their comfort zones and embrace 21st-century learning solutions. In Omnia's view, conventional educational models are inadequate for meeting the challenges of the future. Omnia's vision of the future is that it will be digitised and continually require new knowledge and skills and new forms of teaching and learning anywhere and everywhere in both formal and non-formal settings. It also believes that the requirement for lifelong learning will change the role of educational institutions, that learning paths will be personal and non-linear, and that new jobs and new products and services will arise from different, sometimes surprising, combinations of knowledge, skills and know-how.

Omnia's road map for realising its vision includes providing test-beds and living labs for rapid and radical product-, service- and pedagogical-development projects that involve students, teachers and in-house entrepreneurs, as well as developing new physical and virtual learning environments and delivery models for VET. The following examples highlight the kinds of opportunities it provides for vocational students, teachers and entrepreneurs to not only learn about the new paradigms, but also to participate in and contribute to their creation.

InnoOmnia

In 2011, Omnia undertook an even more ambitious project: a new kind of development, learning, eLearning and entrepreneurship unit, a living lab. Rather than focusing solely on high-tech, high-growth entrepreneurship, its founders aimed to support diversity in entrepreneurship and include the service sector and arts and crafts micro-companies. Business incubator services had previously been tried out on university campuses, but this was the first time that encouragement and support for start-up and early stage companies had been provided on a VET campus. But this was not the only unique feature of InnoOmnia, as it was named. The plan was for this unit to not only offer support to entrepreneurs, but also to provide project opportunities and role models for the VET students. In these ways, InnoOmnia was seen to be a solution to the increasing rates of youth unemployment in the Espoo area, the low rate of entrepreneurs with a VET background and the need to embed entrepreneurship education in VET studies. Innovations in eLearning and pedagogy are centrally developed through InnoOmnia, and then distributed throughout the Omnia organisation.

To date, InnoOmnia has provided support and services to 200 new or aspiring entrepreneurs, trained 1,000 teachers and school leaders, trained 700 Omnia staff

in new pedagogies and received 3,000 visitors from, for example, the education sector, industry and commerce, and the EU. What sets InnoOmnia apart is its multifaceted character. It is part incubation unit, part teacher training/resource centre and part teaching and learning/career guidance service for students. By combining the world of learning and work, it is breaking down boundaries. For the students, it provides a real-life, work-based learning environment. For the entrepreneurs, it provides rented premises, business support and a network. For the teachers, it offers daily interaction and up-to-date knowledge on both entrepreneurship and the trades that the entrepreneurs represent. Everybody is a teacher and everybody is a learner. All the participants mingle and collaborate, engage in new forms of teamwork and combine work-based, ICT-based and social learning. The transferability of best practices is significant. Education has moved out of the silo of the classroom into shared spaces where the students' studies are embedded in solving entrepreneurs' real-life problems and helping to create real-life innovations. Some of the innovations being developed in InnoOmnia are described next.

Diago (2015, p. 1) claims:

By bringing together entrepreneurs, students and teachers from all levels of education, InnoOmnia is breaking boundaries and is in itself a radical innovation combining the worlds of learning and work ... it is a lifelong learning hub and a meeting point for entrepreneurs, teachers and students nested within a larger structure that is Omnia. InnoOmnia defies attempts to classify it.

An entrepreneurial route for students

InnoOmnia's modus operandi is to break away from conventional learning modalities, roles and classroom thinking. Its curriculum focuses not only on the development of technical and vocational skills but also on skills in problem solving, teamwork and interpersonal communications. The learning is very high-tech with tablets, video, and online and mobile learning applications in daily use. At InnoOmnia, all participants are equal. The aim is to create a true knowledge community wherein all the participants have a chance to make an impact. Conventional teacher-student and expert-novice roles are revamped. No longer is the teacher the sole or main source of knowledge and information. Facts, ideas and opinions flow in all directions, and the teacher's role is more that of a tutor, guide and coach than an expert who has all the answers. In such an experimental environment, the conceptual and practical problems that all the participants face change daily and from task to task, so there can never be any certainty about what capabilities will be needed. This changes the nature of teaching. The InnoOmnia Learning Solutions project manager Mimmi Heiniö says in a personal communication:

Such cooperation is very rewarding for both students and entrepreneurs. Students have access to the genuine involvement of businesses and entrepreneurs get new, fresh perspectives on everyday tasks. In addition, our students learn more about entrepreneurship and the use of mobile devices at work.

This fusion of work life, entrepreneurship, schooling and applications of new technologies in education leads Kim, one of the students, to observe:

It's much easier to dedicate yourself to something when you know the result will be utilised by an actual business.

Another student, Miikka, says:

It's a great change of pace from regular learning. We get to perform real tasks and develop solutions to meet the needs of real enterprises.

Taking the entrepreneurial route to learning is popular among students — there is a consistent flow of applicants every year.

LOL: A Gamified Online Learning Environment for Students and Entrepreneurs

Gamification — introducing game-like features into learning — has recently received a lot of attention. One learning resource developed and now offered for general use by Omnia is a business development game called LOL (the acronym of the game's Finnish name, *Lievästi Outoa Liiketoimintaa*) that combines real-life interaction between students and entrepreneurs with working on an online board game. The students and entrepreneurs form an online community within which the entrepreneurs present their business challenges and the students suggest creative solutions to the problems put to them. The game enables the students to work on authentic business problems in an entertaining and engaging manner, the entrepreneurs to gain new insights and ideas and contribute their knowledge and skills to the learning process, and the teachers to observe first-hand how business ideas are put to the test and learners explore real-world possibilities.

The initial work on LOL was funded by the Uusimaa Regional Council as part of the European Regional Development Fund Programme. Uusimaa Regional Council is a regional developer, strategic planner, land-use planner and consensus builder that promotes the Baltic Sea region and neighbouring parts of Russia as a leading knowledge region in Europe. The original game concept was developed in co-operation with the Kasavuori Secondary School of Kauniainen and Laurea University of Applied Sciences. The game was programmed by a game designer agency using the Google Education platform; a graphic designer created the board's visuals, aiming for a layout that was attractive and motivating; and the game is now a part of Omnia's educational offerings.

The students playing the game are assigned to teams, which compete with each other, and are given virtual workspaces for developing and sharing their ideas. The game features a Facebook page for communication and collaboration. Game updates, new tasks and feedback on tasks also appear as notifications in Facebook. YouTube is used to present interviews and reports.

The teams of students are presented with problems and then challenged to come up with creative solutions while bearing in mind the logistical, commercial and other constraints confronting the entrepreneurs. The participating entrepreneurs present their ideas and problems in videos. To give one example, a local restaurant owner had a business that was thriving at lunchtime but grew very quiet during the afternoons. In this case, the students' task was to come up with ideas for making the business more popular and profitable by creating a marketing plan, changing the menu, broadening the customer base or doing whatever else they felt would help. As the competing teams progress in their work, the game offers them

various incentives and rewards to maintain their motivation and create friendly competition.

As the student teams work through the issues and present their ideas to the entrepreneurs, they receive feedback on the originality, usefulness and feasibility of their suggestions. The teachers also give the students feedback on their learning and communication skills. Finally, a jury of participating entrepreneurs chooses the winners based on the best match between the solutions and the business objectives. Virtual trophies and awards are then presented to the winning teams.

Entrepreneur feedback on LOL has been very positive. Not only has the game resulted in co-operation, shared learning and transfer of knowledge but it has actually also created new business insights and opportunities. One entrepreneur said:

For me, the biggest thing is that we got to think about issues together. The kids brought up new ideas — like suggesting new youth target groups for my products — and I have expanded my marketing scope based on these ideas.

The students also report that they find LOL useful and illuminating. One of the students observed:

We worked on this innovative product and talked to the entrepreneur. I'm thinking entrepreneurship is not so far away anymore. If I had a good idea, I might think about commercialising it and becoming an entrepreneur.

LOL has now been mainstreamed into Omnia's training programmes where it has been found to deepen learning and improve teamwork, resourcefulness, self-direction and collaborative skills. The game and its development are described in greater detail by Ylikoski and Oksanen-Ylikoski (2014).

The Open Badges Passport for Students and Teachers

Jisc (2013) describes an "Open Badge" as a digital reward that can be stored inside a student's "digital backpack." The badges can be earned by successfully completing tasks and goals set by a learning provider according to certain criteria, the results of which are embedded inside the badge in the form of metadata, along with details such as who issued the badge, when it was issued and an expiry date (if relevant).

The Open Badges Infrastructure (OBI), which is being developed by the non-profit Mozilla Foundation and an international community of developers, is used by educational providers and communities such as NASA, the Clinton Global Initiative, De Paul University, DigitalMe and the City of Chicago.

Open Badges have been criticised for lack of user-friendliness, fragmentation, data exploitation and data management issues. Working in collaboration with the Finnish learning solutions specialist company Discendum² and the French non-profit ADPIOS,³ Omnia has developed a novel Open Badges Passport system that addresses these problems. This project was one of the 13 winners in the US\$1.2 million international Trust Challenge: Building Trust in Connected Learning Environments competition in 2015. These awards were for projects that

² www.discendum.com

³ www.eportfolio.eu/organisations/adpios

tackled issues of access, trust, privacy and equity in online learning environments, data management and technical interoperability.

The Open Badges Passport enables the seamless sending, receipt, organisation, display and search of digital badges. It encourages a new generation of services supporting learning, employment (including self-employment), social inclusion and citizenship. It is based on the principles of trust and equality upon which the Finnish education system is based; reflects the shift of Finnish education towards the adoption of outcomes-based and competency-based learning and the transfer of responsibility for this to the schools; resonates with Omnia's assessment and credentialing systems which are learner-centred, focussed on mastery instead of time, and use formative and summative assessment to inform learning; and responds to the need for new and flexible methods to recognise and reward prior learning. All this makes InnoOmnia a perfect home for this initiative, and all the goals can be achieved by the Open Badge Passport system. It provides a simple tool for anybody to show what they have achieved and what knowledge, skills and experience they have to offer. It can serve as a lifelong learning portfolio, wherein individuals collect their learning achievements, both in and outside of the formal education system, and can be used by teachers as well as students, stored in human resources management systems and applied in a whole new generation of services.

The Open Badges Passport is still in an early development phase. The first step is to provide a proof of concept to invite the provision of a new generation of services. In the future, Omnia plans to introduce Open Badges for not only its students but also its staff. The Open Badges Passport also provides an easy scalable tool for staff development.

The Edutech Bootcamp

In military and business contexts, bootcamps are short, intensive courses of training for new recruits. Omnia's Edutech Bootcamp is a blended learning experience that applies the intensive, immersive nature of this training method to helping VET teachers and teachers in training acquire the knowledge, skills and attitudes called for in mastering new technologies and new ways of acquiring and constructing knowledge. It places the students in the role of novices and dares them to ask questions, to try things out and to learn through a mix of collaborative, hands-on and online learning. The aim is to involve the students in authentic experiential learning where they take the initiative, challenge assumptions, reflect on their experiences, share their learning and develop new depths of understanding in demanding but enjoyable ways. The core learning outcome targets of the Edutech Bootcamp are to improve the students' familiarity with the role of technology in the traditional classroom and online and mobile learning; understanding of the pedagogical applications of ICTs including social media, mobile and cloud-based services; and ability to create and share mobile and online educational content.

Prior to an orientation session, the Bootcampers create accounts in selected cloud-based services that will be used to support learning, share the content and make the learning permanent during the course of the programme. They start off with an online orientation package and accompanying webinar, and at the end of the programme there is a wrap-up in the form of another webinar. During the two

intensive days of learning, the students are exposed to various hands-on learning experiences using tablet devices, different apps and online services. The students must follow a route that features information access points and educational technology-related learning activities and collaborative tasks. QR code scanners are used in the physical access points, and other options such as shared mobile videos and Popplet boards are used with the non-physical access points. As a final assignment, the students prepare online instructional videos to teach the other students what they have learned about an educational technology tool of their choice. This experience has been shown to increase the students' awareness of the various new tools and methods at their disposal in a challenging but safe environment where both technical and pedagogical support are available where needed.

The first students to undergo the two-day Bootcamp were from the Oulu University of Applied Sciences iVET teacher-training programme. The students' reactions to this experience have been positive. One student commented:

It is always important to reflect [on] our assumptions. It is easy to fall back and hide behind a belief that technology is either something that makes learning happen or is something of a hindrance.

A teacher undergoing the Bootcamp described the experience as “fruitful,” saying,

The use of [the] Qrafter application at the end was a new experience for me. I would also like to try to use it in my workplace, as it seems to be interesting and useful to scan and parse the contents of QR codes. The QR codes can be used to link to a website, text message, email, video, audio or any other useful information.

Conclusion

Omnia aims at being a forerunner in developing TVET. In 2013, the Ministry of Education and Culture awarded Omnia the National Quality Award with special recognition for entrepreneurial learning. In the same year, InnoOmnia received a national award for promoting innovation in learning. Omnia's approach has also gained a lot of international attention. It has been showcased by the European Training Foundation in Brussels as one of the 12 best entrepreneurship-promoting models from across the globe, its learning initiatives have been showcased in online promotions of micro innovation practices in ICT for learning and it is also co-developing vocational training in Egypt and Kosovo through EU twinning projects.

Omnia's approach to 21st-century learning is taking place through a centralised development hub — the living lab that is InnoOmnia. This approach has proven to be an effective route to the quick adoption of new learning environments and other innovations. At InnoOmnia, everyone is a learner and a teacher — learning is designed to be an enjoyable, engaging and challenging process in innovative learning environments that bring together students, staff and entrepreneurs. However, a continuing challenge is that innovations being developed in InnoOmnia are not always easy to integrate and scale into Omnia as a whole.

The design of a development unit as an entrepreneurial living lab has brought several benefits. Innovations in eLearning are closely tied with the needs of local

employers, sometimes serving multiple purposes. For example, the LOL learning platform works as an innovative eLearning instrument as well as a service for local small businesses. Scaling the pilot projects into Omnia's various study programmes, at both a national and an international scale, will be a next step in the development process.

A number of traditional silos have been broken in order to build the co-learning environment, and the transition has not been painless. Issues arising from community borders, operational culture, structures and leadership have all been identified. InnoOmnia will have to pay attention to these issues as it moves forward.

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Shafika Isaacs

Introduction

Huitfeldt and Jütting (2009) report not only that two thirds of sub-Saharan Africa's people are under 25 years of age, but also that up to 90 per cent of employment is in the informal economy. This has been confirmed by comments in a more recent study by the International Labour Organization (ILO, 2015) that "*informal employment is the standard condition among most youth in Sub-Saharan Africa*" because it is often their only choice for survival and livelihood. One of the key contributing factors to this problem is that in most African countries the formal Technical and Vocational Education and Training (TVET) system has been losing its ability to provide adequate skills training to enhance the employability of youth and women, due to low budgets, inadequate infrastructure, and out-of-date materials and pedagogy.

The discourse on the transformation of African TVET required to make it more responsive to the needs of the 21st century includes the optimistic view that rapid changes in the educational technology landscape and their adoption, not only by teachers but also by entire institutions and national systems, can help address Africa's highly complex education and skills development challenges. The vision of digital technologies providing equitable access to quality, locally relevant TVET, especially for economically and socially excluded communities, is one shared by the African Union (2014), Commonwealth of Learning (2010), UNESCO-UNEVOC (2007), Mead Richardson (2011) and many others. A two-week UNESCO-UNEVOC e-forum on the implications of the information and communication technology (ICT) revolution for TVET (Kafka, 2013) highlighted the need to incorporate ICTs into TVET and raised concerns that teachers may not always be prepared to use ICTs in their teaching.

In response to these findings, the Innovation in Vocational Education and Skills Training in Africa (INVEST Africa) programme was established in 2010 by the Commonwealth of Learning (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-based teaching and learning were seen to be among the critical challenges in transforming African TVET. Therefore, the aims of INVEST Africa were to develop capacity in the use of educational media and technology in CAPA member institutions in order to:

- Expand access to TVET to the informal sector.
- Help the huge numbers of poorly educated, frustrated and unemployed youth who are “locked out” of the formal skills training systems.
- Address the unequal training opportunities fostered by inequities based on geographical location, gender and socio-economic factors.
- Improve the quality of TVET offerings in general.

Through the application of readiness criteria, a baseline dataset was established against four dimensions: strategic, organisational, technical and pedagogic. Using these criteria, institutions were selected on the basis of their perceived readiness for new, flexible approaches to TVET delivery. A readiness profile was developed for each institution and the institutional teams set about improving the weaker areas of their profiles. The institutional managers, administrators and teachers participated in capacity building by means of online training through the COL Learning Management System (LMS), workshops, institutional visits and an online community of practice for interaction and collaboration with the COL INVEST Team and other TVET experts. COL also assisted the partner institutions with their ICT infrastructure.

The partnering institutes then undertook a range of development activities to establish flexible and blended approaches to programme provision in their particular local and national contexts. These included setting departmental and institutional targets for the introduction of new courses; engaging with national policy makers; enhancing existing technical infrastructure; training staff in the uses of technology and educational media in teaching and learning; conducting market research and feasibility studies among the local communities; and developing new short courses.

By 2015, INVEST Africa had evolved into a partnership and community of practice between COL and 13 TVET institutions in seven African countries.¹ The move to applying flexible and blended approaches to skills development turned out to be a lengthy and challenging process of determining what worked in each particular institutional and national context. It was found that despite all the interventions, the majority of teachers in these institutions continued to be what Rogers (1962) characterised as “laggards.” That is to say, they were resistant to change, demonstrated either a lack of awareness of digital technologies or technophobia, had their minds set on delivering a traditional curriculum in time-honoured ways, and were risk-averse. These views and experiences were clearly expressed through interviews and focus group discussions with teachers and principals in evaluations of INVEST Africa between 2012 and 2015 (Isaacs, 2015; Isaacs and

1 Ghana, Kenya, Mozambique, Nigeria, Tanzania, Uganda and Zambia.

Mead Richardson, 2012, 2013, 2014). During the course of these exchanges, many of the TVET principals referred to the deep attachment of many of their teachers to their “yellow notes” — the aging, fading teaching notes that many of them had used to deliver their lectures ever since their days of teacher training. In some instances, the teachers even copied and sold these notes to their students, thus further replicating the often out-of-date knowledge, practices and ways of thinking. Edwin Tarno, the principal of the Rift Valley Technical Training Institute in Kenya, noted:

Our teachers teach the way they have been taught and the challenge is to convince them that [flexible and blended learning] will allow them to teach better and that it is in their best interest. (Personal communication, December 2014)

But it was not only in the adoption and use of digital technologies and educational media that the teachers were recalcitrant. Essentially, the majority of them were shown to be determined to hold onto the traditional curriculum and conventional, teacher-centred, lecture-style, didactic ways of “transferring knowledge” to the learners; the use of textbooks; and recall-based examinations. Mead Richardson (2012), who has provided much of the thought leadership on INVEST Africa, observed that:

For many staff, the “hegemony” of traditional approaches to curriculum development is difficult to overcome. Across all countries/institutions, the emphasis on a taught syllabus and final examinations, centrally controlled, is a barrier to wider flexible approaches within the nationally approved portfolio of full-time courses. (p. 3)

Rogers (1962) posited that four key elements influence the spread of innovations from the early adopters to the majority of users: the innovation itself, the communication channels used, time and the social system. The attitudes and behaviour of the majority of TVET teachers indicated the need for transformation in the entire structure and system of the institutions to the point where the number of adopters would ensure that the innovation would be self-sustaining.

This case study describes how INVEST Africa has used Rogers’s diffusion of innovation model to catalyse a shift to the adoption of flexible and blended means of delivery at two of its partner institutions involved in INVEST Africa: the Rift Valley Teacher Training Institute in Kenya and the Technical and Vocational Teachers College in Zambia. These two institutes are highlighted because of their good practices in institutional change towards adopting technology-enabled flexible and blended learning approaches.

INVEST Africa and Institutionalising ICT-based Methods

The INVEST Africa concept of ICT-based teaching and learning² concerns opening up systems through the development and use of open educational resources (OER) that are self-instructional and have open licences to:

2 In the INVEST Africa programme these methods were variously referred to as Flexible and Blended Learning (FAB), Flexible Skills Development (FSD) and Open and Flexible Distance Learning (ODFL). To be consistent with the other chapters in this book, the more commonly used terms such as ICT-based teaching and learning are used here.

- 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 combining or “blending” 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 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:

- The policy making and strategic planning to enable the integration of the new flexible and blended methods.
- The organisational structures to enable the development and delivery of these new forms of learning and teaching.
- The technology infrastructure to support the management and optimal use of digital technologies and educational media to 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 institutionalised gender biases by mainstreaming gender equity and encouraging the recruitment of girls and women into male-dominated technical and vocational areas. (See 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 institutionalise the new forms of development and delivery and install the technology and infrastructure as shown in Table 1. Between 2012 and 2015, 142 Rift Valley and 132 Zambian college managers and staff were involved in COL-supported activities designed to develop their knowledge and skills. These activities included workshops on developing institutional policies and plans and courses on leadership and technical issues; workshops on developing and using OER; online courses on managing alternative means of delivery and classroom uses of PowerPoint; workshops on gender issues and the need for gender mainstreaming; and annual meetings of TVET principals, policy makers and the

online community of practice for sharing experiences and ideas. In these ways, the leaders and staff in these and other INVEST institutions were systematically and continuously provided with opportunities to develop the conceptual understanding and practical skills needed for transforming their operations.

Table 1: 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
Policy making and strategic planning	<p>Developed policy statements and a strategic plan including a commitment to ICT-based and blended learning.</p> <p>Developed an ICT policy that governs equitable and fair use of all computing resources.</p> <p>Identified the actions to be taken in adopting these alternative means of delivery.</p>	<p>Amended the existing open and distance learning policy statement in June 2013 to include flexible and blended approaches.</p> <p>Established an ICT policy that encourages all staff and students to use ICT.</p>
Organisational structures	<p>Identified a champion for the new methods of teaching and learning.</p> <p>Established an ICT Office and a Flexible and Blended Learning Office as part of the Office of Academic Deputy Principal.</p>	<p>Established an Open and Distance Learning Department.</p> <p>Established champion teams in the various teaching departments.</p> <p>Created collaborative partnerships with other institutions to create space for their distance learning students.</p>
ICT infrastructure	<p>PC labs have 300 PCs and another that is Internet-enabled with 200 PCs.</p> <p>Access to 2 MB Internet connection and competent technical support.</p> <p>All HOD's offices have both a desktop computer and a laptop.</p> <p>Every departmental staffroom has at least two computers accessible to teachers.</p> <p>An e-Library.</p> <p>A SMART Board.</p> <p>CCTV cameras to secure ICT infrastructure.</p> <p>Moodle platform and two classrooms equipped with networking infrastructure.</p> <p>New online enrolment system.</p>	<p>Established an ICT Department.</p> <p>Established a laptop loan scheme to improve staff access to ICT.</p> <p>Support for staff in lesson planning and delivery.</p> <p>Provision of campus-wide Wi-Fi access.</p> <p>New online enrolment system.</p>
Gender equity	<p>Appointed a co-ordinator for the Women in TVET (WITED) Chapter.</p> <p>Formation of WITED Chapter and Gender Mainstreaming Committees.</p>	<p>Launched the WITED Chapter.</p> <p>Achieved a higher female student enrolment in the Design and Technology course.</p>
Informal sector learners	<p>Seven courses developed for 315 informal sector learners.</p>	<p>Thirty youth participating in an initial new non-formal Carpentry and Joinery course.</p> <p>Recruited a second cohort of 30 students in the second year.</p>

Both colleges subsequently reported an increase in student numbers, which they attributed to their adoption of the ICT-based and blended learning methodologies. They both also developed new courses in the form of OER designed to be used in flexible learning settings. However, while both institutions could be said to have embarked on their journeys to transformation, the road ahead clearly remained paved with challenges. The lack of widespread and reliable Internet access limited the optimal use of Internet-dependent applications and platforms (a problem that both institutions are still trying to resolve). Moreover, the majority of teachers in both institutions still held firmly to their “yellow notes.” To reach this more conservative group of teachers, INVEST Africa decided to identify, encourage and support “champions” and “early adopters” to model the desired behaviours and influence their peers.

The Early Adopters

Rogers (1962) suggests that innovations come about through the actions of people who are willing to take risks, have high social status and financial liquidity, and are in close contact with scientific sources and other innovators. Clearly, COL and the INVEST Africa team were in a strong position in this regard. But by using what Rogers terms “early adopters,” those with the highest degree of opinion leadership among the managers and staff, it was hoped to influence an “early majority” into adopting the innovations, and then the “late majority,” those who were originally sceptical about the changes, would eventually come to see the benefits of adopting them.

One of the early adopters at the Rift Valley Institute was Tiony Apdi Kirwa. He was a 37-year-old teacher of mechanical engineering who had been teaching for ten years and had formerly used the “yellow notes” in his teaching. When his college joined INVEST in 2013, he was one of those who volunteered to participate in the introductory workshops, an online course on managing flexible and blended learning, a week-long policy-making workshop, a gender mainstreaming workshop and training sessions on Moodle and eLearning. After this, he was one of the first to abandon his “yellow notes,” work closely with the COL consultants to help bring about change and use ICTs in his mechanical engineering workshops. He became convinced that this better prepared his students for the world of work, saying:

My students have heightened interest in topics when I incorporate educational media in teaching. They want to replay the videos and watch the clips more times. They then want to practically apply the concept in real life . . . I have helped many [students] to open e-mail addresses and use them for class communication. I insist that training in TVET is not necessarily for passing national exams, but more importantly to acquire practical skills for the world of work. (Personal communication, May 2014)

His Production Technology and Practice course, which contributes towards a Diploma Certificate in Mechanical Engineering Production, involves both classroom theory and workshop practice sessions in which the students have to develop knowledge of and skills in using both the traditional lathes and milling and drilling equipment and the newer electro-chemical machines. He made

considerable efforts to find videos and other resources to show the students why and how to use the right tools:

All media I use have been adapted to suit my classroom use. Downloaded from supplier or vendor sites, or received from other colleagues in the field. I often search in relevant sites and ask friends and professional colleagues to get electronic media relevant to my course. I prepare them to suit my classroom use and present to my students in a way that flows with the syllabus. Whenever I travel or do industry visits, I also collect relevant media for classroom use. (Personal communication, May 2014)

Kirwa became highly motivated to learn as much as he could about new and better ways to teach and lead others by example.

His institution joined INVEST in 2013. By December 2014, 34 of its 160 teachers were using the e-Library to prepare their lessons and integrating audio, video and SMART Boards in their lessons. This was a consequence of the teachers having received “cascading training” — a methodology that builds skills in trainers so that they can train others. The institutions’ early adopters, including Kirwa, had taken it upon themselves not only to change their classroom practices but also to help their fellow teachers change theirs. The majority of teachers still found change challenging, but Kirwa’s attitude was:

In working with the rest of the teachers who are struggling, our job is to make them feel safe about learning new things. (Personal communication, May 2014)

In May 2015, Kirwa and some of his own staff initiated training in Moodle for the other staff and set up a WhatsApp messenger group where he and the other early adopters could share and reflect upon their experiences with the rest of the staff. Kirwa says he became passionate about improving the way he taught and that this drove him to search for better ways to train and help others. He also says he feels privileged to have had such exposure to a wide range of tools and methods through INVEST workshops, meetings and online discussions and to be able to apply his learning by training his colleagues.

Twaambo Chiinza is a 32-year-old female lecturer in ICT and an early adopter and champion of ICT at the Technical and Vocational Teachers College in Zambia. She was one of the few women lecturers in ICT in the country and had only been at the college for three years (2011–2014). She took every opportunity to learn more through INVEST’s online course in flexible teaching and learning in TVET and Moodle administration. These taught her more about the value of using audio in on-campus and off-campus presentations, making study materials more interactive, giving learners the tools they needed to find and use ICTs in teaching and learning, and how to develop and manage courses using the LMS. Now she says:

My notes are on PowerPoint for all my lessons. [I] use the computer in the use of packages and programming with the learners. [I] send them feedback through email. [I] have a virtual platform on Edmodo for my Design and Technology classes; I have a group on Facebook for the third years . . . I use the Internet to access learning materials (ebookbrowse, bookboon and other free sites for books). I

teach students in all my classes how to access learning material . . .
[I] use videos to show computer networks and equipment. The aim is to empower learners in the use of ICT and its benefits. (Personal communication, May 2014)

She acknowledges that being the ICT teacher places her at an advantage because she is familiar with digital technologies and is already seeing the benefits of applying these ideas in her own work. She attributes the drop in her students' failure rate from 40 per cent to 5 per cent to the more flexible and interesting approaches that she is adopting, the access to more widely sourced materials that explain concepts better, the opportunities for student-tutor contact outside class hours, recognition of learning differences and learners' differences, and the continual learning by both the students and herself. She believes that adopting these new methods has affected her efficiency and effectiveness as a teacher for the better. Not only is she better able to communicate facts, processes and ideas using various media, but by using more self-learning and online communications she is able to get to know her students at a more personal level than she would in a conventional teacher-centred classroom (some of her distance learning classes have as many as 150 students).

Her institution joined INVEST in 2010. By December 2014, 12 of the 36 teachers were integrating educational media and technology in their classrooms and enabling their students to produce videos on topics and projects that allowed them to learn, explore, discover and be creative. Like Kirwa, Chiinza was also involved in the "cascading training" that helped to bring this about. But both Kirwa and Chiinza acknowledge that the support provided by their principals has been paramount to their success.

Principals as Leaders

In an interview in 2013, Alison Mead Richardson, the INVEST co-ordinator, stated that the critical success factor in integrating ICT-based and blended on- and off-campus means of delivery is the commitment and leadership of an institution's principal. Johan Fouche, the COL consultant who trained both institutions' managers and staff on the use of Moodle, said:

There is a leadership desire to be winners, to be the best. (Personal communication, May 2014)

The Rift Valley Teacher Training Institute is located in the county of Uasin Gishu in Kenya, home to the world-renowned Kenyan athletes. Principal Edwin Tarno believes that their institution is imbued with the same winning spirit. Sangster Jere, the principal of the Zambian Technical and Vocational Teachers College, has been described as a "lioness of a leader." With quiet strength and determination, she provides clear guidance, direction and support to her staff in regard to the use of ICTs and flexible methods and reports regularly to the INVEST Africa community about her work, the progress she is making and the challenges she is experiencing. Both she and Edwin Tarno lead by "walking the talk" and being visible and active early adopters. They participate vocally in training sessions and encourage their staff with motivational prayers and proverbs. And not only have they taken on full ownership of the innovative approaches, they have also

championed and attracted local partners, including government ministries, other TVET institutions, donor agencies and private sector institutions.

Government Partnership and Support

Both principals and champions acknowledge the supportive role played by their respective governments and national TVET ministries in encouraging their institutions to adopt the new methods. Tiony Apdi Kirwa says:

INVEST has been an important change driver . . . but we would not be able to do it without our partnership with our national Ministry. (Personal communication, April 2015)

In 2013, the Kenyan government enacted the TVET Act to address some of the weaknesses in the system. Kenya has also made some significant gains in integrating entrepreneurship in TVET and increasing female enrolment in the sector. Another 60 technical training institutes are to be built in 2015, with a further 200 planned for future years. These new institutions will add to the existing 660 institutions in the country. The Ministry of Higher Education, Science and Technology has also provided ICT infrastructure support for these institutes.

The policy environment in Zambia is also becoming more conducive to the adoption of open, distance and flexible learning. A national policy for these means of delivery and a national eLearning strategy are being prepared at the time of writing by the Ministry of Education, and the Ministry of Communications and Transport has developed a national ICT policy. Together these will provide an enabling environment for TVET institutions to advance in the educational applications of ICTs (Konayama, 2013).

Conclusion

The experiences of these two TVET institutions provide insights and lessons for institutional change from an African perspective. The benefits that both institutions have gained come from training and supporting the early adopters to become champions, the use of cascading training to diffuse knowledge and skills, the strong will to win and lead shown by the institutional leaders and the support of the national governments. These benefits include an increase in student numbers and a reduction in dropouts and failures, an increase in activities promoting gender equity, expanded access to TVET through the development of new non-formal courses for informal sector learners, and an increasing number of teachers using OER and other educational media in their classroom-based and off-campus programmes. Furthermore, their adoption of policies and strategies to guide the implementation of their plans for more equitable and flexible means of provision provide a critical advantage in framing the transformation process.

In addition, their experiences, and those of the other INVEST Africa programmes, demonstrate the importance of debate — not only about the delivery vehicles but also about the policies, strategies and practices needed to make TVET more relevant by opening up new ways of teaching, the so-called 21st-century pedagogies, that enable critical thinking, enquiry-based learning, collaborative learning and other life skills and vocational skills development that will prepare

African youth for living and working in an increasingly complex and uncertain world.

It is encouraging to see evidence of the teachers applying learner-centred approaches to technology integration — encouraging learners to produce videos as a means of learning, to use OER and to learn independently and collaboratively, for example. These may still be isolated cases, but they reflect a shift in attitudes and practices. However, as indicated by Isaacs (2015), much of the pedagogical practice of TVET teachers in INVEST Africa really only amounts to layering digital technologies on top of the deeply embedded traditional lecture-style, teacher-centred model of teaching in TVET by using, for example, PowerPoint presentations in lectures. One of the reasons for this may be that curricula and assessments are structured in accordance with the time-honoured standards.

More debate and enquiry are needed to achieve a shared understanding of and improved practice in regard to the national and institutional policies needed to reform teaching and learning and make use of digital technologies in ways appropriate to the psycho-cultural circumstances and practices of the teachers and learners and everyday realities of the classroom, workshop and workplace. The work of Koehler and Mishra (2006, 2008, 2009) and their TPACK (Technological Pedagogical Content Knowledge) model, the UNESCO ICT Competency Framework for Teachers,³ which applies equally to TVET teachers (UNESCO, 2011), and the Commonwealth Certificate for Teacher ICT Integration are worthy of closer scrutiny and greater use by TVET planners and providers.

As INVEST Africa consultants and the early adopters have found, debates on the need for and nature of transformative institutional change in African contexts can become quite heated. Not everyone accepts the need for embedding technology in teaching, transforming gender relations and challenging gender stereotypes, but such discussions are essential in order to unearth a wider range of views and perspectives. The process of change and transformation in TVET is emergent, and the requisite shifts in attitudes and behaviours will need open, critical and honest conversations and contestations that are inclusive in ways that sweep in multiple viewpoints and perspectives.

It is also essential to not assume that there is a shared understanding of the nature or implications of the mercurial change in the digital technologies landscape, as well as how these are likely to influence education and training and should be best managed. Much of the current thinking and activity rests on the older, Web 1.0 paradigm, but this is undergoing a dramatic sea change. The rise of the mobile Internet, social networking, Massive Open Online Courses (MOOCs), 3D printing, gaming, big data and so on are ushering in a new learning paradigm characterised by increased mobility, flexibility, openness, convergence and personalisation in learning and teaching. These disrupt the old ways of delivering TVET and open up new, previously unimagined possibilities for teaching and learning, curriculum development and assessment, student enrolment, administration and management, governance, and communication between TVET and employers and industry. All of these will call for new policies, strategies and strong leadership

3 The UNESCO ICT Competency Framework provides a global framework against which teacher competencies in the use of digital technologies to support learning and teaching can be assessed. While some governments have used this model, its applicability is still being debated. See <http://unesdoc.unesco.org/images/0021/002134/213475e.pdf>

for catalysing institutional transformation and going far beyond the shift from “yellow notes” to OER. Whether such change should be incremental, evolutionary or revolutionary also becomes a crucial part of the debate about TVET’s future role in Africa.

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Mr Tiony Apdi Kirwa, Lecturer, Rift Valley Technical Training Institute.

Ms Sangster Jere, Principal, Technical Vocational Teacher College.

Dr Alison Mead Richardson, Education Specialist, The Commonwealth of Learning.

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Cambodia: The TVET Academy

Pascal Mabilie

Introduction

There are over 15 million people living in Cambodia today. The incidence of poverty in the country (individuals surviving on less than US\$2 per day) is estimated at 40 per cent overall, and even higher in rural areas where 68 per cent of the population lives (CIA, 2015).

The Cambodian government spends only around 2.6 per cent of the US\$15,200 million GDP on education. In 2007, while around 90 per cent of children completed primary education, only 35 per cent completed lower-secondary education and only 15 per cent progressed to upper-secondary education and beyond. This left around 3.1 million youngsters, or 85 per cent of 15–24-year-olds, not receiving any advanced schooling. The situation is even worse when it comes to technical and vocational training, where the number of enrolled students aged between 14 and 20 barely accounts for 2 per cent of this population segment. This results in a very high percentage of the Cambodian labour force lacking any formal trades qualifications. It should also be noted that the vast majority of university students come from wealthy families living in the cities, whereas the majority of basic-level technicians come from low-income families.

Figure 1 compares the actual education levels of the Cambodian population (2007) with those of an ideally educated society as defined by the International Labour Organization (ILO). It illustrates the radical educational imbalance — and in particular, the dramatic shortfall in vocational training — better than any words can do.

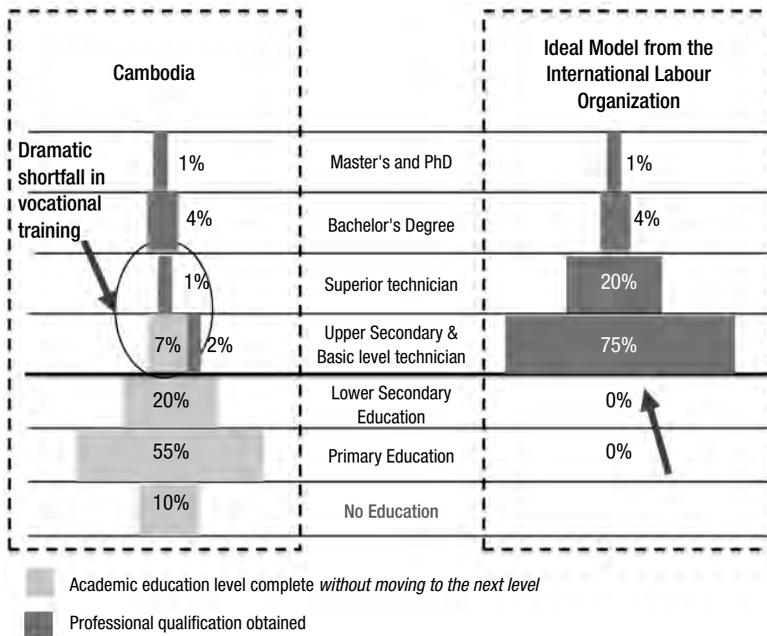


Figure 1: Participation in education in Cambodia compared with the ILO's ideal mode

Why the TVET Academy Focuses on Vocational Training

The TVET Academy is a French not-for-profit NGO whose mission is to help with vocational training of disadvantaged youth in developing countries. The NGO focuses on Technical and Vocational Education and Training (TVET) because, despite its many current shortcomings, poor levels of funding and governments' favouring higher education, this sector is still the best pathway to employment and social integration for young people in developing countries. In this chapter, the word "we" refers to the TVET Academy staff.

When it comes to Cambodia, UNESCO (2013) reports that, confronted by budgetary pressures, the government continues to find difficulty in providing adequate, stable financing for public TVET institutions and skills development in general. The low level of resources allocated to TVET to support non-formal and formal initial and continuing vocational learning in schools and training centres is a crucial policy issue.

The Cambodian Ministry of Labour and Vocational Training (MoLVT) operates five Regional Training Centres (RTCs) and 34 Provincial Training Centres (PTCs), which are providers of non-formal, one- or two-week courses in basic agriculture (46 per cent of the courses) and four- or six-month-long courses on technical trades (15 per cent), textiles-garments (9 per cent), hairdressing-beauty (5 per cent) and computing, tourism, hospitality, business, art and languages (the remaining 25 per cent). Private providers and NGOs provide further non-formal training in agriculture, crafts, textiles and garments, but there is no record of the participation rates in these courses.

These 39 Training Centres host an average of 120 students per year, but their chronic lack of equipment means they are clearly ill-equipped to do so. There is also a severe shortage of highly motivated, well-qualified and experienced TVET teachers. Some of the TVET teachers are former high school teachers who have been reassigned to teach technical subjects as schools have expanded to include vocational training. Some are fresh from university and, while they may know the theory of the subjects they teach, they have never worked in industry. Others have been contracted locally because of their work experience but are lacking in pedagogical skills. In 2007, these teachers were paid less than US\$100 a month — low by local standards — and were inevitably forced to take on second and third jobs in order to be able to support their families. Unable to keep up with changes in work practices and technology, working in classrooms and workshops that are poorly resourced and maintained, with little or no incentive to improve, and left to their own devices without any national standards to work to, these teachers simply keep teaching the same outdated content year after year. These factors clearly have a negative impact on their commitment and performance and give employers little confidence in the students' abilities. There is also a lack of internships in local firms.

In addition, the students often lack interest and motivation. Many students daydream of obtaining comfortable office jobs and regard TVET as a second choice, a second-rate education that will only take them into difficult, dangerous, dirty and poorly paid jobs. The few who do attend vocational training centres realise within only a few weeks that the quality of the training they are receiving will serve them poorly. In some cases, it is difficult for them to get to and from their classes because of the lack or cost of public transport, and it can be dangerous for female students to travel home in the dark after evening classes. Many families, particularly in the rural areas, pressure students to stay at home to supplement the family income and help out with household duties. As a consequence, dropout and absenteeism rates are high.

The Concept of the TVET Academy

Prominent among the problems affecting vocational training in developing countries is the shortage of skilled and motivated teachers. But whatever the subject, there are always a few outstanding teachers, often teaching in the better training institutions in the major cities. Being a team of IT engineers, we asked ourselves: Isn't there a way of using modern technology to bring the know-how of these good teachers to their colleagues in the remote areas? What if the country's best teachers and professionals could be video-recorded and the less qualified teachers were provided with the videos? Would they be able to use these recordings for self-training and to enhance their classes? And what if we organised forums and videoconferences for teachers of the same subjects so they could share best practices in real time? How would this affect the other problems? Table 1 indicates our perceptions of the possible impact of such a project on the various problems we had identified.

Table 1: Ranking of main problems affecting vocational training in Cambodia

Ranking of main problems affecting vocational training in Cambodia	Criticality	Project impact
Shortage of skilled teachers in terms of both technical competencies and pedagogy	High	High
Shortage of dedicated and motivated teachers (essentially due to insufficient salaries)	Medium	Medium
Lack of infrastructure and well-equipped workshops	High	None
Lack of student motivation for vocational training	High	Medium
Lack of internships in local enterprises	High	None
Inadequacy of vocational training in terms of real market requirements	Medium	High
Lack of standards in terms of both training content and student certification	Medium	High
Students' absenteeism through lack of motivation, insecurity, transportation, family support, resources, etc.	Medium	None

The Cambodia Pilot Project

Our pilot project in Cambodia was primarily designed to serve the teachers and students in vocational training centres at a distance from the main centres. But it was also seen as having the potential to benefit NGOs providing training for disadvantaged groups — for example, women seeking to learn sewing or embroidery in order to make a living, and young adults who had dropped out of school but who could gain knowledge and skills by viewing our training videos over the Internet. The project was seen as having the potential to benefit tens of thousands of people in need of technical education.

Services

The project was conceived as providing three main sets of services:

- A database of **free open educational resources (OER)**. These were to be mostly in the form of quality video recordings in Khmer of theoretical and practical vocational lessons taught by “benchmark teachers” whose teaching served as a standard and were to serve multiple purposes. First and most important, they were to be used by the local teachers for self-training and help in preparing their classes more effectively and efficiently. Second, teachers could use them in their teaching for the benefit of their students, showing them on a video projector. Third, the students themselves could review these videos after class for the purposes of revision and reinforcement. Over the course of this five-year project (2009–2013) we produced over 200 hours of videos supporting four months of full-time (40 hours per week) study in 12 different subjects.
- **Videoconferenced tutoring**. There is no such thing as a perfect training video that covers a subject from every perspective in sufficient

detail and lasts forever. Technology evolves, markets evolve and technical skills requirements evolve. So it was necessary to also provide opportunities for online real-time interaction between the benchmark teachers and their colleagues out in the training centres to give the latter opportunities to ask questions about points they misunderstood in or thought were missing from the videos and discuss opportunities for improving their teaching. We therefore scheduled weekly videoconferences by topic.

- **Internet access.** Clearly the beneficiaries needed some form of Internet access to search for educational content and self-train; share information with friends and colleagues through emails, chat, Skype and so on; manage their own private affairs; break their sense of isolation; and give them the feeling of finally being connected to the rest of the world.

Partnerships and Topics

We established various partnerships to ensure project acceptance by local people and quality of deliverables as well as to share the project costs.

First, we signed a partnership agreement with the MoLVT that defined our respective roles and responsibilities, prioritised the topics to be recorded on the database and determined where the project would be implemented.

Second, we partnered with some of the more highly thought-of public, private or NGO training institutions that were likely to provide the benchmark teachers, namely, the Don Bosco Foundation of Cambodia (DBFC)¹ for the motorbike, automotive and air conditioning, computer basics, electricity house wiring, small engines and welding courses; Pour un Sourire d'Enfant (PSE)² for courses in hairdressing and beauty; the Takeo and Siemreap Provincial Training Centres for the course in sewing; and a few other providers for various other courses.

Third, we partnered with Smart Mobile, a telecommunications operator, which provided free Internet and mobile phones to the outlying training centres.

Sites Covered

Following the Ministry's recommendations, we installed our systems in eight provincial capitals across the country: Siemreap, Battambang, Takeo, Kampot, Svay Rieng, Sihanoukville, Pursat and Kompong Thom, as shown in the map on the following page.

1 A national and international organisation founded by the Salesians of Don Bosco to train orphans and poor youth in technical skills and to support children in continuing their basic and secondary education so that they can escape the circle of poverty and contribute to positive social change in their country.

2 A French NGO created by Christian and Marie-France Pallières to help disadvantaged children and school dropouts in Cambodia.



Figure 2: The locations of the selected Regional and Provincial Training Centres
 (Source: d-maps.com: http://d-maps.com/carte.php?num_car=15264&lang=en)

Equipment

There were several hardware architecture options for implementing the system in the training centres. We had envisaged remotely located teachers streaming videos over the Internet directly onto their workshop computers from a central server located in our Phnom Penh office. However, given the current Internet reliability and speeds in Cambodia, it became clear to us that this was not an option. Videos would freeze in the middle of a lesson every time the Internet connection was interrupted. We therefore decided to duplicate our central video server in each training centre and installed a local wireless LAN covering all the centre’s workshops. This guaranteed high-quality video streaming and automatic server updates via VPN synchronisation over the Internet, but it came with high maintenance costs because an IT technician had to travel out to the training centres every time there was problem on the server, a Linux machine. In the final configuration, each training centre was equipped with:

- Internet access with a wireless LAN.
- One video server with VPN synchronisation to the central server.
- One computer and projector in each workshop enabling video streaming from the local video server.

Altogether this configuration cost roughly US\$5,000 per training centre comprising four workshops.

Between 2009 and 2014, the Asian Development Bank (ADB) had allocated a US\$25 million grant to the MoLVT to revamp vocational training in Cambodia. Unfortunately, we were not included in the original budget allocation plan as we had shown up after it was finalised and consequently we had to fund the IT equipment needed for our project in the five RTCs during 2010, 2011 and 2012. In 2012, when we proposed extending the project to another three PTCs, we managed to convince the Ministry’s officials to pay for the necessary computers. However, it took six months for these computers to be delivered — and when they did arrive, it transpired that the Ministry was intending to send them to be installed at the five RTCs we had already equipped. When we asked the Ministry to redirect these computers to the three PTCs, we were told that this was impossible because equipping these centres had not been part of the original ADB plan. After some intense debates, we finally gave up on the matter and decided to transfer our own computers from the RTCs to the PTCs and let the Ministry install the new equipment in the RTCs. However, we were then informed that this was also impossible because the directors of the RTCs would feel humiliated if we withdrew the computers we had installed. We argued that these computers belonged to us and that we would actually be replacing them with brand new ones. The Ministry’s response was that for Cambodians, installing equipment is equivalent to donating it and that withdrawing the equipment would be taken as an insult by the centres’ directors and would signify that they had failed in executing the TVET Academy project. Such can be the trials and tribulations of new NGOs pioneering TVET transformation in developing countries.

The Website User Interface

A user-friendly interface is one of the keys to success in eLearning. We therefore selected Joomla, a free and open-source Content Management System (CMS) for publishing the Web content because of its nice “look and feel” features. The library is available at <http://trainingcontents.tvetacademy.org>.



Figure 3: Training page of Connected Schools (former name of the TVET Academy)

Evaluating the Project

During 2011, 2012 and 2013, the classes we supported represented around 700 students per year. We obtained feedback from 520 students who had received training in 2012 and another 739 who had attended the classes in 2013. Most of these students were aged between 15 and 25. Forty-five per cent of them were girls and women, the majority of whom had been taking sewing lessons because of the good job prospects in the garment factories, which employ almost 300,000 women.

According to these students, the use of the videos had very positive impacts: 93 per cent of the students claimed that their motivation was “much higher” or “higher” and 91 per cent said that their understanding of the topics was “much better” or “better.” All of the students reported that they much preferred their teachers to use the videos during the classes and 97 per cent said that they would have liked to have seen greater use of these videos. Sixty-nine per cent of the students reported that they found the videos very useful because they “showed more details” than the teachers usually did, 53 per cent because they “helped them participate more” and “encouraged them to ask more questions,” 41 per cent because the projectors and speakers enabled them to “hear and see the material better,” and 39 per cent because “the explanations were better” on the videos. On a scale of 1–10, the students rated the overall usefulness of the project at 8.3.

Six months after their training, we found that three quarters of those with whom we were able to make contact were either working, mostly in self-employment, or continuing with their studies.

Knowing that the value and accuracy of students’ self-assessments can always be questionable, we also decided to measure the educational outcomes. The problem here was that there were no national or other formal examinations with which to compare the students’ performance, so we lacked a historical baseline. We therefore hired some teachers to help us develop examinations which we then conducted in 15 comparable PTCs, testing 401 students in centres we had been working with and 359 students in centres that had not been involved in our project. We found that the average examination score for those in the first group was 23 per cent higher than in the latter group.

We asked the teachers involved in the project to score various attributes of the project on a scale of 1–10. They gave an 8.5 rating for the ease of use of the website, around 8 for the quality of the pictures and sound and slightly less than 8 for the quality of the explanations in the videos and their relevance to the course. The latter score suggested some scope for improvement in the instructional design and pedagogy. However, we were pleased to find that the overall rating of the usefulness of the project was 8.5 out of 10. The teachers also reported to us that the system had increased their motivation, improved their teaching and had a significant impact on the students’ understanding of their subjects.

The Project Handover

Our intention had always been to pilot this project to see whether our system could improve the quality of TVET provision at little incremental cost and then hand the project over to the Ministry, which we did by providing four one-week

training sessions for two of the Ministry's IT technicians, donating US\$35,000 worth of computers, servers, projectors, routers, telephones and so on, and handing over the entire vocational training videos library. Only the future will show how capable the Ministry is in maintaining this system.

As a backup solution, we also transferred the project to Don Bosco. The Don Bosco Technical School Kep has a centre for training senior technicians in computer science and social communications (which involves audiovisual content production). This, and the fact that the Director showed great enthusiasm for the project, left us feeling confident that the future of our system for Cambodian disadvantaged youth was assured.

Lessons Learned

Overall, despite all the hurdles, we felt that the project had been very successful. The evidence showed it had had a significant impact on the teachers' motivation and pedagogy and on the students' understanding, which had been measured objectively by means of formal examinations. Our reward was the joyful raising of hands by all the students when we asked how many of them preferred learning when the teachers used our videos.

Project Ownership by the Ministry of Labour and Vocational Training

Creating high-quality online TVET training resources for such projects is costly for developing countries and can therefore only be justified by large-scale deployment and continuous usage by large numbers of teachers and students. This calls for the involvement of the Ministry responsible for TVET. On their own, none of the private or NGO TVET providers will have sufficient schools, teachers and students to warrant the expense of such an approach. The Ministry therefore needs to own and drive the project. It should identify a well-qualified and well-experienced full-time leader to prioritise the needed course content ranked by market employment opportunities and demands, recruit the benchmark teachers to make the video recordings and drive the progressive deployment of the project nationwide. Unfortunately, it must be mentioned that our counterparts in the Ministry experienced some difficulty in transforming their initial enthusiasm for the project into proper execution throughout its duration. Most likely this project was not high enough on their priority list.

Funding the Training Centres

For all the potential benefits of IT, ultimately our strategy depends upon the teachers' motivation. But with teachers earning less than US\$100 a month, the number one priority of the teachers we worked with was earning enough money, not using modern technology to improve the quality of the students' learning. Having visited many developing countries over the last ten years, we can testify to this being a recurring problem; having spoken to many experts, there seems to be only one way of resolving it and that is for the training centres to become more self-sufficient rather than depending on government or overseas aid funding.

This has been achieved by a number of training schools, one of the most famous being the Fundación Paraguaya³ Escuela Agrícola, a 100 per cent self-sufficient school and the winner of multiple awards. It operates a “Learning by Doing, Selling and Earning” model, whereby self-sufficient productive business units are incorporated into the school. The students participate in the complete production cycle, including the marketing of products. This experience teaches them essential job skills, increases their self-esteem and motivates them to become entrepreneurs — and the earnings from the sales pay for the school’s operating costs.

Transforming a public, slow-paced and underperforming training centre into a fast-paced, profitable mixed training centre and enterprise like Fundación Paraguaya involves a radical cultural change for the centre’s management team. Recognising the need for training in these regards, we are now partnering with Fundación Paraguaya to develop multimedia training resources to show training school managers how to transform their institutions into self-sufficient centres. We are convinced that this paradigm shift is the only way to equip such centres in developing countries with the tools they need, pay the teachers better salaries and most important of all, improve the student employment rates (which at Fundación Paraguaya Escuela Agrícola is 100 per cent).

Teacher-friendly Technology

If teachers are to happily adopt the TVET Academy approach, the technology must be easy to use and reliable. It is unrealistic to expect, for example, a teacher of dressmaking without any technical support in a remote province to learn about and manipulate Windows 8 and cope with bugs and computer crashes. This will only frustrate her, embarrass her in front of her students and make her fearful of being accused of having broken the equipment and made to pay for it. Therefore, the equipment must be very robust and the user interface very easy to use. That is why we have redesigned the system to eliminate computers altogether and make it easy to transport and install, as detailed later in the chapter.

Matching the Training to Changing Market Needs

For some jobs, the market is evolving at a rapid pace. Obviously the automotive and IT industries change faster than the cooking industry. All TVET teachers have difficulty in keeping up with the changing requirements and technologies, but particularly if they are located in centres far from the major cities and towns in developing countries. To address this issue, we have now decided to video-record practical lessons with real professionals in actual workplace settings. This provides a much more realistic picture of the job requirements, tools and settings, and as circumstances and conditions change, it is relatively easy to re-edit the videos to be available online immediately, which is far quicker than commissioning, writing, illustrating, printing and distributing new text-based training materials.

3 The Fundación Paraguaya (Paraguayan Foundation) is a non-profit organisation that has pioneered microfinance, entrepreneurship and poverty elimination programmes in Paraguay and elsewhere in the world. Its Self-Sufficient Agricultural School, Entrepreneurial Education programme and Elimination of Poverty Semaphore have won international awards. It has 28 offices in Paraguay, two offices in Tanzania and a sister organisation in London, UK, called Teach a Man to Fish.

Project Costs

The so-called short trainings (four months) are typically free for the students but cost the Ministry around US\$550 per student. This is the historical cost independent of our project.

Table 2 shows our project costs over the five-year period 2009–2013, during which time around 2,500 students have benefited from the project. Our project adds cost to the training. The table below intends to quantify in per cent this additional cost versus the historical cost.

Table 2: Project costs over five years

	Total project costs over five years	Total project cost per student (2,500 students)	Project cost per student/historical training cost (US\$550)
Training content creation	US\$82,000	US\$32.80	5.9%
IT equipment purchase, installation and maintenance	US\$128,000	US\$51.20	9.3%
Total	US\$210,000	US\$84.00	15.2%

At first glance, the project cost per student ($\text{US\$}210,000 \div 2,500 = \text{US\$}84$) may appear quite high, but the cost-reduction opportunities are actually very significant.

The obvious way to reduce the Training Content Creation cost per student is to increase the number of students benefiting from the project. Indeed, once the training videos have been produced, it does not cost a single additional penny whether 1,000 or 10,000 students are watching them. In our case, unfortunately, the Ministry trains less than 2 per cent of Cambodia’s youth in its 39 RTCs and PTCs. In our forward planning for future projects, we have set a minimum of 500 learners per year — approximately 25 classrooms — to justify video-recording a new topic. Had we followed this rule in the Cambodian project, assuming a content validity life cycle of four years (i.e. 2,000 learners per topic), the content creation additional cost per student would have been down to less than 1 per cent of the historical training cost of 550\$ per student.

However, the IT equipment purchase, installation and maintenance costs of \$51.20 per student (9.3 per cent cost added) is another matter. This will not decrease with increased student numbers. This prompted us to find a radically different solution: eliminating the computer, server and Internet connection costs to achieve a tenfold cost reduction in equipment purchase and maintenance. Our new “US\$500 training centre” is based on one LED projector with an integrated navigator and media player shared between two teachers serving 40 students per year. Assuming a four-year life cycle without failure, this results in a cost per student of US\$3.13 — a 0.57 per cent additional cost to the historical training cost of \$550 per student.

Overall — that is, with the Ministry leading the project, an increased number of students for each subject and using the smarter yet cheaper equipment — this would bring the additional cost of the project down to 2 per cent of the historical training cost per student. This should then be compared to the 23 per cent examinations score improvement to fully justify the project from an economic standpoint.

Future Developments for the TVET Academy

Our project in Cambodia ended in May 2014. Since then, we have made many improvements to our TVET Academy while maintaining the principles of using OER.

Extending the User Base

As shown above, the benefits of our model depend upon its scalability. Extending the user base can only be achieved by using languages with a large speaker base — English, French and Spanish, for example, are spoken throughout most of Africa and Latin America. It might be argued that many disadvantaged youth in developing countries do not understand their own nations' official languages. However, they are accustomed to watching movies with subtitles in their mother tongues or dialects and so courseware creators can produce the programmes in these European languages and then either subtitle or dub them in local languages if necessary. This seems to have gained acceptance with local partners as the best compromise.

Contextualising Training Content by Country

Whatever the subject, not all of the contents will be appropriate in all countries. We therefore designed a user interface enabling any partner institution interested in creating their own version of a training programme to reuse generic sections from other TVET Academy sources as well as design and upload new content specific to their country's requirements.

This user interface is designed so that local partners can do this without any intervention from the central TVET Academy team other than a moderator's verification of the relevance and quality of the content prior to its release. In this way, any new training content can potentially be reused by tens of thousands of users.

Richer Content Development

As we identify needs, we develop videos not only on specific vocational and technical subjects but also on:

- Success stories: Videos of former students who have succeeded in life and work and can motivate students and potential students and help them see that they too can succeed in life through vocational training.
- Entrepreneurship training: Videos to help students become self-employed and start their own small enterprises, including business planning, costing and country-specific examples.

- Successful behaviours: Videos to sensitise students to the kinds of soft skills they need to develop to succeed in work and life.
- Sustainable development: Videos illustrating the green versions of various subjects (e.g. eco-construction, agro-ecology, etc.).
- Policy-maker and school manager training: Videos showing how to transform TVET institutions into self-sufficient systems.

Reducing the Complexity and Cost of the Technology

The Cambodian experience revealed some weaknesses in the technology we used, not least that the maintenance costs were high. For example, 10 per cent of the video projector lamps and computer hard disks needed to be replaced annually. But the weakest point was the Linux server and its network cards which kept failing due to the unstable electricity power supplies and lightning strikes. As a consequence of this, one of our IT technicians was fully occupied maintaining these systems in the eight training centres.

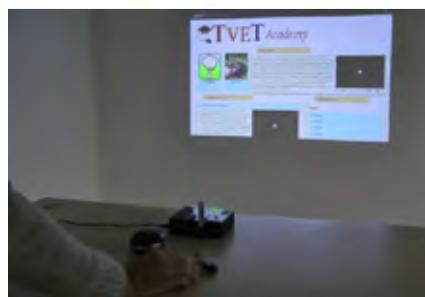
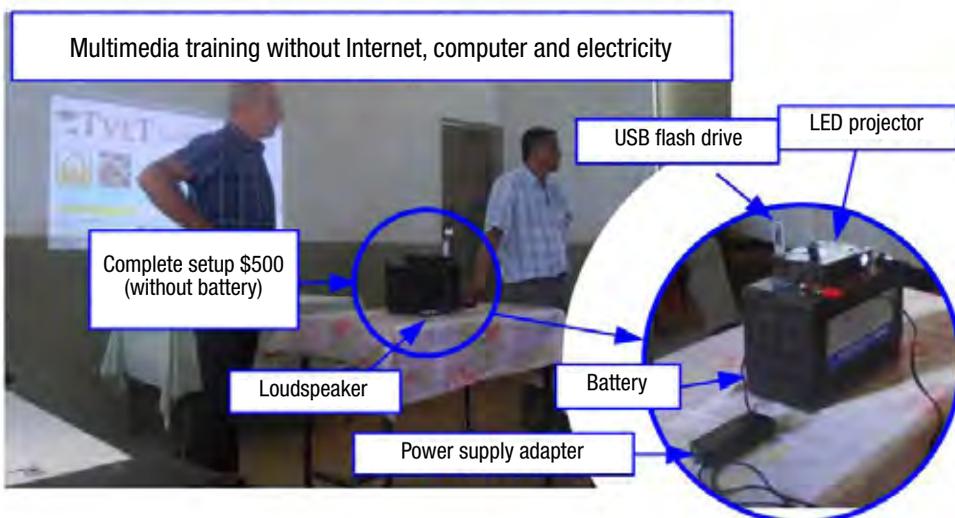
We therefore designed an alternative hardware and software solution that eliminated the server and associated maintenance costs. In future projects, a USB flash drive containing all the videos and documents covering their trade will be distributed to the teachers. Thereafter, possibly annually, the teachers could download updates from the nearest Internet access points, in the training centres, Internet cafés and so on.

A further major cost reduction was achieved by purchasing Android-based LED projectors with integrated media players and Internet browser and USB slots, thereby eliminating computers in the workshops altogether. These projectors last ten times longer (30,000 hours), consume one fifth of the power and weigh five times less than a classic projector. Their lightness means that they are readily transportable, enabling teachers to share them. So, in the new configuration, each training centre now has:

- One Internet access point and one computer or tablet for online tutoring and for downloading videos from our website onto the teacher’s USB flash drive.
- One shared projector with an integrated media player and browser.

In the absence of an Internet connection in centres or funds to pay for Internet access, this system can be further simplified by eliminating the computer and Internet access. This results in the “US\$500 training centre,” comprising one shared projector per training centre plus one 8GB USB flash drive per teacher (costing less than US\$10). In this scenario, Internet browsing and videoconferencing are no longer possible, so we have developed the “Download Entire Job” functionality on our website. This enables any teacher anywhere in the world to download not only the job training files (videos, PowerPoint presentations, quizzes, etc.) but also the TVET Academy website navigation environment which additionally eliminates the need for any training in using the computing tools and allows the teachers to use the training resources immediately.

The photographs below show the technology. This hardware configuration can run from a single 12-volt car battery. A fully charged battery gives 15 hours’ projection time, or about one week of training at the rate of three hours of projection per day.



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Canada: e-Apprenticeships

Paul Little

Introduction

The Conference Board of Canada predicts that, in the next two decades, 40 per cent of all new jobs will be in the skilled trades and technologies and that this will increase the need for post-secondary training, including apprenticeships. Apprenticeships in Canada are regulated by the provinces and territories, which means that there are 13 unique systems. They combine on-the-job training (80–85 per cent of the time) and college, union training centre, private provider or online training (15–20 per cent of the time) and provide the benefits of earning while learning. Once they have completed the required number of hours and/or modules for their trade, apprentices sit the examinations for the Certificate of Qualification of their particular province or territory. Canada also has a standard of excellence known as the Interprovincial Standards Red Seal Program, which applies to 55 trades. Tradespersons successfully completing this interprovincial examination receive nationally recognised credentials.

This form of post-secondary training typically involves four years of employment and supervision by qualified industry journeymen. The classroom portion (six to eight weeks each year) requires the apprentices to be away from their workplaces, during which time they may or may not be paid, despite often incurring travel, accommodation and miscellaneous costs that are not always reimbursed by their employers.

Hartwig (2007) states that the move towards eLearning for apprenticeships is driven by the rapid progress of industry, gaps between demand for and availability of skilled labour, the shortage of post-secondary educational places and the cost of apprenticeship training. Replacing classroom attendance with information and communication technology-based (ICT-based) instruction means that learners can remain within their own communities, save on study costs, earn as

they learn, immediately apply what they learn online in their workplaces and use technology to study. The latter is an increasingly important way of learning for all workers. ICT-based instruction also means that employers only have to do without the apprentices' services for one and a half days a week, rather than a couple of months.

As Dean of Learning Innovation at Red River College of Applied Arts, Science and Technology in Manitoba, I helped to spearhead e-apprenticeship; on becoming Principal of the Nova Scotia Community College, I was able to explore a similar approach with the Blended Trades Training programme. This chapter explores the provision, successes and challenges of these two innovations.

The Red River College E-Apprenticeship Alternate Delivery Design Initiative

The Red River College E-Apprenticeship Alternate Delivery Design Initiative, or EADDI,¹ was conceived in response to the report of the Manitoba Apprenticeship Futures Commission (2008), which recommended that the community colleges, public schools and other accredited training providers explore the opportunities for using alternative means of delivery for increasing the capacity of the technical training system to meet the projected need for skilled tradespeople. EADDI applied for, and subsequently received, funding of approximately Cdn\$2 million for 26 units or levels that went online in 2010.

The aims of EADDI were to:

- Improve access to training for diverse populations (girls and women, First Nations people, the geographically remote, etc.).
- Reduce disruption to remote families and communities who lose the contributions of learners if they have to leave for on-campus study.
- Develop technology-based and lifelong learning skills that will increasingly be needed by all learners.
- Provide cost-effective (comparable to current delivery approaches), accessible and flexible delivery for technical training areas of high need. For example:
 - Electrician, Technical Training, Levels 1–4.
 - Carpenter, Technical Training, Levels 1–4.
 - Plumber, Technical Training, Levels 1–4.
 - Motor Vehicle Mechanic, Levels 1–3.
 - Water and Wastewater Technician, Levels 1–2.
 - Heavy Duty Equipment/Truck and Trailer/Automotive, Common Core Level 1.
 - Industrial Mechanic (Millwright), Levels 1–4.
 - Heating-Ventilation-Air Conditioning/Refrigeration-Air Conditioning, HVAC/RACM, Level TBA.
 - Utility-Specific Crane Operator, Level 3.

¹ www.e-apprentice.ca

Modules were to be developed for all of these subjects, together with assessment procedures and an orientation programme for learners; professional development was to be provided for instructors and administrative staff; and an evaluation framework was created to gauge whether a project met the expectations of the government, students, instructors and other stakeholders.

Design teams were selected for each course. These comprised subject experts (usually volunteers), at least one instructional designer (to develop the videos, games and other online resources needed) and technology support personnel involved with the Learning Management System (LMS), video production and other technological services.

The e-apprentices were to complete six months' part-time study that was a blend of online teaching and learning and self-paced study. They were to be helped to feel just as they would in a regular college class. In terms of technology, they needed to have access to a reliable high-speed Internet connection, a computer, a headset/microphone and a plug-in webcam at home, in the workplace or some other setting. Before enrolling, they could preview recordings of live classroom sessions² to learn what this aspect of their studies would be like and examples of sample lessons.³ At the outset of the programme, the learners were required to attend orientation sessions at the Red River College-Notre Dame Campus in Winnipeg in order to familiarise themselves with the courses, modes of study and uses of technology and to meet their instructors and classmates.

They then returned home to embark on their studies, which were expected to take 10–12 hours a week. Their employers were required to release them for one half-day per week to go online for the live classroom sessions. There were two such sessions per week, one taking the form of instruction, the other being a tutorial. Both gave the learners the chance to talk, listen and collaborate just as in a regular classroom. For the rest of the week, they were expected to study and prepare their weekly assignments in their own time. At the end of the course they returned to Red River College for a “capstone week” to review the learning experience and sit their examination. They received the same credentials as those granted to apprentices studying on campus.

Evaluating EADDI

Three years later, EADDI was reviewed and a final report was released with recommendations. The main ones are summarised below.

General observations

Before considering the criticisms of and recommendations for EADDI, it is important to note that this was a pilot project using technologies and methods that were totally unfamiliar to the instructors and apprentices and that there were some positive outcomes. The programme provided access to technical training for a whole demographic that could not otherwise have been reached. The students' grades were in keeping with those attained by the regular face-to-face students and the programme delivery was certainly found to be helpful to the students and industry in the more remote parts of the province. Many of

2 www.e-apprentice.ca/wp-content/uploads/2011/12/live_examples2a.mp4

3 www.e-apprentice.ca/try-a-sample-lesson

the students appreciated being able to remain at home with family and within their communities, and they also reported that they liked the cohort model, the virtual classroom environment and the instructor support. From an institutional perspective, EADDI led to some useful self-reflection and taught the managers and staff some useful lessons. It also served as a springboard for subsequent work that is currently being undertaken and led to the creation and systemising of courses that are helping to support traditional face-to-face instruction, remediation and overseas-trained tradespersons seeking Canadian accreditation.

Student issues

The students indicated that they felt that some previous experience with online learning would have been beneficial, that computer-based learning was challenging for some learners and that it was sometimes difficult to find quiet spaces at home or to get family support for their studies. Some students had difficulty in organising their time and sticking to schedules, and the pace and intensity of the learning left some of them reporting that they had been on a steep learning curve, had felt overwhelmed and had struggled to keep up with their assignments.

Some of the students said that they would have appreciated more instructor support; some found that it could be difficult to communicate with the instructors and that some of them were more approachable than others. Some were critical of the instructors' teaching methods, saying that they needed to be more polished in their delivery and sometimes seemed rushed and unprepared in terms of both their teaching and their use of the technology. Some students complained about not getting their marks back, or not getting them soon enough, from the instructors, which left them not knowing where they stood in terms of understanding essential concepts.

Feedback was mixed in regards to the duration and scheduling of the programmes. Some learners said that the programmes were too long and that studying at night and at weekends cost them overtime pay. Others said they wanted more online class time, and some felt it would be better to schedule classes on a daily basis rather than on alternate days. Some declared they would still prefer on-campus training.

Management issues

There was a perception that EADDI had been a top-down initiative, driven by the President's office and the College's Teaching, Learning and Technology Centre, and that its goals and significance had not been communicated to staff and faculty. This indicated the need for salesmanship, champions and empowerment in such initiatives. There was also significant turnover in the project's leadership team, which impeded the communications and buy-in needed to gain an understanding of and develop a commitment to the project's goals and also disrupted the continuity of operations. Concerns were also expressed about poor communication between Apprenticeship Manitoba and Red River College.

The programme co-ordinators charged with the daily management of the traditional and online programmes felt that EADDI had attempted to produce too many programmes for too many trades within an unrealistic time frame. One serious mistake was that the project launched without any scheduled staff time-

release for the creation of the videos and other courseware. The staff's teaching schedules were already very demanding, so this prevented them from giving their full commitment to the work. Some of the instructors were also unconvinced that apprenticeship training could be delivered online, and this combination of organisational factors and personal dispositions (e.g. lack of faith in the project, feelings of being overloaded by work, disagreements about curriculum design) put the project co-ordinators and instructional designers under great pressure to meet the deadlines. The costs and other resource requirements of EADDI had also been underestimated, which was another source of tension.

Instructor issues

Some of the instructors said that this had been a useful experience for them, and some felt that this was the way of the future. But it was clear that they all felt insufficiently prepared for teaching in this way. Some said they had not realised just how much work was expected of them, and despite the training provided, some found teaching in a virtual classroom to be an overwhelming experience and said they felt that success came more through trial and error than instructional theory. They all saw a need for more training in on-camera presentational skills and managing discussions online.

Course and instructional design issues

The time requirements of the various trades training programmes range from 280 to 340 hours of instruction. Converting these traditional time requirements into online programmes presented a real challenge. A level of training requires around ten hours a week, so a "10-4 model" was used for EADDI: ten hours a week of study with the employers granting four hours of release time and the apprentice being responsible for finding the remaining six hours according to his or her commitments and preferences. This model turned out to work for the larger employers but not the smaller firms, which found it difficult to manage this amount of time-release.

Lesson logs had been used to capture the content and pedagogical approaches used in the regular face-to-face classes and were found to be very useful in shaping and standardising the content and instructional design. However, the instructional designers and technicians still reported problems in working with the subject experts. For example, one instructor spent an entire lesson reading out the code book of regulations to the class. Therefore, there was found to be a need for ongoing monitoring and guidance to ensure that the off-campus students were being as engaged and supported in their learning as they needed to be.

Online learning requires certain levels of skill and dedication that the traditional student does not always have. One of the lessons learned was that there needed to be pre-testing of online students to gauge who was comfortable with online self-study and who needed support or other accommodations in their studies. It was also found not only that the best mix of theory, practice, instruction, collaborative learning and self-learning varied according to the trades being taught but also that not all trades training transfers well to online delivery.

It is usual in online and distance education for specially trained instructional designers to work with the subject specialists. However, in this case, the course and instructional designers felt that to mainstream online training, it might be better

to train the subject matter experts in the skills of instructional design to reduce the level of dependency and develop more mutual understanding.

Industry supervisor issues

The industry supervisors under whom the students worked were generally satisfied with the programmes. They liked the way the apprentices could remain in their own communities and the way the online learning tools allowed the apprentices to preview and review lessons. However, some would have liked the programmes to be more oriented to the specific needs and interests of their particular trades. Others thought the courses were too long, interfered with the work scheduling of the apprentices, and made it difficult to keep the apprentices meaningfully engaged during their alternate days at work. They therefore favoured more condensed delivery and more hands-on training.

Technology issues

There were glitches in online delivery which called for improvements in the technology and infrastructure.

The Nova Scotia Community College Blended Trades Training Programme

The Nova Scotia Community College (NSCC) Blended Trades Training Programme was similar to Red River College's EADDI but dates back to 1997, and while Red River College has always depended on industry to provide the hands-on training, NSCC relies on weekend hands-on training at nearby college campuses or other suitably equipped sites.

NSCC's Blended Trades Training came about as a consequence of the provincial Department of Education, federal Department of Human Resources Development and NSCC exploring the possibilities of maximising access to apprenticeship training while minimising the costs to the external funding agencies, industry and learners. Out of this emerged a plan for the NSCC Virtual Campus to provide online apprenticeship training province-wide.

Evaluating the NSCC Blended Trades Training Programme

In 2006, the Apprenticeship Training and Skills Development Division of the Department of Education of Nova Scotia commissioned an external evaluation of the Blended Trades Training programme by Nicolle Associates (2006). This included interviews with government, educational and industry stakeholders in apprenticeship training in Nova Scotia; surveys of apprentices and employers in the province; and analysis of data from the Apprenticeship Training and Skill Development Division, NSCC and others across Canada providing apprenticeship programmes. Its findings are summarised below.

General findings

In 2006, the programme had the following outcomes:

- Approximately 20 per cent of all apprenticeship training course enrolments were being served by the NSCC Virtual Campus.

- Blended training was being provided for apprentices in ten trades.
- Training for two trades (gas fitter and power engineer) was being provided wholly online.
- 1,486 individual apprentices had accessed the Virtual Campus for all or part of their technical training.
- These 1,486 apprentices had registered for a total of 6,597 courses.
- Virtual Campus users represented approximately 20 per cent of all individuals who had registered as apprentices since the introduction of this means of delivery.
- 32 per cent of the Virtual Campus enrolments had been in the gas fitter and power engineering trades, for which apprenticeship training had only been available through the Virtual Campus.
- Other trades for which all technical training courses were available online (automotive service, electrician and cook) accounted for 65 per cent of the enrolments.
- The four trades for which only a portion of technical training was available online (carpenter, machinist, oil burner mechanic and plumber) accounted for only 3 per cent of all enrolments since the opening of the Virtual Campus.

While recognising the overall success and potential of the programme, the report noted a need to increase the completion rates, improve the user satisfaction levels, increase the level of employer engagement and increase the number of apprentices studying through the Virtual Campus. Between 2006 and 2012 (the last year recorded), the enrolments in this programme grew at an annual rate of 17–20 per cent.

Student issues

Surveys of the students showed that they appreciated the more convenient delivery methods and that the programme had contributed to the growth of apprenticeship training in Nova Scotia by attracting entrants who would not have considered training by conventional means.

The students' comments on the learning systems, content and methods were generally favourable, but their reactions to the administrative processes were mixed. Some were frustrated by the registration process, regarding it as cumbersome and time-consuming, or found difficulty in obtaining the course and registration information. Others found the Virtual Campus staff helpful.

At this stage, not all of the programmes had student orientations, and 56 per cent of the students were unable to take advantage of this option. The students who did have access to this option said that it contributed not only to their understanding of the study requirements but also to their subsequent success.

The majority of students were found not to have used the guidelines on the use of the LMS, but it was not known whether this was due to their being already familiar with such systems or if they were simply unaware of the availability of these resources. Some concerns were expressed over browser compatibility and the online materials needing to be more printer-friendly.

Apprentices who were training by traditional methods and had not yet taken the online training available were also surveyed to see if they were likely to enrol in online courses and, if so, what would attract them to this. Predictably, they indicated that they would find it more convenient, they would be able to learn at their own pace and in a place of their choosing, and they would not have travel costs. However, 97 per cent of those saying that they would study online already had computers and a reliable Internet connection at home. Sixty-three per cent of those saying they would not wish to study through online programmes did not have these facilities at home. It was also found that those inclined to the idea of online study tended to be slightly older, had been longer in apprenticeship training and were progressing more slowly than those who said they were unlikely to enrol. They were also more likely to already hold college diplomas and/or university degrees and certificates of qualification.

Management issues

Given the students' concerns about the nature and means of providing information to them at the time of enrolment, the reviewers concluded that there was a need to improve these information systems and more clearly articulate the means, benefits and challenges of online and blended study and make this information available in print, on CD-ROM and online.

The reviewers also advised that there should be a pre-screening process to ensure a better fit between the learners' attributes and the demands of online study and thus increase the likelihood of success. They recommended assessing the potential students' self-discipline, ability and willingness to give the time needed to their studies; the levels of their literacy, numeracy and any other knowledge and skills essential for the course and level of study to be undertaken; and access to an appropriately configured computer and the technical skills needed to navigate a website and perform the basic functions required in the online study.

The reviewers also recommended that all staff who would be responsible for counselling and advising the apprentices should also take the online courses to better understand what they entailed and anticipate where the students might find difficulty.

Instructor issues

The major recommendation regarding the instruction was that there should be more and better interaction between the instructors and the learners. It was observed that left too much to their own devices, many learners would have difficulty with some course elements, which could only lead to confusion, stress and thoughts of withdrawal. Therefore, the capacity of the online instructor (and there is typically only one per trade/programme) to anticipate and respond to questions and assist the apprentices in timely and appropriate ways was paramount. The most popular, convenient and therefore common means of communicating with instructors was found to be email (used by 71 per cent of the learners), although 50 per cent of the learners preferred to make telephone contact.

Industrial partner issues

Responses from those in industry indicated that there was overall satisfaction with the Virtual Campus training system and that both the managers and the apprentices' supervisors recognised the benefits of this form of learning provision to industry and learners alike. However, the responses also suggested that there could be some underlying negative perceptions of online training and a suspicion that it was not as effective as classroom training.

Course and instructional design issues

The earlier methods employed in the online apprenticeship training by the NSCC were very much based on the traditions of the correspondence course. That is to say, it was primarily text-based and predominately one-way. In subsequent years, the methods used had evolved in keeping with the emerging technologies to include videos, simulations and other ways of enhancing the learning. However, one of the major criticisms in the review of the course and instructional design was the limited amount of interaction between the apprentices, the instructor and the other learners on the course compared with the degree of interaction found in a traditional classroom.

Technology issues

At the time of the 2006 study, the technology had a number of limitations, most of which were later overcome by the rapid advances in computing and infrastructure. Today's technology allows for more trouble-free provision, increased use of motivating multimedia applications and improved administrative procedures, as well as far better communication between instructors and learners, including online forums, collaborative learning and problem solving.

Post-2006 Developments

Since the 2006 review, much has been done to implement the key recommendations and the NSCC has also continued to develop its online and blended programmes and the services of the Virtual Campus.⁴

Today, those wishing to take apprenticeship training can access online programmes at home, at work or wherever else an Internet connection is available. Apprentices accessing online technical training are expected to complete one group of training courses per year. Potential learners first advise their training officers that they wish to access online training and these officers then forward a Training Plan to NSCC Online Learning and provide the learners with a copy of this plan. The learners can then register at their local NSCC campus or by telephone or online. Once registered, they receive an email with a user ID and password, along with the course access information.

The orientation programme is now mandatory for all courses and all learners. The learners are responsible for meeting the costs of textbooks and other resource materials over and above the cost of tuition but do not pay for the technology. Computer terminals are available in the libraries of NSCC campuses throughout Nova Scotia, as well as various other community locations, and special study facilities are available for apprentices with disabilities.

4 www.apprenticeship.nsc.ca

There is also a Document Use Course, the purpose of which is to develop the skills necessary to locate and use all the information contained in various document formats such as lists, drawings, maps, forms, service manuals and troubleshooting charts. This course is delivered one to two evenings a week over a six-week period, and learners receive the NSCC Certificate of Continuing Education upon its successful completion.

The Apprenticeship Agency has also introduced an informal skills self-assessment system and several new learning options, including the development of a learning plan and training and support to assist apprentices in the technical aspects of their training.

There have been continual improvements in the pre- and in-service training of college staff in the use of technology and how to teach, engage with and support the online learners. Training is now also provided for the Training Officers, the provincial government employees whose role it is to track, register and support the apprentices in their training. These measures have all helped to increase the completion rates and improve user satisfaction levels with the Virtual Campus courses.

Increasing the level of employer engagement in online apprenticeship training has been helped by the Nova Scotia Apprenticeship Training Division undertaking industry consultations which have led to the formation of a new Nova Scotia Apprenticeship Agency. This agency engages Nova Scotia employers and industry, designates trades for apprenticeship training and certification, regulates and assesses all apprenticeship technical and workplace training, and participates in the national Red Seal programme and jurisdictional initiatives — all of which have resulted in more interest in finding innovative ways of increasing the opportunities for, and quality of, apprenticeship training in the province.

Conclusion

Developing and operating quality online training systems is a complex process. It requires all the teaching, technical and administrative staff involved to have a thorough understanding of the theory and pedagogical and appropriate uses of the technology. It also requires a close understanding of the learning needs of the apprentices, who are typically not academically inclined or used to self-study. In most of the trades there is still a considerable degree of hands-on learning under the eye of skilled practitioners, and it is difficult to gauge the extent and quality of the support and supervision the apprentices are receiving in the remote workplaces. There are many situations where for reasons of safety, convenience, quality, uniqueness and cost, online training can be used as a substitute for or a supplement to hands-on learning, but the concepts and means of online learning are yet to be fully accepted by many employers and supervising tradespersons, so there is still a great need for closer collaboration between technical and vocational education providers and industry in the use of online and blended learning.

Both of the projects described in this chapter required significant human, financial and technological resources in order to achieve very similar outcomes. Collaboration could have resulted in cost savings; better use of existing expertise and resources; wider access to new beneficiary groups, knowledge, good practice and information sharing; capacity to replicate success; and stronger and more

united advocacy for transformation within the institutions and the wider system. Unfortunately, Red River College and Nova Scotia College operate under different provincial authorities and have no mandate or organisational framework to enable them to collaborate in such innovations. It is only now as I am reviewing the e-apprenticeship training programmes of these two colleges that I can fully appreciate the opportunities lost by the lack of collaboration in the planning, implementation and evaluation and reviewing of common lessons learned from both institutions.

First, staffing. In apprenticeship training, the instructors are drawn from the various trades and are often mature practitioners in their particular fields. However, they may often hark back to their own training, some 20 or 30 years ago, when they worked under the supervision of master craftsmen, a system dating back hundreds of years. It can therefore be difficult for some of these older instructors to abandon their old ways of training apprentices, adopt a more facilitating, empowering role and understand just how much the various trades practices are being significantly affected by new technology. These two projects were therefore trying to achieve innovative, cutting-edge methods and uses of technology with a generation of instructors who found it difficult to understand the technological, instructional and communication skills needed. In some cases, no amount of staff development will overcome this barrier. Hopefully, things will improve as younger and more computer-savvy instructors come up through the system.

Second, not all of the learners were ready to embrace new learning methods such as self-study. Again, it must be hoped that the rising generations of apprentices raised in an increasingly technologically sophisticated environment will both expect and readily embrace technological solutions to learning.

Third, there was a great deal of unnecessary, time-demanding and costly duplication of resource creation in both institutions. The cultures in both institutions were more concerned with revenue raising and competing in new markets than with collaboration and the shared development and use of open source materials which could have also benefitted other colleges in the respective provinces and even other parts of Canada or overseas. Fortunately, Manitoba is now considering an ambitious development of the EADDI project in which the resources and lessons learned will be shared with other colleges. In Nova Scotia, the blended learning model has been shown to be successful, and while the LMS will change, in substance the current model will continue. But these two sets of initiatives will continue in parallel.

As Hartick (2007) observes, the early adopters of educational technology are often enthusiastic and willing to work hard to learn the process of online training and to provide support to the students. But for those who follow, the learning curve can be steep, and they need not only training for their new roles but also time-release, support, and rewards and incentives for all the time and effort they expend in such transformations. It is unrealistic to expect faculty to be capable of developing high-quality online materials, tutoring online, assessing assignments online or onsite, providing tutorial and technical support for the students and also teaching their face-to-face classes without some careful timetabling. But this is not always understood. For example, Hartick observed that one problem faced by those teaching online at NSCC was that sitting at one's desk looking after an online

course was not perceived as “real work.” Clearly, the transition from traditional classroom and workshop instruction to online teaching requires institutional leadership in concert with government and faculty incentives.

Ways are continually being sought to improve the delivery of trades or apprenticeship training in the two colleges. Red River has acquired two mobile units and Nova Scotia College has taken ownership of one. Costing approximately Cdn\$1 million each, these units deliver the training resources to the worksites. Examples of Nova Scotia College’s use of simulation technology to provide cost-effective and safe training include training in the use of welding equipment and heavy-duty equipment and virtual experience of navigating in the world’s harbours.

The Canadian Apprenticeship Forum (2013) provides evidence of the increasing use of online and mobile learning, social media and 3D visualisation and simulation in worksite and preparatory training across Canada. It also notes the increased importance of vendor-supplied e-training as a source of skill development in the workplace.

Recognising the challenges that apprentices face when they have to alternate between campus-based and on-the-job training, the government of Canada launched a three-year, Cdn\$13 million Flexibility and Innovation in Apprenticeship Technical Training (FIATT) pilot project to explore ways of collaboratively applying different styles of learning and new forms of training delivery, including in-class simulators, eLearning modules, flexible in-class training delivery and videoconferencing in order to help apprentices complete their technical training and get their certificate or licence (“ticket”) (Government of Canada, 2015). While the need for new approaches to provide technical training and the viability in using ICTs are understood, the two projects described here are good case studies and provide recordings of learning to inform further development.

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PART

III

Planning for Transformation

Considerations in Costing ODL and ICTs in TVET

Sarah Hoosen and Neil Butcher

Introduction

Open and distance learning (ODL) and information and communication technologies (ICTs) are viewed by many policy makers, 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 Technical and Vocational Education and Training (TVET) sector. Arguably, this is because there appears to have been less of a focus on research in TVET compared to tertiary education. Also, there may be a perception among some in the sector that ODL is an inappropriate means of imparting vocational and technical skills, a perception that possibly derives from memories of the shortcomings of earlier correspondence education and the notion that technical and vocational skills can only be mastered in the workplace or training centres.

With the growing ability to present simulations and modelling using ICTs, 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 in 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. For example, in Zambia, the level of government subvention to TVET institutions is less than 6 per cent in some cases (Herd and Mead Richardson, 2015). This lack of funding limits the

extent of training, the number of students who can be trained and the quality of the training, with the recruitment of teachers, modernisation of equipment and acquisition of training resources being especially affected (Siriwardene and Qureshi, 2009).

With many TVET systems in the developing world now considering the adoption of ODL and ICTs because of the promised cost efficiencies, it is important to examine the costing of these new educational and training practices. Given the dearth of resources focusing specifically on costing ODL in TVET, this chapter focuses more generally on costs in the use of ODL and ICTs and extrapolates these findings to the TVET context. This chapter explores the costs of ODL and how to avoid the ramifications of weak financial planning.

Key Terms Used in Costing

It is useful to clarify some cost definitions before venturing further into costing issues since these all need to be considered in costing the alternative delivery methods available to TVET:

- **Direct costs** are those costs that are directly attributable to an activity, such as the costs of course material, course design, co-ordination, teacher time, student administration and student support.
- **Indirect costs** are course-related costs that are not specific to that course. They can also be considered as “overhead expenses” that might have to be apportioned to an activity — for example, the costs of equipment, such as computers or television, that the students need to use the teaching materials.
- **Marginal costs** are costs that would not have been incurred if the activity had never been started.
- **Cost analysis** refers to estimating all the costs involved in a particular activity and breaking down the costs of courses into constituents and studying and reporting on each factor. In ODL, this can include analysis of such costs as direct professional staff, support staff, capital equipment, equipment maintenance, consumables and use of joint facilities.
- **Unit cost** is often used as a measure of resource impact for a specific unit of analysis (depending on what is measured) — for example, the cost per student, cost per hour or cost per course module.
- **Fixed costs** do not alter when the scale of an activity increases — for example, telephone rental is unaffected by an increased number of students.
- **Variable costs** do alter — for example, telephone usage charges are affected by the number of students.
- **Total cost** is the fixed cost plus all of the variable costs.
- **Opportunity cost** is the income or benefit lost in going ahead with an activity.
- **Cost-effectiveness** refers to the extent to which an institution or programme produces particular outputs (which are concrete and measurable) or outcomes (which may not be measurable). It represents

striking the optimal balance between cost, student numbers and educational quality, a balance that changes according to educational context.

- **Cost-efficiency** refers to the extent to which an institution or programme maintains a particular level of production with fewer resources or increases the level of products or services it produces with a less than proportionate increase in the resources used. It thus refers to the “cheapness” of educational provision.

Costing ODL

There has been no consistent or comprehensive research into the comparative costs of ODL. Some of the studies undertaken have focussed on institutional costs, others have considered public expenditure costs, and yet others have focussed 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 the students, researching and developing the delivery systems, and the ever-changing technological infrastructure (Bart, 2008).

Nevertheless, the literature does suggest that ODL programmes can be more cost-efficient than their conventional equivalents *if* they enrol large numbers of students on every course and thus reap large economies of scale. ODL courses are not restricted by classroom size, so per student costs decrease as enrolments increase. The literature also suggests that ODL 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 the 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 ODL, 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. These are discussed briefly below, with a more in-depth consideration of the issues later in the chapter.

Students' Costs

In face-to-face education and training, students' contributions towards their study costs usually comprise fees, textbooks and other educational or training materials, living expenses, accommodation, meals, travel and possibly a loss of, or reduction in, income. Students' perceptions of the cost and value of their programmes relate to the return on investment (ROI) — that is, whether the

studies and qualifications raise 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 the 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 those of accessing a computer and connecting with the Internet.

Student Support Costs

The costs to institutions of providing student support depend upon 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 of assignments.
- Playing a key role within the assessment scheme in the ultimate recognition of learning through credit and qualification.
- Paying attention to the progress of students, both through response and intervention.
- Providing opportunities for social learning, where possible in groups, and a dimension of the local and familiar through a face to face contribution to learning.
- Providing support with regard to administrative and other systemic issues. (Tait, 2014, p. 8)

Student support costs are also incurred in non-academic functions such as enrolment/study options, advisory services, counselling, library services and ICT-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. Under-investment 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 upon 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

The cost of teachers and trainers in traditional TVET institutions is directly related to student numbers and is one of the main cost drivers. The costs of face-to-face teaching rise 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 assigned to this class. ODL 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).

In using ICTs in TVET, there is often a need to upgrade the teachers' knowledge and skills in integrating the new method and technologies in teaching and learning (Herd and Mead Richardson, 2015). Thus, in costing ODL, it is 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).

Technology Costs

Historically in ODL, technology costs were limited to print production, correspondence and, more rarely, use of radio and television. While these may still be called for, especially in developing countries and areas lacking a reliable or affordable Internet connection, the move in ODL is towards ever greater use of ICTs and the myriad teaching and learning options they provide. With this greater reliance on technology to deliver instruction and support the learners, it is inevitable that the technology costs will rise. These can be considered in four categories: initial purchase price of hardware and cabling (including periodic replacement of obsolete equipment); cost of software and related resources; costs of connectivity; and support, maintenance and training costs.

Many institutions are now investing in Learning Management Systems (LMSs) and related online learning platforms and specialised 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. 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 are, of course, in a constant state of transition and change, so with each new technology with the potential for new and better forms of delivery of learning, there will be new costs to consider. Therefore, particularly in developing countries, it may be better to stick with easy-to-use, robust and low-maintenance technology (see Chapter 10).

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 study 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 expense, 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 be necessary. Many effective courses have been designed with a relatively small number of personnel. However, a generalisation that has fairly high reliability in the case of ODL is that the quality of the course (subject matter and pedagogy) is related to the level of investment in its design (Butcher and Roberts, 2004).

ICT Costs

Course development costs have generally increased over time, as ICT-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 TVET at a distance. 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 video instructional materials are increasingly being used and can lead to better practical skills acquisition (see, for example, Donkor, 2010). Thus, while video and simulations may be more expensive to produce than printed resources, they can be more cost-effective in contexts where practical demonstrations are required. And the same content can be used to teach successive cohorts and increasing numbers of students over a period of several years, provided

that 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).

The Cost Benefits of Using Digital Resources and Open Educational Resources

There can be enormous cost benefits from using openly licensed digital materials in TVET course development. Developers can access existing content and contextualise it to their own curriculum, thus speeding up the process of materials development. Teachers lacking technical expertise in specific vocational subjects can use expertly designed materials from other sources to bridge the gap. Simulations can provide learners with access to laboratory experiments where no laboratories are available (Herd and Mead Richardson, 2015). And students can gain from the shared use of well-designed materials that provide better learning outcomes at a lower cost.

As institutions make strategic decisions to increase their levels of investment in the design and development of better educational programmes, embracing open licensing environments and harnessing existing open educational resources (OER) is a cost-effective way of doing so (Butcher, 2011). However, when it comes to TVET, there is currently a shortage of well-designed instructional content that can be shared within the sector (Stevens, 2001) and few OER content repositories specifically focussed on technical and vocational subjects (Herd and Mead Richardson, 2015). So it would seem to be more of a case of the TVET sector having to build its own collections of OER from the ground up. It will take time, effort and money, but through collaboration or partnerships between faculties, or multiple faculties in different institutions involved in the same content areas, a larger, richer database of content can be developed more efficiently, have broader use and prevent duplication of efforts (Boettcher, 2006). Every word, every image, every example, every definition and every other aspect of the OER they create will then be available for localisation, adaptation, remixing and improvement by the users in TVET who could number hundreds or even thousands. Not only will the TVET institutions have a greatly expanded content base to draw upon, there will also be no copyright clearance processes to manage.

One way of approaching this is to create consortia whereby two or more institutions (or units within organisations) agree to share the responsibility for and the costs of designing and delivering sets of courses or entire programmes. Each institution will have its own management structure and contribute personnel to the various tasks. Each institution will also manage the delivery of the courses to its own students (World Bank, n.d.). Such initiatives may be especially worthwhile if they involve institution-industry collaborations, thus allowing the content to be relevant to both TVET and industry needs. The content of many TVET courses is globally relevant and, as shown in Chapter 10, the three main languages — English, Spanish and French — are understood in many countries, and so consortia in particular countries or regions can produce content that is readily usable or adaptable worldwide, something that is increasingly important in the globalised knowledge economy.

One example of harnessing different specialists' knowledge, skills and experience; minimising duplication of effort; and saving costs through a consortium approach is the Commonwealth of Learning (COL)-supported project undertaken with the eight countries of the Southern African Development Community (SADC) which involved developing ODL training materials enabling teachers to enhance their professional skills. The various modules were developed by teams of writers in Botswana, Namibia, South Africa, Zambia and Zimbabwe. Throughout the writing phase, content input and review of the materials remained the collective responsibility of all the participating countries. Once the core modules were developed, each country was able to adapt them to meet the needs of its people. Thus, the cost of the initiative to any one institution, agency or country was dramatically reduced, and the quality of the finished product was higher than if only one institution or country had undertaken the development of the course and materials (Wright, Dhanarajan and Reju, 2009).

As shown elsewhere in this book, the advent of Massive Open Online Courses (MOOCs) means that high-quality educational materials are now being made available across the world, free for students registering for non-formal study and inexpensively for those seeking credit. The MOOCs concept could well be adopted and adapted for TVET. Inexpensive, simple-to-produce MOOCs could take the form of self-produced lectures delivered in front of a webcam and uploaded via an open source platform such as Google's Course Builder. Slightly more complex and costly videos could be shot in workshops, industrial sites and other locations. The most expensive MOOCs could be multimedia and interactive courses that have been produced to the highest professional standards and developed by rethinking course structures, rewriting content, creating multiple-choice quizzes, adapting assessment software, recording lectures and possibly founding discussion groups and building up online course pages. Once these MOOCs went online, there would, of course, be further costs arising from, for example, operating analytics, monitoring chat feeds, repairing technical glitches, administering the enrolments and providing learner support (Dejong, 2013).

By adopting such approaches, TVET has opportunities to reassess the needs, resources available on particular topics, approaches needed for specific subject areas and the international dimensions of TVET provision. The educational, logistical and cost benefits as well as earnings could be massive, and this could improve the TVET brand internationally and encourage a more collaborative culture and environment.

Estimating the Costs of Course Design and Development

There have been several attempts to estimate the costs involved in course design and development. For example, Boettcher (2006) estimates that it takes an average of 18 hours (a range of five to 23 hours) to create one hour of instruction for publication on the Web that can be studied independently of an expert faculty member. Kruse (2004) notes that in TVET training, providers generally use a "rule of thumb" approach to estimating the cost of developing ICT-mediated teaching and learning. This can be based on either a per hour or a per screen rate. Kruse observes that it takes 600 person hours to develop one hour of high-quality ICT-mediated teaching and learning material as compared to only 300 hours to develop simpler Web- or computer-based training without audio or video elements

(UNESCO IITE, 2005). However, a key consideration here is that such estimates change over time because new technologies that come on-stream often reduce the hours required to achieve similar results (e.g. the digital tools now available for the creation of computer graphics and animations, editing and formatting text and desktop editing of digital video).

Bryan Chapman (2010) of Chapman Alliance¹ conducted a survey of nearly 4,000 learning development professionals from 249 companies to try to arrive at the average time required to produce one hour’s training of various types. Table 1 shows the results.

Table 1: Average design time requirements for one hour of training material
(Source: Chapman, 2010)

Level	Average hours	Range
Instructor-led training	43	22–82
Level 1 eLearning (Basic): incorporating content pages, text, graphics, simple audio, simple video, test questions and PowerPoint presentations	79	49–125
Level 2 eLearning (Interactive): incorporating Level 1 plus 25% (or more) interactive exercises allowing learners to perform virtual “try it” exercises and liberal use of multimedia (audio, video, animations)	184	127–267
Level 3 eLearning (Advanced): highly interactive, possibly simulation or serious game-based, use of avatars, custom interactions, award-winning-calibre courseware	490	217–716

Of course, these are “averages.” Any one programme might take as little as 22 hours or up to 716 hours, depending on the experience, skills and knowledge of the designer(s) and complexity of the subject matter and instructional design. For example, a course on thermodynamics will clearly take significantly longer to design than one on basic office procedures (Dashe and Thomson, 2010).

Mays (2011) provides a breakdown of the staff hours required for the development of a module at the University of South Africa.

Table 2: Staff hours to develop a module
(Source: Mays, 2011)

Activity	Hours
Course design preparation	8
Curriculum design	250
Compiling of study material	1,300
Editing (if done by academic department)	50
Translation (if done by academic department)	300

¹ www.chapmanalliance.com

But as Mays himself observes, the number of staff hours required to compile this study material could be reduced from 1,300 hours to 650 by the use of a prescribed textbook and “wrap-around” study guide that helps the students work through this textbook. Estimates for course design tend to vary across a range of such variables as the tools used, the learning methods involved and the availability of existing content (Johansen and Wiley, 2010). Also, staffing costs may be much lower and technology provision and access costs much higher in developing countries than in developed countries.

Kruse (in UNESCO IITE, 2005) argues that the flat-rate estimate does not reflect the true costs of eLearning. He suggests a ten-factor analysis approach to determining the costs of ICT-mediated teaching and learning:

1. Mode of training delivery.
2. Bandwidth requirements for Web-based courses.
3. Subject matter content.
4. Duration of training.
5. Special features, such as audio, video and animations.
6. Source of content.
7. Need for student-tracking capabilities.
8. Project start and end dates.
9. Nature of in-house contribution in training development.
10. Life span.

Considering the Expertise of the Course Developers

One challenge in course design is estimating the person-power needed to design one notional hour of student learning time. Given that design time itself is not a stable quantum, it is worth considering how different combinations of expertise might affect student performance. For example, a course development team consisting of an instructional designer and an editor is likely to be less effective than a course development team comprising multiple specialists such as:

- A project manager to oversee production and to keep the development process on track, as well as manage the assigned development budget.
- The content specialist/instructional designer.
- A content reviewer/editor.
- A graphics and interface designer.
- A media specialist.
- A technical support team, including programmers, Web designers and technical support staff.

Increasing interactivity in courses typically requires more time and often more specialists to develop the content and methods (Boettcher, 2006; Mays, 2011). Historically, the functions required in curriculum and courseware design have tended to be spread across multiple specialists, thus raising the costs. However, as course developers become more experienced and comfortable with the available

tools and technology, the number of hours required to produce content should decrease. They may become multiskilled, capable of combining the functions of, for example, instructional designer, graphic and Web designer, and general editor. Such multitasking is being greatly facilitated by the growing number of ICT-based content development tools.

Course Delivery Costs

Successful ODL systems are likely to require as much attention to the presentation as the preparation of courses. As highlighted, course delivery systems that allow a wide distribution of the course materials and 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 the quality and completion rates, thus raising the cost per graduate) or the student-trainer interaction increases (which raises the costs of the service provision). The degree and nature of the 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 associated costs. Thus, a programme with tutorial-style interaction will cost more than one where the content is simply presented online with self-learning expectations (Sadik, 2009). Somewhere in all of this a balance has to be struck 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.

Training providers can also plan for infrastructure and facilities that allow collaboration between and among students, students and staff, and staff. Collaboration between colleagues who have never met each other physically is possible with computer conferencing, instant messaging, Voice-over Internet Protocol (VoIP) applications like Skype, and social interaction tools like Facebook and helps 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-based learning with practical hands-on components within institutional settings or workplaces in partnership with employers and industry. As shown in Chapter 11, which describes the use of e-apprenticeships, 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-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 organise 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, that is, changes in technology or approaches require new forms of support.

Thus, course delivery costs depend on the choice of media, the level of support required in a programme (and 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 financial sustainability of institutions relies in no small part on the efficiency of the administration. The administrative costs usually involve those 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. Management information systems (MISs) save time and avoid unnecessary duplication by capturing and making available required information 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 staff to track student progress, publish course results and address such matters as payment, resources procurement and facilities management. Others may use databases such as Oracle and PeopleSoft, which offer institutions a virtual platform to organise registration systems and payroll and manage such matters as staff requests for leave. In all of these cases, there will be the costs of purchasing and maintaining the licences for these systems, as well as training the staff to operate them.

Conclusion

As shown in this chapter, costing and evidencing the cost-effectiveness and cost benefits of ODL and other forms of technology-based teaching and training in order to make well-informed decisions about educational options is complex and can be problematic. Using various modes of delivery or technologies for a programme does not necessarily make that programme more or less cost-effective. And every country has particular barriers to overcome in terms of access to, and costs of, ICTs: the levels of government, donor or NGO funding; and staff expertise in using ODL and ICTs. So their choice of how to overcome these barriers must be considered holistically for the impact it may have on all the stakeholders involved (Thompson, 2010).

Applying a strict comparison of expenditures for administration, materials development and delivery of an ODL programme versus the traditional face-to-face model would likely result in a lower per student cost for ODL, and particularly so if all the costs are amortised over the life of the programme. However, if the judgements of cost-effectiveness include outcomes such as student satisfaction

levels, completion rates, improvements in teacher quality and opportunity costs, then the measures are far harder to quantify.

To make ODL programmes more cost-effective, it is necessary to consider all aspects of expenditures and revenues over a programme's lifespan (Thompson, 2012). As shown above, cost-effectiveness in ODL systems is affected by several factors, including the number, nature and circumstances of the students enrolled, scope and complexity of the curriculum, course development costs, choice of teaching and learning methods and technologies, required level of student support and number of partners or collaborators. Arguably, the main consideration highlighted here is that design costs are incurred regardless of the number of students who study the course. Low unit costs then follow only if large numbers of students study the materials successfully and the person-power devoted to "presenting" the course is substantially lower than in face-to-face settings.

In the case of TVET, training demand in most developing countries is for small numbers of graduates in a wide range of occupational areas (UNESCO IITE, 2005). Furthermore, given the practical nature of TVET, it makes more sense for courses to be provided in multimedia format, as opposed to print. This can be more costly, but cost efficiencies and savings can be achieved by forming consortia, sharing costs between institutions and/or partnering with industry, creating OER and MOOCs and establishing public repositories of resources relevant to TVET. Given the nature of TVET, there should, in all likelihood, be fewer problems with cultural bias in much of the content.

There is no one clear model that can accommodate all the challenges of costing. Each country, TVET system and training institution needs to find the best and most cost-effective ways of serving its students' needs. To do this, they need to understand the problems and pitfalls, develop business plans and take the appropriate and time-honoured steps in their costing (identification, decision, measurement, analysis and presentation).

To date, there are very few comparative cost studies to show how the cost structure of TVET is affected by new technologies and approaches. And there is no evidence, even from countries with mature eLearning systems, that ICTs improve efficiency in TVET (Herd and Mead Richardson, 2015). More research in these areas is badly needed. In the current economic climate, innovations and proposals for change are increasingly likely to come under critical scrutiny and only receive funding if there is solid evidence that money can be saved and that activities making heavy demands upon staff and resources disproportionate to their benefits can be identified and replaced. It is therefore essential that teachers and trainers themselves become involved in costing and cost analysis and in providing quantitative data to ensure that the ODL- and ICT-based innovations in teaching, learning, support, administration and assessment are cost-beneficial and cost-effective. Such cost studies are essential for using ODL and ICTs in the effective transformation of TVET.

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Planning for the Use of ICTs at the National and Institutional Levels

Colin Latchem

Introduction

One of the main conclusions to be drawn from this book in general and the case studies in particular is that using information and communication technologies (ICTs) to transform Technical and Vocational Education and Training (TVET) calls for more than a series of one-off interventions. It requires the creation of a training ecosystem wherein all of the stakeholders in the internal and external organisational ecosystems agree, collaborate and share resources, information and services. This chapter examines the important planning factors that need to be attended to at both the national and the institutional levels in order to achieve successful applications of ICTs 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 the National and Institutional Levels

Frydenberg (2002) observes that the widespread adoption of quality eLearning 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 related to institutional leadership, effective overall policy making 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 into TVET requires strategic, pedagogical, organisational and technical readiness.

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

All of the authors of the case studies in this book 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 (Chapter 8), described by Leena Vainio, Elina Oksanen-Ylikoski and Teemu Ylikoski, one of the national professional development providers for VET. And innovation, technology and education lie at the core 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 to 21st-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 outside agencies partnering with those inside systems to catalyse leadership for innovation. For example, the Commonwealth of Learning (COL), the intergovernmental organisation 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 described by Shafika Isaacs in Chapter 9. But this initiative was then operationalised in partnership with the Commonwealth Association of Polytechnics in Africa (CAPA) and 13 member institutions of CAPA in seven African countries. All these players acknowledged the supportive role played by their governments and TVET ministries and the “early adopters” and “champions” in 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 the National Level

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

The first step is to establish the physical infrastructure for broadband access. In 2015, there were more than 7 billion mobile cellular subscriptions worldwide, and 3.2 billion people throughout the world — 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 covered by a 2G mobile-cellular network has reached 95 per cent, 3G mobile-broadband coverage is extending rapidly, including into the rural areas, and there are 7 billion mobile cellular subscriptions worldwide, a penetration rate of 97 per cent. However, in the developing countries, Internet penetration is only 35 per cent, and only 34 per cent of households in these countries have Internet access, compared with 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 with the world average of 46 per cent. Moreover, in developing countries, the average monthly fixed broadband prices are three times higher than in the developed countries, mobile broadband prices are twice as expensive as in developed countries and differences in broadband speed persist (ITU, 2015). So there are still countries and regions where infrastructure issues need to be addressed in order to realise the vision of online education for all and a truly inclusive information society.

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 the early adopters.

The third step is to undertake research and evaluation to find evidence of the benefits of eLearning, inform policy making and decision making, build demand for online services and encourage collaboration and co-operation between institutions. An example of this is shown in Michael Härtel's case study of the Federal Institute for Vocational Education and Training (BIBB) in Chapter 3. BIBB's mandated tasks include co-operating 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.

The next step involves developing systems to mainstream ICT-based teaching and learning and pedagogical change at the national and institutional levels. Australia provides a useful example of national planning for ICT-enabled TVET. In 1999, the 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 eLearning infrastructure and expertise 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 focussed on engaging with key target groups, and a

third framework strategy (2008–2011), which focussed on embedding eLearning in training for providers and businesses.

The National VET E-learning Strategy's 2013 E-learning Benchmarking Survey on the uptake, use and impact of eLearning in VET in 2012, to which 677 registered training organisations and 1,991 VET teachers and trainers from all states and territories responded, revealed that 48 per cent of all VET activity in 2012 involved eLearning, although the actual level of eLearning uptake was thought to be much greater than this — estimated at 90 per cent — due to continuing misconceptions about what eLearning actually involves (training activities that occur at an institution, offsite and/or in the workplace, and as part of a completely online training programme or as part of a blended mix of training delivery). Overall, 95 per cent of VET teachers and trainers said that they used one or more technologies in their training (up from 90 per cent in 2010) and 65 per cent of the teachers and trainers agreed that they were confident about using eLearning, compared with 54 per cent in 2010. The VET teachers and trainers also reported accessing a wider range of online learning resources from within and outside their training organisation, as well as developing their own online resources (65 per cent) or customising resources for their own use (60 per cent). The major barriers to greater uptake and use of eLearning were cost and time for teachers and trainers and access to computers and the Internet for the VET students (Flexible Learning Advisory Group, 2013).

However, after reviewing the outcomes of these national frameworks, TVET Australia (2012), a ministerial company providing services to the TVET system, concluded that while access to eLearning infrastructure and technologies is important for delivering rich learning environments, it would not in itself achieve a “step change” in the use of ICTs 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 in incorporating eLearning into their practices and have the skills to use eLearning in transformative and innovative ways requires a long-term focus and a well-planned and well-resourced national strategy for development within the sector.

The National E-learning Strategy 2012–2015 (Department of Industry, Innovation, Science, Research and Tertiary Education, 2012) was designed to enable the Australian training sector to take advantage of the rollout of the National Broadband Network (NBN) to make major advances in the achievement of government training objectives. Continuous research into and measurement of the educational and training outcomes and an annual review of progress in this three-year programme was to influence the approaches used from year to year to allow for ongoing improvements and responses to change in the environment.

As shown in the aforementioned BIBB case study, another way of encouraging eLearning is to offer competitive innovation and development grants and seed funding for nationally strategic projects. Another means of advancing TVET transformation is to encourage and support 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, and raises 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 collaborative initiatives are shared purposes, interdependencies that link various stakeholders and recognition of the mutual benefits. Risk analysis may be needed to assess the possibility of resistance to change, lack of preparedness and slow or weak co-operation between the providers, changes in political and economic circumstances, and a lack of sustainability potential.

Centralisation versus Decentralisation

In organising national or state-wide open, distance and online learning systems, it is important to strike the right balance between centralisation and localisation. The benefits of centralisation lie in the co-location of people with similar skill sets and highly specialised capabilities, cost savings, standardised procedures and co-ordination and cohesion across the system or organisation.

Marope, Chakroun and Holmes (2015) describe how the Republic of Korea created a single specialised 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-learning system based upon ICTs. KERIS established the master plan, secured the budget, defined the roles and responsibilities of the various partners and providers, standardised the procedures, selected and ran pilot programmes, built consensus on the new systems in consultation with the 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 nation-wide educational content sharing service for universities and colleges. This centralised approach has helped them to achieve the ambitious goals set by the Korean government and raise 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 not only that ICTs are one of the strongest drivers of innovation but also that the organisation plays a proactive and leadership role in advancing ICTs in vocational education and training. 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 exchange ideas and experiences.

In Chapter 4, Robyn Harriden explains how the vocational and training system of distance education in New South Wales, Australia, was originally decentralised, with students enrolling in local colleges and being supported by local correspondence teachers and tutorial and seminar groups. However, with the establishment of the Open Training and Education Network (OTEN) and greater use of online learning, it was decided to replace this arrangement with a centralised 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 Organisations to meet the training needs of an industry, or a group of industries, and approved by the Australian Skills Quality Authority.¹

As the European Centre for the Development of Vocational Training (Cedefop)² (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, as noted by Janaka Jayalath in Chapter 5, where he describes the island-wide Online National Careers Guidance and Counselling System established in Sri Lanka by the Ministry of Youth Affairs and Skills Development and Tertiary and Vocational Education Commission.

However, over-centralisation can sometimes lead to delays and bottlenecks, and the 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 centralisation to co-ordinate the key operations, but also encourages and supports innovation, creativity and locally adaptive systems at all levels to address local problems quickly and effectively.

Funding

Simply adopting eLearning on the assumption that it will be profitable, cheaper or a means of coping with reduced funding can lead to many problems. ICT-based learning can be resource- and labour-demanding 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 the funding issues.

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 organisations, public-private-partnerships and revenues earned from entrepreneurial activities. Tinio (2015) observes that using private sector-public sector partnerships to pilot or fast-track ICT-based projects is a strategy that is gaining currency among ministries of Education in developing countries. Many of the most significant ICTs in education efforts have also been supported by multilateral organisations and international aid agencies. Google is a useful source of information about grants that are available. For example, at the time of writing, The Fund for Internet Research and Development (FIRE Africa) was announcing that it had over US\$240,000 in grant funding and was inviting agencies to apply to develop innovative projects using ICTs to provide solutions to 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 the funding agencies that direct and tangible outcomes are likely and with evidence of previous

1 www.asqa.gov.au/about/australias-vet-sector/training-packages1.html

2 www.cedefop.europa.eu

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-based programmes is their ability to continue after the donors' funding comes to an end. Far too many pilot ICT-based education programmes prove to be unsustainable because governments are unable to provide permanent funding and the local institutions or communities are not in a position to support the programmes. So, as Pascal Mabile suggests in the Cambodian case study in Chapter 10, it may 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 the *Fundación Paraguaya Escuela Agricola*.

Planning at the Institutional Level

At the institutional level, a mix of centralisation and decentralisation may also provide the best answer to using ICTs for TVET transformation. Co-locating people with similar skill sets can foster innovation and the development and spread of highly specialised capabilities, so there may well be value in centralising functions such as instructional design, media production, staff development, quality assurance, 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-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-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 the 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 (Chapter 7), Jeanette Bartley-Bryan argues that the successful integration of ICT-based teaching and learning methods requires what she describes as a “total systems’ approach.” UTech ended up establishing a central specialised unit to oversee the entire process of change, clarify the expectations, identify the sources of expertise and resources, provide templates for the design of the learning activities and assessment of the modules and units, and manage the budgets and workflows. Bartley-Bryan also stresses how essential professional development was to ensure 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 ICTs’ 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.

Instructional Design

The most basic forms of ODL and eLearning 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 Pascal Mabilie shows in the TVET Academy pilot programme (Chapter 10), 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-standard multimedia online courseware is much more time-consuming and costly. It requires careful thought about the 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 upon due care being given to, to paraphrase Bernard, Naidu and Amundsen (1991):

1. Content presentation strategies (developing advance and graphic organisers, objectives statements and instructional methods that help the organisation 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 (Chapter 6), Caroline Seelig and Mark Nichols present 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, Merrill (2002) concludes that all theories and models of instructional design are essentially five fundamental principles which, stated in their most concise form, are as follows:

1. Learning is promoted when learners are engaged in solving real-world problems.
2. Learning is promoted when existing knowledge is activated as a foundation for new knowledge.
3. Learning is promoted when new knowledge is demonstrated to the learner.
4. Learning is promoted when new knowledge is applied by the learner.
5. 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 so 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.

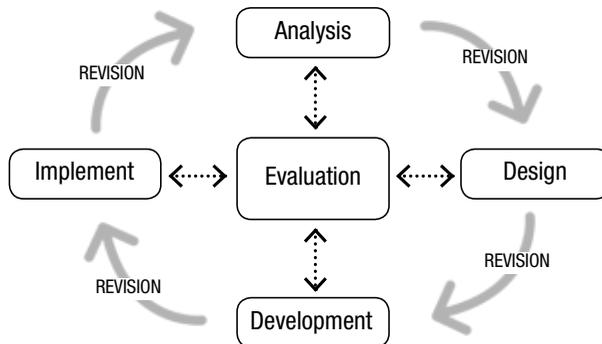


Figure 1. The ADDIE model

(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 media designers that are quite distinct from those of the conventional teacher. In its simplest forms, instructional design can be managed by individual or groups of subject experts working on their own. Alternatively, the 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 out-sourced to commercial production agencies. The latter may be necessary if staff lack the specialised 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, understand all the different students' needs and 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 is to 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 the various media.

Selecting Media

There are numerous ways of providing text, audio, images, animation, video, learner support and collaborative learning by 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 best the sector can use them.

The Internet, social media and 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 onto this digital platform. Accessed by 1 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-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 course and materials designers. It sets out the factors that must be considered in selecting media and methods in descending order of importance. These are:

- **S**tudents.
- **E**ase of use.
- **C**ost.
- **T**eaching functions, including pedagogical affordances.
- **I**nteraction.
- **O**rganisational issues.
- **N**etworking and novelty.
- **S**peed and security.

Effective teaching and learning in all forms calls for fundamental adjustments of thought, application, discipline and concentration. And creating quality ICT-based courses and programmes can be costly and time-consuming. So it is 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, customise, 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 the developing countries. Figure 2 is a visualisation of what the William and Flora Hewlett Foundation³ sees as the methods for equalising access to educational resources worldwide:

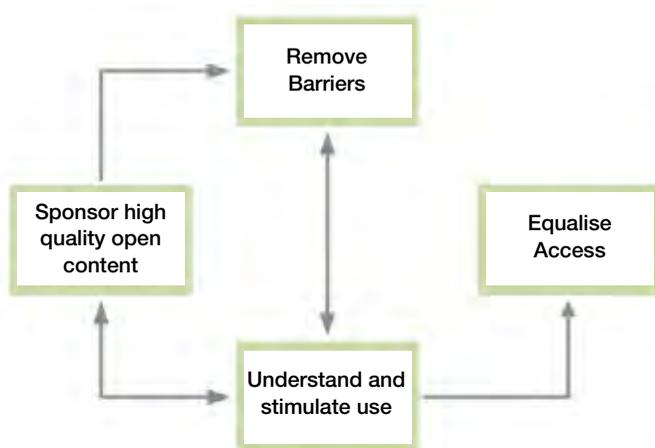


Figure 2: Methods for equalising access to educational resources worldwide
 (Source: Jisc. (2015). OER Guide: Stakeholders and benefits. <https://jisc.ac.uk/guides/open-educational-resources/stakeholders-and-benefits>)

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 multimedia and multi-modal 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 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

³ See www.hewlett.org/about-us

find that they lack the aptitude, experience and knowledge for self-directed study and need confidence and morale boosting, tutorial support and counselling with 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 and 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 rise 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 the learner support.

Risk Analysis and Prevention Costs

As Sarah Hoosen and Neil Butcher show in Chapter 12, TVET providers must balance the benefits of using the various ICT-based approaches with the costs. They must also analyse the risks, because identifying and reducing the possible negative impact of events and circumstances on processes and outcomes also helps to contain or reduce the costs.

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 the policy making, planning, consulting with stakeholders and establishing the correct organisational and management procedures for the curriculum and pedagogical development, instructional design, technical services, course delivery and learner support. The appraisal costs are those costs that are 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. The internal failure costs are those costs that are incurred before the final creation or delivery of systems, products and services. The later any faults

or failures are detected, the more costly their reworking or abandonment will be. The 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 2012,⁴ 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),⁵ 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 teachers, trainers and leaders in TVET. These included capabilities in adult learning, the use of ICTs 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 and support and training in integrating ICTs into learning. Daniel, Alluri and Mallet (2008) observe that not only is initial teacher training needed to provide qualified TVET teachers at the secondary, post-secondary and tertiary levels, but practising teachers should also be helped to upgrade their knowledge, skills and qualifications through continuing professional development. What none of these studies refer to 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 range of ongoing training for TVET teachers, particularly in the 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

4 <http://rcp-platform.com/2nd-upi-international-conference-on-technical-and-vocational-education-and-training>

5 www.cedefop.europa.eu/en/events-and-projects/networks/training-trainers-network-ttnet

environments. However, as explained in Chapter 2, Danaher and Umar (2010) illustrate how open, distance and ICT-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 employed for updating industry-specific knowledge and skills. By using such means as the Web, CD-ROMs, video streaming and e-forums, teachers anywhere 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. 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. So 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 the TVET-specific teacher training needs. Where these cannot be found, online customisable 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 eLearning 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 eLearning and e-training can be established. And information about ICTs 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 policy makers, managers, teachers and students whose experiences and opinions are so crucial to TVET development.

If the teachers and trainers are going to commit themselves to TVET transformation and the integration of ICT-based methods in their courses, there need to be incentives. 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 justly 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 realising 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 the other sectors of the education industry. They suggest that this weak culture of research and analytical knowledge creation and lack of regular and current data substantially limit the TVET sector's capacity for foresight and a 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 policy making 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, and the uses and impact of ICTs. The importance of research into the latter cannot be over-stated. 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 in Red River College and Nova Scotia Community College in Canada (Chapter 11), the evaluation process focussed on the student issues, the management issues, the instructor issues, the course and instructional design issues, the industry supervisor issues and only finally, the 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 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. And 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 is 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.

Conclusion

The Qingdao Declaration (UNESCO, 2015) states that to achieve the goal of inclusive and equitable quality education and lifelong learning by 2030, ICTs — including mobile learning — must be harnessed to strengthen education systems, knowledge dissemination, information access, quality and effective learning, and more efficient service provision. Its advocacy approach is to “seize digital opportunities, lead education transformation.” The biggest mistake that policy makers, managers and educators and trainers can make in response to these calls and in using ICTs 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, TVET can develop the gifts and talents of all and more effectively meet the development needs of the present and future generations.

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Conclusions and Recommendations

Colin Latchem

There is an expectation that Technical and Vocational Education and Training (TVET) will anticipate future skill needs, engage employers in planning for training provision, make training accessible to all sectors of society, build solid bridges between the world of learning and the world of work, assure quality and relevance in education and training and ensure that training costs and productivity gains are shared equitably. There is also a belief that information and communication technologies (ICTs) can improve the quality, range and scope of TVET provision — and at less cost than current options — and that, being multimedia and interactive, they can help learners process and retain knowledge. The Qingdao Declaration (UNESCO, 2015) declares that to achieve the goals of inclusive, equitable and quality education and lifelong learning by 2030, ICT-based teaching and learning needs to be integrated in all sectors of education. However, it also observes that on their own, ICTs will not bring about the required transformation and that there is a need for well-informed, long-term policies and strategies, professional development and well-researched and innovative methodologies for educational technology to play a central role in building inclusive and sustainable knowledge societies.

As Marope, Chakroun and Holmes (2015) point out, the rhetoric about the far-reaching changes that can result from the incorporation of ICTs in TVET teaching and learning has yet to be matched by the reality. The necessary changes in policy, planning and practice have not been implemented and innovation has been limited in scale. There has been insufficient awareness-building of the benefits of ICTs' integration, encouragement to innovate, professional development and recognition and reward. And there has been insufficient research and evaluation to convince governments, funding agencies, industry and TVET managers and staff that online teaching and learning can and do result in improved learning outputs, outcomes and impact. The sector can only afford to embrace innovations that

result in enhanced understanding and skills, cost savings, greater organisational efficiency, increased access and equity, gender mainstreaming and sustainable development.

To progress to more widespread application and evaluation of ICT-based methods and blended learning requires leadership and a series of co-ordinated initiatives, incentives and support mechanisms to encourage and support change in the following regards.

Leadership

Transformational change calls for transformational leadership. TVET therefore needs to:

- Develop sector-wide policies and strategies to fully realise TVET transformation worldwide.
- Commit to the goal of ensuring that all learners, regardless of age, status, gender, location, language, disability or other circumstances, have access to online technology and the option of online or blended study.
- Empower and train managers and staff to initiate and lead such transformations.

Teaching and Learning

To be responsive to the scale and diversity of the needs of both on- and off-campus learners in different countries, cultures and contexts, TVET needs to:

- Mainstream ICT-based and flexible courses and means of delivery.
- Ensure access, equity and quality in course provision and allow for multiple learning styles.
- Provide courses and courseware that are learner-centred, are fit for purpose and achieve quality learning outcomes.
- Employ sound principles of instructional design and adult education that make learning more efficient, effective and appealing.
- Enrich learning experiences by using guest lecturers, team teaching, virtual learning and international and cross-cultural collaboration in teaching and learning.
- Encourage and support online learning communities in which learners contribute to knowledge-building through blogs, chatrooms, discussion forums, wikis, etc.
- Ensure equitable and quality learner support.
- Achieve quality, equity and economy in TVET provision by encouraging and supporting the co-creation, sharing and use of courseware, including OER and MOOCs.
- Create international, national and subject repositories to share teaching and training materials, information, guidelines, case studies and research findings to encourage good practices.

- Use the above means to also provide education and training for the informal sector and those starting up or running small enterprises.

Enrolment and Career Guidance

To help close the gap between vocational and education training systems and labour market demands, TVET providers need to develop ICT-based systems to:

- Help learners discover their special interests and receive career guidance.
- Provide learning pathways from informal and non-formal learning to formal study.
- Collaborate with industry in developing online portals that enable learners and particularly out-of-school youth and the unemployed to access up-to-date information about job opportunities, career paths and opportunities for study.
- Provide introductory or “taster” courses on a “freemium” basis, in which study and support are free but a modest premium is charged for assignment marking and assessment for anyone who wishes.

Branding and Status

To convince students, employers, communities and funding agencies that TVET is future-oriented, transforming itself and ensuring quality, the sector needs to use the Web and social media to:

- Rebrand and reposition itself in the educational hierarchy.
- Portray itself as innovative and customer-responsive.
- Increase its market share, internationalise its programmes and develop strategically important partnerships.

Professional Development and Quality Assurance

ICT-based teaching and training requires knowledge and skills in instructional design for adult learning, self-directed learning and experiential learning.

Therefore, managers and staff need:

- Face-to-face, online and blended induction programmes for new staff, and workshops, study groups, mentoring and collaborative action research for current staff.
- Training in educational research and quality assurance.

Quality Assurance

To convince all the stakeholders that the sector is achieving quality and fitness for purpose in all of its services and products at every stage of delivery or production, there is a need for:

- Quality frameworks that enable continual monitoring and quality improvement.

- System-wide and institutional quality assurance and reporting mechanisms that are outputs-, outcomes- and impact-focussed.
- Professional development in quality assurance for managers and staff.
- A culture of continuous quality improvement.

Research and Dissemination

The transformation of TVET and adoption of ICT-based methods require a strong evidence base. There is therefore a need for:

- Qualitative and quantitative studies to verify the needs, benefits and potential of the systems and methods adopted.
- Staff training in learning analytics, evaluation and research methods.
- More research articles, reports, case studies and opinion pieces to build up a body of knowledge in the field.
- Multiple means of dissemination to achieve system-wide awareness of what works and what does not work, and encourage others to confirm, refute or add to the findings.

Reward and Recognition

Innovation and transformation require incentives for staff in the form of:

- Excellence awards for outstanding work by individuals and groups.
- Competitive grant schemes.
- Study leave and tours.
- Support for conference attendance.
- Time release, fellowships and scholarships for research and development projects.
- Public acknowledgement.

Scalability, Transferability and Sustainability

While some of the initiatives described in this book are mainstreamed in TVET systems, others have been short-term, pilots, temporary or donor-funded and have yielded no evidence of their long-term benefits, sustainability and impact. There is a need for ongoing support for initiatives that can be shown to:

- Significantly change the teachers' and learners' roles, practices and performance.
- Improve access, equity, learning outcomes, employment and benefits to industry, the community, etc.
- Provide savings and efficiencies.
- Be likely to be widely accepted, replicated and supported within the TVET system.

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PERSPECTIVES ON OPEN AND DISTANCE LEARNING

USING ICTS AND BLENDED LEARNING IN TRANSFORMING TVET

The Education for All initiative concluded in 2015, but in many countries, and particularly in the developing countries, secondary education is still the preserve of the privileged few. This means that millions of adults and young people are denied the opportunity to complete their basic education, which in turns sees them trapped in a pattern of low-skilled, low-income work. How can they gain the knowledge and skills necessary to improve both their lives and their employment opportunities?

This book draws on the expertise and experience of 15 experts who examine the potential of technical and vocational education and training (TVET) to bring education to those who might otherwise be unable to access it. It discusses ways in which information and communication technology-based (ICT-based) methodologies can contribute to the transformation and expansion of TVET programmes and courses. Drawing on nine case studies, it provides insight into — and lessons learned from — different applications of ICTs in TVET around the globe, examines issues of cost and approaches to planning for successful and sustainable applications of ICTs and offers recommendations for the international organisations, governments, policy makers, managers and staff responsible for TVET. This book should prove to be a valuable asset for both practising and potential TVET providers.

Using ICTs and Blended Learning in Transforming TVET is co-published by COL and UNESCO as part of COL's Perspectives Series on Open and Distance Learning.

