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Re-engineering Education and Training for Economic and Social Development in the 21st Century:
A Focus on Technology and Skills Development in National Education and Training Systems in Africa

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1. Introduction/ Background

According to Zuehlke (2009) youth unemployment and underemployment is increasingly recognized as a potential trigger for social instability. Zuehlke states that Africa in particular faces socio-economic and demographic challenges as its youth population continues to increase. Coupled with this, the limited relevance of the education and training systems and the low quality of education provision in many African countries, are often identified as contributory factors to the high rates of youth unemployment and underemployment. It is from this perspective that this paper argues for the re-engineering of education and training systems for sustainable socio-economic development. Such an undertaking will require youth to be equipped with the skills demanded by their communities and economies.

There are few direct references to Technical and Vocational Skills Development (TVSD)[1] in the Millennium Development Goals (MDGs) and Poverty Reduction Strategy Papers (PRSPs). However, the development of employable skills has emerged as a prioritised area for many countries in Sub-Saharan Africa, and among regional bodies, and development partners. Noticeable within the various plans is an increased focus on the youth and expansion of opportunities for employment. Africa has the largest percentage of young people in the world, with over sixty per cent of the population aged between 15 and 25 years old. African youth face very high unemployment rates, while also constituting a vast reservoir of talent, skills and opportunity. Such potential could be harnessed through smart interventions to create a productive workforce (viz. African Economic Outlook 2011). The UNESCO International Experts Meeting's Bonn Declaration gave prominence to this need for transformation stating that that *"(...) since education is considered the key to effective development strategies, technical and vocational education and training (TVET) must be the master key that can alleviate poverty, promote peace, conserve the environment, improve the quality of life for all and help achieve sustainable development."* (UNESCO 2004, p107).

Research in Sub-Saharan Africa shows that improved access to and quality of, skills development, is critical to addressing youth unemployment (World Bank 2008). Appropriate skills development programs feature prominently in strategies to facilitate the transition of young people to the world of work, and many countries in Sub-Saharan Africa are taking on policy activities on training for both the formal and the informal sector (King & Palmer 2010). TVSD is increasingly seen as an important sector to solve the major development challenge youth unemployment represents. The OECD and the African Development Bank in their 2008 African Economic Outlook report identified TVSD as a key resource for

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[1] Technical, Vocational Education & Training has been the traditional term used for Skills Development initiatives within the formal schooling system whereas initiatives taken on by the informal sector have been using the newer and broader "Skills Development" term. Recent research marries the two terms to recognise skills acquired from different learning environments and hence use the term Technical and Vocational Skills Development (TVSD).

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training a skilled and globally competitive workforce. They acknowledged that private investments in Africa are often constrained by a lack of local skilled labour (OECD/AfDB 2008). Regional bodies such as the African Union (AU), the Economic Community of West African States (ECOWAS) and East African Community (EAC) also place TVSD high on their agendas. The AU rates TVSD as one of its seven priority areas for investment in the continent in its Plan for Action for the Second Decade of Education (2006-2015) and has adopted a policy framework for TVSD in Africa (AU 2007). The crucial role TVSD can play in the acquisition of employable skills by the youth and in the sustainable economic development of the African continent has been emphasised in the Association for the Development of Education in Africa (ADEA) 2008 Biennale and will be further emphasized in the 2011 Triennale, through the theme "Promoting critical knowledge, skills and qualifications for sustainable development in Africa: how to design and implement an effective response by education and training systems?" (Hoppers 2008).

Despite the major challenges identified, the World Bank (2008) report entitled "Youth and Unemployment in Africa: The Potential, The Problem, The Promise", describes youth as the most "abundant asset" the continent has at its disposal. The report argues that to benefit from this asset, strong, visionary and transformational leadership is required. Such leadership will have to seriously consider the social ramifications of high rates of youth unemployment and underemployment and craft viable strategies to mitigate them. Additionally, leaders will have to create conducive environments and direct the re-engineering of their education and training systems for responsive, relevant and sustainable youth skills development not only to avert disaster, but also for robust socio-economic development.

Integral to the discussions of systems re-engineering is the role that Information and Communication Technologies (ICT) can play. The potential of emerging technologies in the African socio-economic development landscape suggests that innovation is only just beginning. African mobile communications growth since 2000 has significantly outpaced expansion in all other global regions (Kapstein 2009). The vision over the past decade of internet cafes and telecentres opening up enterprises in every African village, has been replaced by a much more potent vision of a supercomputer in the pocket of every African, already evidenced in the exponential growth of smartphones on the continent. With improved connectivity by way of undersea cables, it is estimated that 69% of mobile phones in Africa will have internet access by 2014 (Ledgard 2011) and young people tend to be early adopters of the emerging technologies. Nevertheless, traditional educational practice fails to support the use of these technologies for addressing the challenges of youth training and skills development. Policy-makers need to respond by creating their own transformational initiatives to harness the technological revolution for the benefit of education and training.

The Ministerial Roundtable hosted by ICWE under the auspices of eLearning Africa presents a valuable opportunity for Ministers of Education (and other sectors) to think through innovative and practical ways of addressing the above mentioned challenges. This paper seeks to look at national education and training systems in Sub-Saharan Africa and tease out key issues related to ICT and their integration to these systems. The paper also presents three case studies based on GESCI's[2] work within the Education and Training Sector of Kenya and Ghana. It is expected that these will provide practical examples that can complement the Roundtable participants' own experiences within their respective countries.

Additionally, participants in the Ministerial Roundtable are being encouraged to consider 'how' technology use can be used to support education re-engineering for socio-economic development in the 21st Century. More specifically, participants are asked to think through the following issues within their deliberations:

> What critical success factors need to be considered if education and training systems are to be re-engineered to meet the challenges and opportunities presented by an increasing youth population?

> How should education and training systems (including TVSD) be re-engineered to optimize the impact of emerging ICT technologies for 21st Century youth skills development?
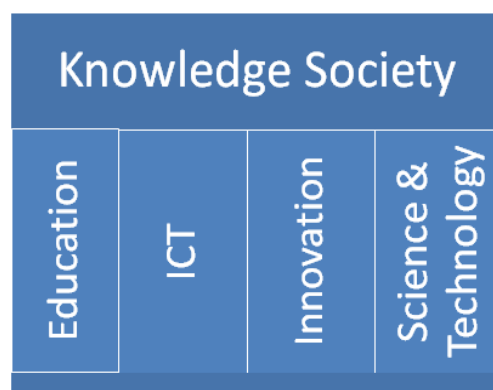
> How can systems evaluate the success of technology integration policies and initiatives for educational transformation and re-engineering?

2. What do policies in Education & Training, ICT and Innovation mean for socio-economic growth, skills development and youth employment?

In the 2007 continent-wide African Knowledge Economy Forum on *Utilizing Knowledge for Development* (DST-RSA, WB, FINNIDA, 2007)*,* a 'new approach' for utilizing knowledge for socio-economic growth was defined that focuses on systemic development of the pillars of Education & Training, ICT and Innovation (incorporating Science & Technology). In a paper commission for GESCI on ICT, Education, Development, and the Knowledge Society, Butcher (2010) concurs on the need for a systems perspective to support socio-economic growth. Butcher suggests that rather than considering Education & Training, ICT and Innovation as separate pillars, they should be viewed as interrelated drivers for socio-economic development towards Knowledge Societies (Figure 1).

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[2] GESCI is a not for profit organisation that provides technical and strategic advice and builds the capacity of countries to use and integrate ICTs in teaching, learning, research, innovation, training administration and other facets of the education system. GESCI's work in integrating ICTs is done on a system-wide and in a systematic approach providing not only expert knowledge of change management in specific education sectors, but also an understanding of how interventions in one part of the education sector impact on other sectors of the system. For more information about GESCI see www.gesci.org .

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Figure 1: Education, ICT, Innovation and Science & Technology Pillars of the Knowledge Society

Source: Butcher 2010

2.1 Education and Training

Technical and Vocational Skills Development cuts across all levels of education and training systems. It is the embodiment of   life-long learning which is the key to keeping pace with a constantly changing global job market and rapid technological advancements. Preparation for lifelong learning requires increased emphasis in primary and secondary schools on learning general skills and competencies, in particular communication, mathematics and science skills, new literacy skills, problem-solving and interpersonal skills, as well as skills needed to learn other subjects. At tertiary level the requirement is for building capacity in science and technology and discipline-specific skills, research and development (Hooker 2010).

Policymakers face the dual challenge of creating conditions for life-long learning, while also creating policies and programs that harness its benefits for economic growth and the public good. The challenge has become more arduous because of the successful implementation of Education For All (EFA) and Universal Primary Completion (UPC) policies. EFA and UPC have increased the number of graduates from basic education who are then faced with limited opportunities for further education (Palmer & King 2010). Countries also face the challenge of combating the effects of the current global economic crisis that has resulted in a sharp decline in labour market opportunities and a steep rise in unemployment generally, but for youth in particular.

Despite the complexity of the challenges, it is clear that continued investment in education is needed as both a driver and strategy for economic recovery. This investment, this paper argues must be aimed at improving educational efficiency and innovation with a view to preparing students for the jobs of the future as well as meeting the current needs of the labor market. The focus of education and training

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policies should therefore not be confined to traditional formal learning institutions such as schools and universities, but should also embrace adult education, informal learning, and workplace-based learning. An appropriate mix of academic and vocational education needs to be developed, providing opportunities for immediate employability, and the development of basic transferable skills to support occupational mobility. The pressure on systems to support the millions of school leavers graduating from basic education has also led to a need for re-examining the use of new technologies to address challenges for smoothing young people's transition to work, combating unemployment and creating a more competitive workforce for the global economy.

2.2 Information and Communication Technology

As the second pillar, ICT is considered a critical tool that can furnish students with the required skills for the global workplace. Technology plays a double role - both educating students so that they can continually adapt to a work world of continuous technological innovations, and makingit easier for students to access the world's knowledge systems. ICT is regarded as an engine for growth and tool for empowerment, with profound implications for education change and socio-economic development. As policymakers aim to improve efficiency and innovation in educational provision that positions countries for economic competiveness, technology integration is becoming a key element in almost every plan for the restructuring and re-engineering of education systems (Scheffler and Logan 2000). Butcher (2010) however cautions that ICT use in education and training plans not be seen as vehicles for teaching 'ICT literacy', but as a means to build higher-order skills, such as knowing and understanding what it means to live in a digitized and networked society and use digital technology in everyday life. In this regard new technologies provide opportunities and tools for reengineering traditional and often times archaic education and training systems and provide alternative ways to reverse youth employment trends while producing a more effective, productive and innovative workforce.
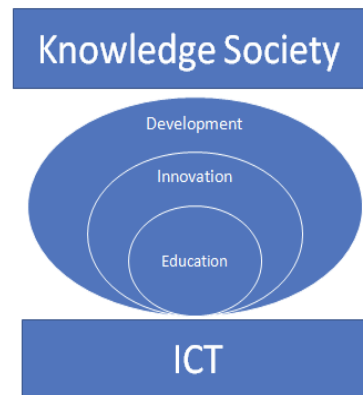
2.3 Innovation

UNECA in a paper commission for GESCI on Innovation and Change and the Knowledge Society**,** refer to the innovative society as one in which growth and development is based on continuous learning in which the stock of knowledge is continuously replenished and renewed (UNECA 2010). Innovation is therefore seen as the 'life-blood' of development and economic functioning in societies (Westera 2004) and can be described as a process of creation, exchange, evolution, and application of knowledge to produce new goods. Innovation is fundamentally about risk taking where "unplanned opportunities and previously unexpected linkages and synergies are to be expected" (DST-RSA, WB, FINNIDA 2007).

The preparation of students for jobs of the future with the required skills, abilities, competencies and creative innovativeness for the 21st Century knowledge-based economy and marketplace is a complex

process which requires an integrated, holistic and inter-sectoral approach and strong leadership. For effective interventions Butcher (2010) therefore proposes that Education and Innovation should be viewed as interrelated drivers for socio-economic development, in a context where ICT is the enabler for education, training, innovation and development (Figure 2).

Figure 2: ICT as an enabler of the education, training, innovation and development

Source: Butcher 2010

3. Technology, Education and Innovation as interrelated pillars in System Re-engineering for Technical and Vocational Skills Development

3.1 The Challenge of TVSD in Sub-Saharan Africa

While it is readily recognized that each Sub-Saharan African country faces its own set of challenges regarding TVSD, some common priority areas have also been noted in the literature (African Union 2007; International Vocational Education Training Association 2008).

These include but are not limited to:

- Modernization of curriculum and increased relevance of TVSD education (addressing low quality of training due to emphasis on theory and certification rather than on skills acquisition and proficiency testing, outdated materials/technology/equipment)
- Aligning TVSD provision with industry and community demand
- Introduction of competency based training
- Strengthening of business management, entrepreneurship and traditional handicraft skills in course provision
- Instructor training and professionalization of national TVSD staff
- Gender stereotyping
- Expansion of enrolment capacity

Development of National Qualification Frameworks (NQFs)

Uncoordinated, unregulated and fragmented country delivery systems and policies

Harmonisation of TVSD programs and qualifications within the region

Funding and equipping of TVSD institutions

Improving the status and public perception of TVSD

To date, countries have developed a range of responses to the above mentioned challenges, and this section of the paper seeks to provide more detailed information on three case studies developed by GESCI in partnership with the Ministries and Agencies mentioned. The cases specifically look at:

Addressing a number of critical challenges as they relate to Policy and Governance Reform, as done in Ghana;

Using information and data to support TVSD Reforms, as evidenced by way of conducting a baseline study in Kenya; and

Customising ICT Teacher Competencies for TVSD teachers, as evidenced by way of contextualising the UNESCO ICT Competency Framework as done in Kenya.

In each case the context (i.e. the drivers), leadership, approaches to re-engineering and the lessons learnt have been summarised.

3.2 Facilitating Holistic Policy and Governance Reform

Uncoordinated, unregulated and fragmented country delivery systems and policies are a TVSD challenge faced by many countries. It is difficult to design an education system that ensures demand driven skills provision and involves stakeholders from key relevant sectors and this requires changes to policy and governance structures at a number of levels. The Ghana case study presented may provide some insights in this regard:

Country Case 1: A Holistic Approach to Technical and Vocational Education and Training (TVET) Policy and Governance Reform, Ghana

Country context: The Government of Ghana, through the Ministry of Education, embarked on a series of Education Reforms in 2007. Included in these reforms are objectives also set out of technical and vocational education and training that essentially seeks to re-engineer the way TVET is handled from a number of perspectives. Critical to these changes a number of priorities were identified including governance, harmonisation and policy related issues.

When was it done and who took the lead?
The COTVET Act (Act 718) was passed by Parliament in July 2006 establishing the Council for Technical and Vocational Education and Training (COTVET). The Act mandates the Council to formulate policies for skills development across the broad spectrum of pre-tertiary and tertiary education, formal, informal and non-formal, ensure quality in the delivery of access to technical and vocational education and training and facilitate research and development in technical and vocational education and training. The overall goals of the Council are to:

Ensure that the unemployed particularly the youth are given competitive, employable and entrepreneurial skills

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nationally and globally within the formal and informal sectors.

Ensure that graduates coming out of our formal, informal and non-formal TVET institutions are endowed with employable and entrepreneurial skills.

The work with establishing COTVET has been carried out since the start of the 2007 Education Reforms and is on-going ever since. The Council is actively engaging with other Ministries, Departments and Agencies, Development Partners, Industry and the TVET Institutions themselves when acting upon its mandate. Within the broader support given to the Ministry of Education, GESCI has worked with the Council in the capacity of a TVET Advisor in addressing some of the issues to be addressed under the Education Reforms as it relates to the sub-sector.

How the re-engineering practically was achieved?

The process and approach took into consideration a number of challenges that were apparent within the sub-sector. The challenge and the solutions as pursued are summarised below:

Challenge 1*: TVET as now offered not linked to Identification of Growth/Focal Sectors and skills development implications (i.e. not demand driven)

> *Solutions:*
> - Focused sector assessments to determine labour demand and supply; scare skills; demands by industry
> - Establishing skills requirements for identified growth sectors
> - Training strategies to achieve the skills requirements, including Competency Based Training (CBT)

Challenge 2*: TVET Programme Development archaic and not linked to standards as determined for various occupations; lack of focus on attainment of competencies

> *Solutions:*
> - Utilizing a Competency-Based Training(CBT)/Outcomes Based Training Approach; starting with a small pilot in selected and key sectors (formal and informal)
> - Establishment of Industrial Training Advisory Committees (ITAGs) and Sub-ITAGs for development of occupational standards
> - Registration of Industry Trade/Sector Committees to develop CBT/OBT Programs
> - Improve general quality of programme development as resulting from the above mentioned measures

Challenge 3: Improving general TVET Programme Delivery

> *Solutions:*
> - Training of TVET teachers/facilitators for CBT/OBT
> - Standardized facilities and equipment for TVET programs at various levels
> - Improved and targeted industrial attachment/workplace training for trainees
> - Expanded opportunities for Industrial internship for teachers/facilitators
> - Improved and expanded Informal TVET provision/Traditional Apprenticeship
> - Workplace Training/Modern/Formal Apprenticeship
> - Improved quality assurance mechanisms for training

Challenge 4: Clear levels for assessment and certification not uniform and/or in place; no clear link between TVET and academic qualifications; no recognition of prior learning

> *Solutions :*
> - Development of a National TVET Qualification Framework
> - Integration of TVET qualifications with Academic Qualifications
> - Recognition of Prior Learning (RPL)
> - Improved Assessment of TVET programs

Challenge 5: Lack of clear governance and coordination structures for TVET

> *Solution:*
> - Harmonise overall responsibility for TVET
> - Defined responsibilities of Ministries, Departments and Agencies in implementing TVET programs
> - Improved coordination of Informal TVET
> - Improved supervision of private TVET provision
> - Increased governance and accountability measures at institutional level

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- Monitoring and evaluation of the TVET system

Challenge 6: Lack of Sustainable Funding for TVET

    Solution :
- Establishment of a Skills Development Fund
- Increased commitment of financial resources by the Government of Ghana
- Increased commitment and participation of Development Partners
- Exploration of Legislative Instruments for a training levy

Lessons learned?
The process to date is still evolving, but already a number of interesting lessons have been learnt. Ensuring the intended changes in TVET – at both the policy and governance levels – does need to involve a multi-stakeholder approach, as the issues cut across several sectors. Alignment to national government priorities is also crucial if long term objectives are to be achieved. The involvement of Industry is critical if TVSD is to be successful in addressing social and economic challenges. Additionally, if the proposed reforms in education and training are to be successful they will have to be accompanied by the necessary (and appropriate) legislative changes – including policy. In the case of Ghana, the establishment of the Council is a critical step towards this process of reform and harmonization. Importantly too there must be a dual emphasis and approach on improving both formal and informal TVET for issues to be addressed in a holistic manner. Lastly, changes must also be accompanied by finding sustainable funding mechanisms if they are to be successful.

3.3 Re-equipping TVSD through ICT

TVSD often suffers from outdated curricula perceived to be too theoretical, and focused on certification rather than skills acquisition and proficiency testing. Additionally, most vocational areas today rely on ICT to a large extent and require that people working in these areas have both basic ICT skills and vocation specific knowledge of software packages. There are few areas of modern work life, independent of vocational areas, where operational procedures have not been subject to constant innovation and improvements in recent years (International Labour Office 2011). By not having ICT represented in the curriculum students graduate from TVSD institutions with skills that don't meet industry needs and the emerging job market. But continuous innovation through technology also means that new skills are continually being demanded by employers. This is why curricula cannot remain static: curricula must be competency based, leaving room for flexibility with regard to the tools, software, and techniques that are used to carry out a task.

By modernizing the TVSD curriculum, developing competency-based curricula and integrating ICT as a core curricular subject that cuts across all subject areas, vocational training provision can be made more relevant. Increased use of simulation software would enhance students' understanding of complex processes and components and these simulations even show potential for substituting some of the 'hands-on' workshop training that otherwise is required. Furthermore, knowledge of vocation specific software packages is increasingly demanded by industry and for students to be equipped with the relevant skills they need to master these tools (Rauner & McLean 2009). Many countries in Sub-Saharan Africa, for example Ghana, Kenya, Rwanda and South Africa, are also targeting new business sectors (such as Business Process Outsourcing, IT and Manufacturing) where technology plays an important role

and hence require skills development for a rapidly changing work environment. In these settings the role of ICT in TVSD becomes particularly important.

Since many African countries remain challenged by uncoordinated, unregulated and fragmented country delivery systems and policies within the field of TVSD, interventions to revitalize TVSD through ICT will have to be supported by a proper policy framework that embraces an ICT integration strategy and acknowledges the importance of developing students' 21st Century Skills. Combined with such policy frameworks competency-based curricula that integrate both basic ICT skills and vocation specific ICT skills hold potential to improve the quality of training and equipping students with relevant practical skills that are attractive to the labor market. The Kenya case study below highlights the importance of reliable and valid information on which to base the development of strategies to address these challenges:

Country Case 2: Using a Baseline Survey to Inform Policy Development and Strategic Planning in Kenya

Country context: Kenya is working towards becoming a middle income economy by implementing its Vision 2030 socio economic development blueprint and developing its Science Technology and Innovation human resource base to enhance science and technology based industrialization. The role of the national education and training system in developing not just the right numbers, but also the right quality of the manpower required to serve in key growth sectors is acknowledged. The Technical Industrial Vocational Education and Training (TIVET) sub-sector is critical for the development of personnel required by industry and a TIVET system that embraces technology both in its content and methods is vital to deliver high quality training services. One of the identified ways to enhance the quality of training is the use of ICT, a measure that also offers possibilities to increase access and equity as well as quality of the management of the sub-sector. The complexity of proper integration of ICT in education requires that it is well planned and executed. Technological innovations and developments in industry are IT biased. Computer technology permeates all areas of work in most fields. This is the rationale for integrating ICT skills as a requisite preparation for different trade areas that is related to work-place requirements.

Who took the lead?
The Directorate of Technical Education under the Ministry of Higher Education, Science and Technology was leading the baseline survey initiative. The work group carried out the survey in close collaboration with the public TIVET institutes and Kenya Technical Teachers' College, with technical assistance from GESCI.

When was it done?
The baseline survey was taken on at a time when the Ministry of Higher Education, Science and Technology was in its initial phase of planning for how to efficiently integrate ICT in the TIVET sub-sector. In starting to plan for relevant interventions it became clear that there was a need for national teams to better understand the issues and challenges encountered in TIVET institutions while attempting to integrate technology use in course delivery and TIVET management - key baseline data on relevant ICT capacities in public TIVET institutions to inform the decision making on future actions and priorities was needed. The baseline survey and field visits were initiated in the latter half of 2010 and the report finalised in the beginning of 2011.

How the re-engineering practically was achieved?
The baseline was carried out using a mixed methods approach combining qualitative and quantitative methods during field visits to the majority of the 38 public TIVET institutions participating in the survey. The baseline survey captured data from 88% of all public TIVET institutions in the country and took a systems perspective on ICT use in institutional practice, focusing on the six components *Policy, Curriculum, Infrastructure, Organization & Management, and Professional development*.

The baseline survey consisted of data collected through;

> *Questionnaires* targeted to ministerial, institutional, departmental and individual levels and structured to provide baseline information along all six system components.
> *An infrastructure survey* to gauge the existence and use of ICT infrastructure in the institutions.
> *Focus group discussions* with a sample of lecturers and students at TIVET institutions.
> *A Training Needs Analysis* that measured stakeholder perceptions of the importance and developmental level ofICT competencies of TIVET lecturers.

The data collected was analysed and the findings summarised in a report, providing recommendations for appropriate strategies for integrating ICT in TIVET.

Lessons learned?

The baseline survey showed the need to reequip Kenya's TIVET institutions with modern curricula and policy formulation to enable the development of youth with relevant employable skills. To respond to existing industry demands, but also to ensure a TIVET sector that is responsive to a continuously changing labour market and new emerging business sectors that many times are technology intensive, there is a need to look at all the components required for successful integration of ICT in an education setting all of which could be brought together in an ICT Integration Strategy for the TIVET sector at a national level. The strategy needs to ensure parallel goals with national sector policies related to education and training as well as provide clear guidelines for how the TIVET institutions should integrate ICTs into classroom practice.

Although infrastructural challenges often have been cited as major impediments to technology uptake in an education setting, the baseline survey identifies a number of other challenges. The ICT Integration Strategy should take into consideration the following components:

> *Policy issues*: National and institutional policies should stipulate how the potential of ICTs should be tapped to address the challenges of access, relevance, equity and quality. Accompanying implementation plans should also be developed to ensure a clear strategy at the institutional level towards the attainment of set national goals and/or standards.

> *Curriculum and Assessment issues*: The current curriculum is not in-step with Industry requirements and it is key to strengthen Industry involvement in TIVET. The curriculum and assessment should go through an audit to ensure adherence to occupational and industry standards, identify where and how ICTs could be best integrated and vocation specific ICT skills graduates should be introduced to. Additionally, the TIVET sub-sector is recommended to investigate a competency based approach, conduct tracer studies in selected courses to ensure employer satisfaction with new curriculum offerings, and introduce ICT as a core curriculum area.

> *Pedagogy*: The art of teaching and learning within TIVET has not taken advantage of ICT as tools for delivery, subject knowledge deepening, classroom and institutional management in most institutions. Head of Departments and Lecturers should be equipped with appropriate pedagogical skills to make learning more meaningful and relevant.

> *ICT Infrastructure*: Most TIVET institutions have invested in traditional ICT equipment (computers and projectors) but there is a need for a more systemic approach to the planning of ICT purchase, use and deployment. For example access to ICT tools and equipment for various skills areas should be standardized.

> *Organization and Management*: Management of TIVET institutions can greatly be enhanced in terms of efficiency and effectiveness through more robust mechanisms that ensure a seamless flow of data between national and classroom administration levels.

> *Professional development*: Head of Departments' and Lecturers' knowledge, skills and attitudes towards ICTs are a big challenge to the technology uptake in TIVET institutions. Nascent steps have concentrated on basic ICT skills and there is a need to move staff competencies from a level of discrete skills training to reflective practice and integrative professional development overlapping subject areas and tools.

3.4 Redefining Lecturer/Instructor Competencies

Instructor training and professionalization of national TVSD staff is also a general challenge threatening the relevance and quality of TVSD. Lecturers and instructors must be empowered in their efforts to transfer relevant skills and knowledge to students that respond to industry demands, and efficient ICT deployment is fundamental in this. A revitalized TVSD system and curricula that integrate the use of ICT additionally require new skill sets also for lecturers and instructors working within the field and that is why continuous professional development interventions becomes a necessity.

Development of ICT competency frameworks and methodologies for lecturer and instructor training in the acquisition of these competencies is a way to empower the TVSD workforce to enhance TVSD delivery. Work has already been undertaken to contextualize UNESCO's ICT competency standards for teachers on a national scale. Together with the Ministries of Higher Education and Youth Affairs in Kenya GESCI has started making these competency standards applicable to lecturers in their daily working environment. They provide guidance for the professional development of an institution's management, and concrete examples for lecturers aiming to develop their ICT skills. By establishing national ICT competency frameworks for lecturers and instructors a standard can be set for training institutes responsible for future lecturer/instructor provision in combination with professional development initiatives aimed at taking currently tutoring staff to an ICT literate level. In this way the high quality tutoring required for relevant TVSD provision can be achieved. The Kenya case study below provides information on the process:

Country Case 3: Defining ICT Competencies for TIVET Lecturers and Instructors, Kenya

Country context: The Government of Kenya, through the Ministry of Higher Education Science and Technology (MoHEST) and the Ministry of Youth Affairs and Sports (MoYAS), is implementing ICT in TIVET institutions with the aim of improving teaching, learning and management. Kenya's Technical Education is implemented through institutions which are known as Technical Colleges and Youth Polytechnics and the teachers in the two types of colleges are referred to as lecturers and instructors respectively.

The overarching goal of an initiative to define ICT competencies for TIVET lecturers and instructors is to contribute to the enhancement of access, equity, quality and relevance of education. Kenya is aspiring to lay a foundation for ICT hardware, software and connectivity infrastructure to deliver learning content in digital format to trainees for enhanced learning outcomes. The role of the teacher in technology rich learning environments has changed from that of a provider of knowledge to a facilitator of the learning process. This new role requires the teacher to be well equipped with technology and pedagogy skills to enable him/her to establish effective technology rich learning opportunities for the learners. It also enables him/her to use technology to carry out administrative tasks.

Who took the lead?
MoHEST and MoYAS led the initiative as the Ministries in charge of TIVET education and training. Supported by GESCI they involved instructors and lecturers from public Technical Colleges and Youth Polytechnics across Kenya as well as representatives from Kenya Technical Teachers Training College, Strathmore University, the Directorate of e-governance and stakeholders from the private sector.

When was it done?
The work with defining ICT Competency Standards for lecturers and instructors was initiated at a time when there was a renewed thinking in the approach to TIVET education in Kenya, with one strong catalyst being the development of the Vision 2030 which has a strong orientation to Science, Technology and Innovation. ICT Competency Standards also became important at the time when Kenya was going through major political changes that gave prominence to Technical education in the new structure for education and training. The restructuring moved the Directorate of Technical Education from the Ministry of (basic) Education to the Ministry of Higher Education, Science and Technology. Following the restructuring a department for ICT integration was constituted and the mandate spelt out the need to re-examine the teaching practice in Technical Colleges and accordingly the required competencies in the use of ICT in teaching and learning. Hence, an initiative to define ICT Competency Standards for lecturers and instructors was initiated in the second quarter of 2010.

How the re-engineering practically was achieved?
The UNESCO ICT Competency Framework for Teachers, which is a generic framework that spells out the required generic competencies, was used as the basis for contextualizing lecturer/instructor ICT competencies for the TIVET sector in Kenya. With the goal of identifying the specific lecturer/instructor ICT competencies required in Kenya, MoHEST and MoYAS in collaboration with GESCI organised a workshop for lecturers, instructors and key stakeholders to jointly develop a framework for Kenya's TIVET sector. Workshop facilitators and panellists were drawn from GESCI, MoHEST and the Directorate of Technical Training, Directorate of Youth Training under MoYAS, the Kenya Technical Teachers Training College, Strathmore University, the Directorate of e-governance, Seven Seas Technologies, and ADBEST BITES limited (BPO ICT Skills requirements). The workshop was facilitated through presentations, case studies, group discussions, panel discussions as well as demonstrations and exhibitions from TIVET institutions in various parts of the country. Using the UNESCO competency framework as a point of departure, workshop participants selected the most important areas for Kenya's TIVET sector and rated the current state and maturity of lecturer/instructor ICT competencies.

After the workshop a virtual community space for the TIVET workshop group was used as a forum for further collaboration between facilitators and workshop participants. The work done in the workshop was continued and finally validated, resulting in a draft ICT Competency Framework for lecturers and instructors in Kenya. The competency framework will be used as a roadmap on how to capacitate TIVET lecturers and instructors by MoHEST and MoYAS in their efforts to efficiently integrate ICTs into the education and training system to increase the quality and relevance of educational delivery.

Lessons learned?
Instructor training and professionalization of national TVSD staff is a challenge threatening the relevance and quality of TVSD and lecturers and instructors must be empowered in their efforts to transfer relevant skills and knowledge to students that respond to industry demand. New competency needs emerge for tutoring staff and ICT skills is one such fundamental competency. A revitalized TVSD system and curricula that integrate the use of ICTs additionally require that lecturers and instructors continually upgrade their skill sets and continuous professional development interventions become a necessity.

Development of ICT competency framework and methodologies for how to train lecturers and instructors to acquire these competencies is one way to empower the TVSD workforce for enhanced TVSD delivery. International standards such as the UNESCO's ICT Competency Framework for Teachers can be used as a point of departure or benchmark but will always have to be contextualised for strategic fit with the context in focus. Participatory needs assessments that involve lecturers/instructors and selected key stakeholders from both public and private spheres are vital to make the contextualization relevant and the standards applicable to lecturers/instructors in their daily working environment. The set standards also have to be measured against the current state of competencies so that the existing competency gap and priorities in this can be validated. A mix of face-to-face and on-line forums can be used to create awareness for, develop and validate such standards to ensure they constitute a sound roadmap for institutions in planning for professional development initiatives, be they pre- or in-service.

3.5 Skills Development for future labor market needs

With increasing outreach of infrastructure and connectivity and constantly declining costs for equipment ICT integration into TVSD is within reach. The possibilities for efficient deployment of ICT to modernise TVSD curricula, increase relevance of skills provision and expand enrolment capacity of institutions should be harnessed. Innovation, technology and market developments have turned the world of work into a fast changing environment and TVSD training must be carried out to match this reality. Many jobs of the future do not even exist yet, still we're facing the challenge of equipping a growing young workforce with the skills required to deliver in such roles. Not to mention re-equipping the current workforce with the skills required to keep up with this new reality (International Labour Office 2011). ICT have a central role to play in bridging the TVSD learning environment to the world of work.

The growth potential of ICT and Business Process Outsourcing sectors is acknowledged by many African countries (for example Kenya, Ghana, Egypt, South Africa, Rwanda) and hence expected to become increasingly important sectors for job creation. TVSD is to a large extent seen as the natural segment of the education and training system to counteract the shortage of skilled people available to these growth sectors and hence the TVSD system needs to be given a push to develop these ICT-intensive skills.

In summary, TVSD should efficiently incorporate ICT to:

Improve the quality of training and equip graduates with skills relevant to industry. This is required to respond to existing industry demands but also to ensure a TVSD sector that is responsive to a continuously changing labor market and new emerging business sectors that are often technology intensive. TVSD needs to be reequipped with modern curricula and policy formulation to develop youth with relevant employable skills.

Empower lecturers in their efforts to transfer relevant skills and knowledge to TVSD students. Lecturer competencies must be redefined to efficiently include ICT and pedagogical development as a part of enabling lecturers' delivery of high quality and relevant TVSD training.

Increase access to TVSD through enabling new learning pathways. Opportunities to expand enrolment to TVSD can be seized through ICT enabled blended learning methodologies that complement regular TVSD course offerings. Flexible and modular TVSD opportunities can play an important role in bridging the skills gap recognised by many growth sectors.

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4. Conclusions

The education and training systems of Sub-Saharan African countries are under increasing pressure to address issues that affect the very core of their countries' economic and social development. The preparation of graduates for jobs – both those demanded now, as well as those projected - with the required skills, abilities and competencies for the 21st Century knowledge based-economy and marketplace is a long and complex process which requires an integrated, holistic and inter-sectoral approach guided by strong leaders. For effective interventions, education and training have to be viewed as interrelated drivers for socio economic development, and while the appropriate solution for a specific country will always be unique, there are some commonalities. These can include but are not limited to:

a. **Exploring the potential of ICT integration to address both skill demands and employment possibilities:** with increasing expansion of infrastructure and connectivity coupled with constantly declining costs for equipment ICT integration to TVSD is within reach. As seen in this paper and the presented cases, efficient deployment of ICTs shows potential to modernize TVSD curricula and increase the relevance of skills provision. Innovation, technology and market developments have turned the world of work into a fast changing environment and TVSD training must be carried out to match this reality. Many jobs of the future do not even exist, yet still we're facing the challenge of equipping a growing young workforce with the skills required to deliver in such roles. Parallel to this, there is also the need to re-equip the current workforce with the skills required to keep up with this new reality. ICT have a central role to play in bridging the TVSD learning environment to the world of work. The growth potential of ICT and Business Process Outsourcing sectors is acknowledged by many African countries (for example Kenya, Ghana, Egypt, South Africa, Rwanda) and hence expected to become increasingly important sectors for job creation. TVSD is to a large extent seen as the natural segment of the education and training system to counteract the shortage of skilled people available to these growth sectors and hence the TVSD system needs to be given a push to develop these many times ICT-intensive skills. TVSD needs to be re-equipped through ICT integration.

b. **Adopting multi-stakeholder approaches, including cross-ministerial collaboration:** Many African countries remain challenged by uncoordinated, unregulated and fragmented country delivery systems and policies within the field of TVSD and interventions to revitalize the field must be facilitated through cross-ministerial collaboration. TVSD can not only be discussed within the Ministries of Education if the quality of training is to be improved and students equipped with relevant practical skills attractive to the labour market. Ministries in charge of Labour and Youth, the TVSD institutions themselves, and other relevant Departments and Agencies will have to be

consulted and partnered with even if a coordinating council as in the case of Ghana's COTVET is not available. The ministerial modes of collaboration need to be re-engineered.

c. **Ensure demand driven skills provision:** As seen in the case of COTVET (Ghana), procedures to actively engage Industry representatives need to be developed to make sure that future employers are given a voice when designing TVSD delivery. To ensure a demand driven TVSD system, Industry must be involved in developing curricula, identifying skills requirements and setting competency standards. These efforts should not only target the formal sector but also involve representatives from the informal sector to fully enable a TVSD system that develops the skills demanded by Industry.

d. **Addressing professional development:** Lecturers and instructors must be empowered in their efforts to transfer relevant skills and knowledge to students that respond to industry demand. A revitalized TVSD system and curricula require that lecturers and instructors continually upgrade their skill sets and know how to manage change processes. Continuous professional development for the TVSD personnel thus becomes a necessity. Lecturer competencies must be redefined to efficiently include ICT and emphasise pedagogical methods suitable for developing the 21st Century skills required by the youth of today and tomorrow. Development of lecturer/instructor competency frameworks and methodologies for how to train lecturers and instructors to acquire these competencies is one way this re-engineering of the TVSD workforce can be driven and their work towards enhanced TVSD delivery facilitated.

e. **Adopting a holistic approach towards re-engineering**: So what innovative yet practical ways can jointly be drawn in an attempt to address all these challenges the TVSD sector is facing? How should education systems be re-engineered and evaluated? And what role can technology play in enabling demand driven skills provision and innovation? The responses will always differ depending on the country context but through collaborative efforts new ideas can emerge. The way towards re-engineering may be complex but through a holistic approach that integrates spheres of education, innovation and technology, appropriate solutions could be identified.

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Re-engineering Education and Training for Economic and Social Development in the 21st Century: A Focus on Technology and Skills Development in National Education and Training Systems in Africa

According to Zuehlke (2009) youth unemployment and underemployment is increasingly recognized as a potential trigger for social instability. Zuehlke states that Africa in particular faces socio-economic and demographic challenges as its youth population continues to increase.

Coupled with this, the limited relevance of the education and training systems and the low quality of education provision in many African countries, are often identified as contributory factors to the high rates of youth unemployment and underemployment.

It is from this perspective that this paper argues for the re-engineering of education and training systems for sustainable socio-economic development. Such an undertaking will require youth to be equipped with the skills demanded by their communities and economies.

GESCI'S VISION

To be a global thought leader and expert organization in supporting the utilization of new technologies to transform learning and empower individuals and communities with competencies and skills for inclusive and sustainable development.