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The Role of ICT in Sustainable and Responsible Development: E-skilling

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Abstract. Skilling unquestionably plays the most practical role in creating innovations which will be financially, socially and economically sustainable in developing countries (DCs). And because we now live in an economic age dependent on knowledge and driven by the rapid and global advances in Information and Communication Technologies (ICT), skilling in ICT is even more important. Key to participating in the knowledge-based economy is the ability to creatively and productively apply whatever ICT is within reach to be e-skilled. While ICT has become an important national strategy in all DCs, e-skilling has not. The emphasis has primarily been on education to produce more ICT and science graduates. The irony in DCs is that more ICT graduates do not necessarily result in greater productive participation in the knowledge-based economy. The result is often unemployed ICT graduates or the increased brain-drain of ICT and science graduates to developed countries. E-skilling is clearly a new strategic problem in DCs. The productivity paradox points to the unique need for DCs to re-think e-skilling so as to create financially, socially and economically sustainable local innovations driven by ICT. While many articles appear on how DCs may participate in the knowledge-based economy, very few offer practical suggestions that are locally relevant in DC contexts. Developing a DC e-skills agenda is clearly of interest. In this chapter, we draw on early efforts being undertaken in South Africa to present progressive perspectives on e-skilling in DCs based on four important provisions; a national budget for e-skills development, an environment that fosters creativity and innovation, a collaborative platform that recognizes the collectivist nature of DCs, and a national support structure that in inclined to e-skills brain-circulation.

Keywords: capabilities approach, developing countries, development, e-skills, ICT, innovation, knowledge-based economy, sustainability

1 Introduction

We live in an economic age dependent on knowledge and driven by the rapid and global advances in Information and Communication Technologies (ICT) in what has been referred to as the knowledge-based economy [1]. For example, the emphasis on knowledge can be seen from the increased investment in research and development,

education and software which stand at 9% of the Gross Domestic Product in OECD (Organisation for Economic Co-operation and Development) countries [2]. The convergence of media (text, video, telephony and images) and the constant advancement in the power of technology and communications infrastructure to generate, transmit and distribute information at faster speeds and yet at a lower cost amplifies the necessity to have a different labour market. This is a labour market that has the ability to innovate the readily and easily available scientific and technological knowledge for sustainable gain [3].

In this paper, we adopt a view of knowledge as the intangible sum of – what is known and what one has become familiar with – fact, truth, principles acquired with education and experience. Knowledge is however not sufficient for sustainable growth and economic development. While it remains a good starting point, creativity and innovation are required to turn knowledge into a product, idea or artefact that will add value to an individual, group, organization and society. We refer to the productive end point of knowledge as a skill. A skill goes beyond knowledge to the capacity to achieve desirable results with minimal effort within a context [4].

Dreyfus and Dreyfus' [4] model of skills acquisition suggests that knowledge is transformed into a skill through formal instruction and practice in several stages: novice, competence, proficiency, expertise, and mastery. At the novice stage rules about a field are followed without consideration of how they can be applied in context. The person will often need to be guided on the rules. At the competence stage the person is now able to apply the rules within the context and make trade-offs although in a limited way. At the proficient stage, a person is able to make decisions within the context and even make rules to guide later decisions. A person who has acquired expertise is able to prioritize what is important within the context, and even innovate within the situation at hand. The mastery stage is where the person has embedded a deep knowledge such that he or she can now develop visions of the future and guide others towards achieving those visions.

A simple example could be when at the novice stage an entrepreneur could learn to use a mobile app to send information about his or her products to clients. Then as the entrepreneur becomes comfortable with the app, he or she could create client groups within the mobile app which could send preferential information to different types of clients. Based on physical client feedback, the entrepreneur could later modify the groupings to decide on better management of the information sent to the clients. Beyond this, the entrepreneur could request customized modifications from the mobile app that would allow for supply chain type inter-communication with clients. The entrepreneur would have mastery of the mobile app by creating new channels which would apply to similar entrepreneurs, train employees on its use, and project modifications that are needed for future business.

The model by Dreyfus and Dreyfus is however insufficient in not being prescriptive enough on the process required in moving from one stage to the next, nor allowing for the place of creativity and innovation [5].

We posit that e-skilling, applying creativity and innovative processes using ICT as a tool, plays the most practical role in creating new artefacts which are financially, socially and economically sustainable in the knowledge-based economy in developing

countries (DCs). Next, we consider the complex issue of development and show the special attention needed to stimulate e-skilling in DCs.

2 The Nature of Development

The nature of development is a subject of continuing theoretical debate [6] ranging from something that happens in the third world [7] to a structured and linearly staged process of enabling DCs to catch up with developed countries [8]. The issues that stand out in the debates on development generally arise from two areas; how development is defined and for whom development is aimed. These issues include the measurement of development, the economics of development, the contribution of international aid, political and civil development, the globalization influences on development, gender, development such as modernization, regional variation, underdevelopment, the environment, and community development [9], [10].

The current discourse appreciates that development does not occur in a vacuum but requires harmonious collaboration between governments, the private sector, civil society and citizens. Policies that are aimed at development need to consider at least five important DC aspects: they should support local institutional structures such as the collectivist culture, play a role in the implementation of other pro-development policies, ride on democratic freedoms to foster creativity and innovation, take caution to increase self-reliance, and play a unifying role in the country [11].

The ideas on development by Amartya Sen [12], which have significantly influenced the United Nations approach to development, take a more sustainable approach to development by centring on individual choice and the freedoms to make the choices. Sen's [12] Capabilities Approach (CA) is a broad framework that assesses individual well-being and social arrangements based on what individuals are able to do and to be. The basic premise is to enlarge the choices available to individuals so they can live the life they choose [12]. Sen contends that the assessment of well-being should be concerned with an individual's capability to function, "what a person can do or can be", and the real opportunities that the person has especially compared with others. Robeyns [13] proposed a schematic representation to visualize the CA (Fig. 1).

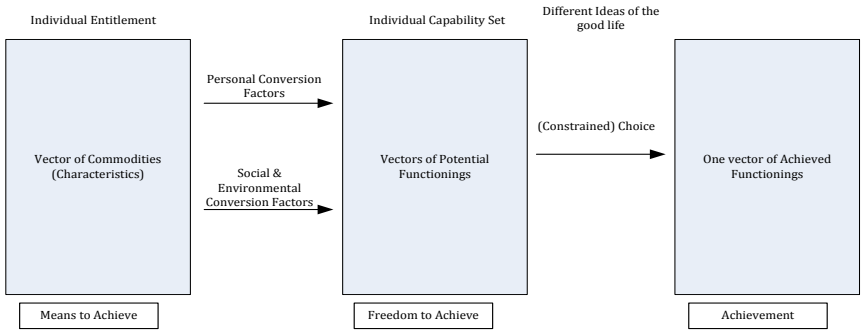

Fig. 1. Schema of the Capabilities Approach [14].

The figure can be summarized as follows, beginning from the left. An individual may have the means to achieve such as access to a mobile phone or a computer. The means to achieve are expected to assist to emancipate the person from conditions of deprivation. However, the person's psyche needs to be transformed in order to exercise control of the available commodities for his or her benefit. The transformation of the person requires social and environmental factors, such as training. The trained person will then have obtained the freedom to achieve. Then, based on the person's perspective of what is considered good and beneficial, what Sen refers to as a constrained choice, the freedom to achieve is drawn on to actually do something. For example, a person can create a website to advertise products. By doing this, the person will have made an achievement based on what he or she desires.

Sen's humane way of thinking is a fundamental shift away from the linear and structured development norms which measure well-being based on financial estimates such as Gross Domestic Product and Gross National Product. In CA it is not enough to only remove obstacles that inhibit individuals from living the life they value; individuals should be provided with the means to achieve such a life [12], [14].

Nonetheless, Sen's developmental approach is limited for many DCs in especially two areas; it is overly individualistic because it ignores the strong collectiveness nature of DC cultures [15], and it is non-prescriptive. The CA is strong on values but weak on prescriptions in contrast to the traditional approaches to development [16]. For example, Sen's framework accounts only for knowledge but leaves open the constrained factors that will move a group, organization or a society from knowledge to exercising a skill to mastery. Creativity and innovation are required for a person, group, organization or society to take the acquired knowledge through to implementation. And in the knowledge-based economy, a creative and innovative manipulation of ICT tools needs to be emphasized as a significant part of the constrained choice.

3 Examples of e-Skilling as Means of Sustainable Development

There are a number of countries that have already adopted a creative and innovative ICT approach to the knowledge-based economy such as Australia, China, Hong Kong, New Zealand, Singapore, Sweden, as well as the EU. For example, Malaysia and India moved the focus from foreign direct investments in ICT to investments in indigenous companies. Malaysia intentionally forces multinational corporations to employ local resources in the ICT sector which has resulted in a brain-circulation where skills eventually remain in Malaysia. South Korea invests in its human capital by upgrading the quality of higher education and the employment opportunities available to indigenous high-tech labour. South Korea purposefully created industries that could lure back critical ICT skills. South Korea's decision to offshore some ICT skills has additionally been a factor that has caused a change in the economic paradigm from looking for low-wage labour to perform low-wage work to low-wage labour to perform high-skilled work [17]. It is clear from these examples that government has played a significant role in creating and enforcing an amiable environment for the creative and innovative sustenance of ICT skills [17]. With the exception of India, these are all

developed countries. We present below a budding e-skilling agenda in a DC, using South Africa as an example.

3.1 The National e-Skills Plan of Action, South Africa

South Africa recently developed an e-skills agenda in the National e-Skills Plan of Action 2010 (NeSPA). The agenda aims to stimulate the creative and innovative use of ICT among citizens, communities, and organizations so they can favourably participate in the knowledge-based economy [18]. NeSPA was the climax of two years' consultation across business, government, education and civil society in South Africa and with international donor agencies, international IT corporations and research co-ordinators. The five areas identified for focused effort are:

- The alignment of an e-skilling agenda within existing developmental policy – national and international, budgeted for and linked with human capacity development
- The cultivation of cross-collaborative research on e-skills across the main four sectors of government, business, education and civil society
- The creation of a cascading hub-and-spoke type of collaborative administrative structure which places universities at the centre of bringing together the sectors
- Improving economic access to Internet and telecommunications
- The formation of a high-level advisory council that takes care of the interests of the different sectors.

In the context of South Africa, seven e-skills were identified:

- e-Literacy Skills: the basic use of ICT, for example, the Internet and email
- e-Participation and e-Democracy Skills: focusing on enhancing participative citizen-government engagement
- e-Government/Governance Skills: to increase a more efficient and productive use of ICT within government
- e-Business Skills: aimed at increasing organizational efficiency and productivity
- e-User Skills: focusing on enhancing efficiency of people for any task at hand
- e-Practitioner Skills: for the more traditional mainstream ICT professional
- e-Community Skills: aimed at communities for building social cohesion within local contexts, for example, to deal with crime, health and education.

The e-skills agenda sees impact as being measured based on the degree of:

- Employment readiness: a higher ability to become employed
- Effective e-governance and service delivery: using ICT to improve government services
- Business development: leveraging ICT to enhance business productivity
- Socio-economic development: an increase in national productiveness
- Research and development: to guide policy and curriculum development.

4 Towards a DC e-Skilling Agenda

The local context of DCs differs from developed countries in at least five ways: the history and culture, technical staff, infrastructure, citizens and government officers (Chen et al., 2006). The recent democracy of most DCs, relative to other developing countries, is particularly distinctive. In terms of culture, Western societies are highly individualistic while DC cultures are more collectivist [19]. DCs also typically suffer from e-skills shortages, unlike developed countries where, on the one hand, most government officials use and may in fact depend on ICT. On the other hand, government officers in DCs are often vaguely familiar with ICT and will in most instances prefer not to dedicate the already few human capital resources to a notion that is vague.

The contextual differences highlight the need to create an e-skilling agenda that suits the development needs of DCs.

In summary, we see an opportunity for an e-skilling agenda that takes into account the following key principles:

1. An increased national budget for research and development in e-skills development
2. An environment that fosters creativity and innovation, and further enables people, groups, organizations and societies to progress from knowledge through to a mastery of e-skills in creating and innovating artefacts that suit their specific contexts
3. A collaborative platform to share ideas, and one that recognizes the collectivist nature of DC communities
4. A national support structure that in many respects enforces and is inclined towards brain-circulation.

In the next section, we offer a fuller discussion on the points presented above and later use the discussion to evaluate the e-skilling agenda of South Africa.

5 Discussion

The following discussion is primarily guided by Dreyfus and Dreyfus' [4] model of skills acquisition presented in the introduction section. The model throws light on how basic/novice knowledge of ICT could be transformed into a mastered e-skill through formal instruction and practice following the stages of novice, competence, proficiency, expertise, and mastery. The model will also assist as a lens through which to evaluate the e-skilling programme of South Africa and glean conceptual ideas for an e-skilling agenda for DCs taking into account Sen's ideas on humane development [12].

5.1 A Necessary Stimulant Budgetary Provision for an e-Skills Programme

A key ingredient for development of any kind is for there to exist a range of commodities which people or groups of people can draw on to emancipate themselves. One of the most important of these commodities in DCs is finances. These countries are DCs

because the greater majority of the populations do not have sufficient economic capabilities. Therefore, for an e-skilling agenda, commodities such as economic access to ICT and the Internet would be the vital starting point. Sen [12] is quick to caution that having access of whatever kind to a commodity does not necessary mean the commodity will be productively utilized. There are personal and social factors where a person needs to be trained on how to use the ICT. In South Africa, like many other countries, there are multi-purpose community centres which have computers with an Internet capability. However, access to the computers is constrained by the inability of the people in the community to pay for the relatively high cost to learn how to use the computers or access the Internet by using the computers. The second constraint is that where training is done, it is often focused on creating the novice knowledge of ICT, and no path is provided to reach mastery levels such that the few people who gain such novice knowledge are not able to do much with their new knowledge except to have a certificate. The above two constraints have been the main reasons why many of the multi-purpose community centres have not added much value in terms of getting people to use ICT.

The lessons that can be learnt from multi-purpose community centres shows that DC governments need to go beyond providing access to ICT and the Internet, to providing economic access to ICT/Internet up to mastery level by either making access to the ICT/Internet free, and/or by providing economic incentives for people in the community to learn to use the ICT/Internet in their vicinity up to the level of mastery.

Nonetheless, making the provision is still not enough. While a person may have a mastery of how to use a commodity, it does not necessarily mean that the person will take advantage of the commodity to do something productive. Sen [12] describes the necessary step as a constrained choice which is often tapered by personal and social notions of what is beneficial. For example, a person who has mastered how to use ICT may prefer to only use the ICT to send emails to relatives and friends or apply for jobs online. Another person could take the same opportunity through self-taught free Internet education to create a free-website and advertise products for sale. Another may not even use the mastery of e-skills.

Although the responsibility for a productive use of an e-skill eventually lies with an individual, and not with government, government can provide an environment whereby people will be stimulated or encouraged to make an attempt at trying out their new e-skills. We posit the answer to lie in creating an environment that encourages innovation.

5.2 An Environment that Fosters Creativity and Innovation

Creativity is the creation of a valuable artefact, procedure, or process often by people who work in collaboration [20]. Innovation carries the same essence as creativity except the end-result is from an improvement of something that already existed. Creativity is a part of innovation which in turn is part of organizational change. For groups to be creative, the leadership should be democratic and collaborative, the structure should be organic rather than mechanistic, and the groups preferably “composed of

individuals drawn from diverse fields or functional backgrounds." [20]. The key to innovating with ICT is therefore individuals with a mastery of e-skills.

An example of a needed innovation in DCs is the advent of the mobile. The uptake of mobile technology in the form of basic cell phones, smartphones and tablets has already outpaced the traditional personal computer (PC) and fixed-line telephones, creating with it an opportunity for innovation. For example, South Africa has a 101% mobile phone penetration, which means that each and every person has access to a mobile phone. This means that innovations in e-skilling should pay close attention to mastering e-skills in developing mobile applications. Although there are some successful models such as Kenya's M-PESA and u-Shahidi, it is unpromising that most mobile apps are created in developed countries and are not relevant to DCs. This creates an opportunity for the creation of valuable mobile apps which are locally relevant to DCs.

In addition, in 2007 South Africa made provision in its income tax law for a 150% tax incentive to organizations that invest in research and development in areas such as software development. Coupled with the 150% tax incentive, the South African e-skills agenda has a number of qualities that encourage an environment which fosters creativity and innovation. The cascaded hub-and-spoke system is fluid and allows a degree of autonomy to each of the hubs to participate in advancing the agenda and developing funded research programmes. The individuals participating in the hubs are from a broad range of functional and organizational areas beyond information systems, such as, for example, chemical engineering, mathematics, physics, management, computer science, government, education, business and civil society.

It is too early to tell whether the environment of creativity in the South African e-skills agenda will pay off and what, if any, were the factors that may previously have inhibited creativity and innovation.

5.3 A Collaborative Platform to Share Ideas that Acknowledge Collectivist Culture

The collectivist nature of people in DCs means that people without sufficient economic means often group together not only to leverage scarce economic resources but also because it is a fundamental part of their social fabric. For a DC e-skilling agenda, cognizance must be taken of the fact that people prefer to work in groups and will not suddenly prefer the individualistic modes of ICT training often offered by traditional institutions where each person sits alone on a computer [15]. There are a number of education models that allow for group learning which ICT training could borrow from such as the jigsaw classroom cooperative learning technique.

If the individuals in a collective all had mastery of special e-skills and a mastery of their different functional areas, this could create even greater opportunities for innovation. The collaborative nature of South Africa's e-skills agenda at the high-level offers an ideal platform to share ideas. It will be important for the curricula developed by the e-skills agenda to incorporate such cooperative learning techniques.

5.4 A National Support Structure Inclined towards Brain-Circulation

It is advantageous to upskill people to a mastery of e-skills, yet two global problems constantly hover on the economic horizon; the brain-drain of the best e-skills from DCs to developed countries, and the globalization of ICT skills to lower labour markets such as China, Eastern Europe and India. Developed countries have the economic muscle to target and offer "heavenly salaries" to highly e-skilled people from DCs who, without good employment, are understandably forced to repatriate. The few e-skilled people who stay are not able to compete favourably against the cheaper rates offered in low labour markets. The two problems create an even greater need for governments to create environments where e-skilled people have an opportunity to reap a comfortable economic benefit where the best e-skills prefer to stay and are accessible within the country at a competitive rate.

In South Africa's e-skills agenda, an intentional effort has been placed on making the organizational structure a cross-cutting one that includes partners from all spheres in government, business, education and civil society in an attempt to address the national issues that affect every sector of South African society. There are also other collaborative partnerships beyond South Africa to other countries such as Kenya, Rwanda, Mexico and Australia.

6 Conclusions

With the advancement of ICT in society, business and government, the dependence on knowledge has become more complex and pronounced, and presents new challenges for participation in the knowledge-based economy [21]. In this paper, we have seen that while access to ICT is on the increase in DCs, it remains a challenge to productively find sufficient means, economic and skilling, of using it for sustainable development. The problem is not that there is not enough knowledge about ICT, there is not enough skilling to a level of mastery in ICT. There is insufficient economic access to ICT such that the ICT which is available is not being put to productive use. The paper posits that there is a great need for economic access to e-skilling to a mastery level. Dreyfus and Dreyfus' [4] model of skilling showed that skilling goes beyond knowledge to mastering the capacity to achieve desirable results with minimal effort in a given context.

This paper contributes to knowledge in identifying that the needed change is the creation of interactive spaces that will allow more innovation and creativity among adopters of ICT. The change from producing more knowledge to producing more skills at a mastery level will require a great deal of innovation and creativity to create an e-skills agenda that meets the dynamic needs of DCs. The new e-skills agenda calls for a collaborative partnership between government as a stimulator, the business sector as a consumer of ICT, civil society to ensure that common interests are advanced without negatively affecting other interests and from citizens who will be using ICT. The e-skills efforts of South Africa appear to be on the right track to create such an interactive space that allows for creativity and innovation.

A limitation of this paper is the focus on the e-skilling agenda from South Africa without taking into account the e-skilling agendas of other DC countries, thereby making generalizations about the contribution to knowledge to a wider DC context problematic. The reason is that, because while many DCs are investing in national ICT strategies and in improving ICT skills, South Africa has established a clear national e-skilling agenda which does not only focus mainly on ICT skills but also on training the entire country in e-skills.

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