

**Development of 21st Century Skills for
Innovation and Enterprise: Exploring the role of
Informal Learning Environments in the Development
of Skills and Aptitudes for the Digital Creative Media
Industries**

**African Knowledge Exchange (AKE)-
*A Creative Media Venture***

January 2013

gesci
Founded by UN ICT Task Force



Development of 21st Century Skills for Innovation and Enterprise: Exploring the role of Informal Learning Environments in the Development of Skills and Aptitudes for the Digital Creative Media Industries



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Published by:
Global e-Schools and Communities Initiative (GESCI)
Unga House, Muthithi Road, Westlands
Nairobi, Kenya
www.gesci.org

GESCI 2013, Development of 21st Century Skills for Innovation and Enterprise: Exploring the role of Informal Learning Environments in the Development of Skills and Aptitudes for the Digital Creative Media Industries. Nairobi, Kenya.

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ACKNOWLEDGEMENTS

GESCI would like to thank the following individuals and groups for their valuable contributions towards the elaboration of the report:

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Neil Butcher and Associates

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Special thanks to all the persons and institutions affiliated to skills development and innovation initiatives and programmes who participated in interviews in the field research - from Kenya, Ethiopia, Mozambique and Zambia. Your time, commitment and contribution to this research project is much appreciated as is your contribution to the knowledge base on new models for skills development and innovation in the knowledge age.

Executive Summary

21st Century Skills to Build a Knowledge Society

A knowledge society is one that creates, shares, and uses knowledge for the prosperity and well-being of its people. It brings greater access to information and new forms of social interaction and cultural expression (UNESCO Asia and Pacific Regional Bureau for Education, 2004). Information is a key driver of knowledge societies. As such, it is important to consider what information and skills are required for youth to be innovative and contribute to the development of their communities in the 21st century knowledge society. The term '21st century skills' is often used to refer to sets of cognitive, non-cognitive, and technical skills. Cognitive skills refer to basic mental abilities used to think, study, and learn, for example, literacy, numeracy, and the use of theory, concepts, or tacit knowledge. Non-cognitive skills refer to socio-emotional personality traits, behaviours, and attitudes, (also called 'soft' skills), whilst technical skills include business, ICT, and specialized skills (Burton, 2012).

Participants from the field research were asked to rate the most important skills for youth entering the 21st century workplace. All identified 21st century skills were highly regarded, although entrepreneurial skills and creativity & innovation were considered most important, followed by initiative & self-direction and productivity & accountability. Interestingly, business skills and collaboration were regarded as least important. Respondents were also asked to rank the top three priority skills they think their institution/organization should focus on for youth skills development. Creativity and innovation were identified as the top priority, followed by productivity and accountability and then entrepreneurial skills and general and specialized skills.

Skills development for innovation and entrepreneurship

The global economy has gone through a shift from an industrial economy to a service economy that is driven by information, knowledge, and innovation. Economic success therefore depends on effective use of intangible assets such as knowledge, skills, and innovative potential as a resource for achieving competitive advantage (Lisbon Council, 2007). Education and skills training are critical to achieving competitive advantage. The level of workforce skills and the periodic need to update those skills are both steadily rising in new economies that are driven by knowledge. Additionally, workforce requirements have changed due to advancements in ICT. Employees are required to have skills such as the ability to use information to generate knowledge, use different types of media for collaboration, engage in collaborative problem solving, make decisions, be self-driven and organize and regulate themselves, and work well with and respect members of the team from other cultures. These are all 21st century skills which are rarely covered by formal school curricula (Dede, 2007; OECD, 2009; Partners in Education Transformation, 2010).

Education for innovation and entrepreneurship for the 21st century

There exists a skills development gap because students are prepared for 21st century workplace processes and institutions using legacy curriculum and methods suiting the 20th century. With 20th century learning, little time is spent on building capabilities in group interpretation, negotiation of

shared meaning, and co-construction of problem resolutions as required in the 21st century workplace. The objective of 21st century education should therefore be to develop expert decision-making and metacognitive strategies that indicate how to proceed when no standard approach seems applicable (Dede, 2007). To remain competitive, workers need to engage in lifelong learning to update their education and job skills. The result of the above-mentioned developments is that employers increasingly require a new set of skills in employees, such as innovativeness, entrepreneurship, independence of thought and decision making, self-motivation, self-regulation, critical thinking, communication and collaborative problem solving (OECD, 2011). However, these skills requirements may not be confined to the formal sector, but are also applicable in the informal sector.

Trends in the Development of Youth Skills for the 21st Century Workplace

There are several emerging trends in the development of 21st century skills. Some countries are recognizing the role of 21st century skills and therefore, are including them in the curriculum of their schools. There is also a trend towards emphasizing a holistic approach to planning and executing training for 21st century skills, in terms of policy reform, integration of ICT, changes in curriculum and assessment, research and evaluation, teacher professional development, and capacity building towards the use of ICT to facilitate student-centred learning.

Various approaches are noteworthy when considering how youth skills are developed in the 21st century. One of these is double cognitive apprenticeship, which refers to direct instruction for cognitive and technical skills, followed by project-based learning in a group in the real world of work, supported by trainers and more able peers, which is faded as student skill levels increase (DCU21, 2011). A need has also been identified for inclusive planning for 21st century skills training to include leaders in business, education, and technology (Lorenz 2011; C21, 2012). Collaborative learning is emerging as a learning model for cognitive knowledge acquisition and to develop communication skills (Schleicher, 2012). Technology-enabled informal learning is another approach recommended to address the question of how to improve learning methods to enable the self-directed learner to develop critical 21st century skills (Herring, 2012). There have also been recommendations to infuse 21st century skills and competencies in all learning curriculum outcomes (Canadians for 21st Century Learning and Innovation, 2012). Additionally, there are also recommendations for governance geared towards the development of 21st century skills among the youth, and the need for a strategic and focused approach by governments.

Whilst there are efforts to focus on recognition and development of 21st century skills, it is clear that countries need to place increased emphasis on the development of skills that will enable workers and citizens to use available and accessible information in new ways so as to generate knowledge that is relevant to their work and life in the society. With this background in place, the paper examines the DCM industries in Eastern and Southern Africa in more detail in order to explore the extent to which 21st Century skills are growing in importance, and how skills are being developed for youth entering these industries (with particular emphasis on the role of informal learning).

The Digital Creative Media Industry

Innovative ICT solutions and the rapid spread of digital technologies have changed the nature of the creative sector and given rise to digital creative media (DCM) industries. DCM industries refers to those

industries which have their origin in individual creativity, skill, and talent, for which digital media are used for production, transmission or storage, and which have a potential for wealth and job creation through the generation and exploitation of intellectual capital (DCMS, 1998; Digital Media Centre, 2011). Examples of DCM industries include film and animation, music, computer games, design, photo imaging, interactive digital media (including web and multimedia interaction and user experience design), and advertising, as well as supportive industries such as post production, visual effects, processing laboratories, software development, and specialized education and training (DCMS, 1998; Canadian Ministry of Tourism and Culture, 2010; Government of Australia, 2011). The creative class of workers is much more than artists and people from the cultural word and now includes professionals, technically minded people, and scientists. There are also some new emerging DCM industries, including those focused on: 3D illustration and graphics; photo realistic illustrations; immersive experience design; 3D Internet and virtual realities; and interactive museums, galleries, and performances (Zaboura, 2009).

Creative industries drive creative economies, and it is believed that they thrive in specially organized metropolises and cities or regions and clusters which recognize the role of creative industries and also create an enabling environment (Government of Australia, 2011). Globally, there are several positive developments: for example, European Union (EU) has formed the 'Creative Europe 2014-2020' Programme to accelerate growth of this sector (British Council, 2012). Canada and the USA have creative clusters which help to drive the creative economy forward, through initiatives such as the Content Production Cluster of Ontario in Canada (Government of Ontario, 2010). There are also new players from the developing world entering the DCM industry sector, including China, India, Mexico, and the Philippines. Additionally, a number of smaller Asian players, such as Malaysia, Hong Kong, and Singapore, have been able to consolidate domestic industries and penetrate global markets. The growing importance of creative industries is most evident in developing countries in East Asia. Many of these same countries are already targeting their creative industries for future growth. For example, South Korea has been investing in digital media and video game animation, Thailand has been successfully developing its film and advertising industries, and Singapore's advertising industry has become an important driver in the growing creative industries cluster, with strong linkages among creative industries that link to heritage, design, and media (UNCTAD, 2008). A few other global trends are worth noting:

- 1) Changing consumer behaviour is becoming more and more favourable to the growth and development of DCM industries, driven by the power of mobility and devices, such as increasing engagement of the consumers with digital creative content and rise in their readiness to pay for content.
- 2) Growing dominance of the Internet over all content consumption is leading to increases in access to video and interactive content. Consumers increasingly expect to see digital creative content embedded in the internet and accessible using different types of devices
- 3) Gaming is growing, both in terms of developers and consumers. There is an increase in 3D games, increased demand and access to online and mobile games, and the emergence of social games played over social media, which have a huge following across the world (PWC, 2011).

DCM Industries in Africa

Since 2005, UNESCO has put in place initiatives to build creative industries in Africa, including skills development, mapping of creative industries, and the UNESCO Africa Animated Initiative (UNESCO, 2006). UNESCO has indicated that their next objective is to leverage these industries using information technology. South Africa's DCM industries and training institutions are regarded as very advanced in

Africa, with some of the best equipment, expertise and experience on the continent in animation, graphic design and film production. Other African countries in which there is some development in DCM industries include Kenya, Nigeria, Egypt, Mozambique, Madagascar, Ghana, Algeria, Tunisia, and the Republic of Congo. It appears that many DCM industry initiatives are taken on as private enterprises or are driven by international funding (African Digital Art, 2011). Africa has some good examples of DCM industry products which have reached a global market. Some African governments are also setting up grants to support youth engaged in DCM industries, in line with policies geared to a future knowledge society in Africa.

Skills Required for DCM Industries

DCM industries require multi-faceted skills, which can be grouped under technical, entrepreneurial, creative and organizational and management skills. Technical skills are industry-specific skills required for the production of products or services such as calligraphy, illustration, printing, web design, typography, photography, film recording and production, graphic design, and animation (Edwards., 2008; Prospects, 2010). Practitioners also need to know how to use the computer application packages for their field, as well as the equipment required for DCM industries (Edwards, 2008; Skillset, 2011). DCM industry practitioners also require entrepreneurial, communication, social media marketing and networking and business development skills (Design reviver, 2009; Skillset, 2011). Creative skills include creative thinking, inventiveness and innovation, which enable an artist to take something deficient or incomplete and turn it into something valuable and remarkable (Design reviver, 2009). They also include diagonal thinking across creativity and entrepreneurialism in order to link creativity and business and develop businesses based on creativity (Skillset, 2011). Organizational and management skills include project planning, networking and teamwork, and capacity to work independently and determine one's own future learning needs (Prospects, 2010; Kibera Film School, 2010) as continuous improvement to keep up to date with the technologies and market requirements is required in the DCM sectors (Skillset, 2011). The other skills in this group are self-discipline, self-motivation, and time management as DCM practitioners need to come up with their own ideas and build personal projects (Prospects, 2010). They also require capacity to do research to inform their work.

There are several initiatives for developing digital creative industry skills in the AKE countries. Some are formal and others non-formal (and include informal training). The paper presents an illustration of several kinds of initiatives in Kenya, Mozambique, Zambia and Ethiopia.

Skills Gaps in African DCM Industries

The DCM industry has been regarded as being in its infancy in AKE countries. Some evidence suggests that technical skills required for the development of local content, such as graphic design, animation, web design, and user interface and user experience design are in short supply. The results of the field research indicate that the biggest skills in demand are writing, animation, photography and documentary film making. Additionally, lack of education on DCM skills such as animation, film techniques, motion capture, visual effects as well as scriptwriting was highlighted. Furthermore, the need for marketing skills was noted. Also, there is a lack of multi-skilling or development of all-round skills. Thus, for example, creative people may know how to use software for graphic design or animation but are not well prepared in other aspects, such as visual literacy skills or proper articulation of the basis of a design or design idea. This is due to lack of an interdisciplinary approach in skills development.

Another skills gap is entrepreneurial skills, as well as business management and budgeting skills which are required in order to manage DCM industries as enterprises, with respondents indicating that when incubating new enterprises, some may prefer to have informal companies to avoid paying taxes. This is due to 'security' reasons as they are not confident of being able to maintain their business, but also due to poor management skills. Organizational and management skill gaps include inadequacy of collaborative skills, resulting in individuals mostly working on their own. There also appears to be a shortage of effective leadership skills in the African DCM sector, suggesting a need to develop leaders and role models among the African youth who are involved in DCM industries (Collett, 2009). Additionally, there is inadequacy in terms of capacity to determine new skills that are required. Relevant education, including capacity to determine new skills that are required to face new challenges and the capacity to engage in lifelong learning, is lacking. Project management skills are in short supply due to focusing on the craft skills of the learners more than art as education or art as an enterprise (African Digital Art, 2011).

DCM Skills required for employability

Respondents' views on the skills required for employability differed. Most indicated a combination of technical skills and entrepreneurship skills, whilst others focused specifically on business and entrepreneurship skills. Others provided a more general explanation such as 'being an all-rounder' or being good at 'multi-skilling'. One of the Kenyan formal training institutions highlighted in detail some of the skills required for employability, this includes: Business entrepreneurship including how to develop business plans, marketing skills, technical skills, teamwork and being aware of the skills required and developing them.

Challenges faced in the development of DCM skills

There are challenges faced by the DCM sector in Africa that contribute to the skill gaps. One of these is that, inasmuch as there is a lot of natural creative talent in Africa, there is little in terms of means for developing these skills (Kibera Film School, 2010). There is also an inadequate supply of resources and educational materials for DCM skills development. Training institutions are thus reliant on donors, which limits enrolment numbers, and impact on operations. As a result of insufficient equipment, training may tend to be more theoretical in nature.

A further challenge is that, in general, education systems in Africa may not emphasize creative arts, and where it is included in the curriculum, the arts are not taken as seriously as other subjects such as mathematics and science. As a result of this lack of emphasis on DCM in curricula, those who may have a passion are not able to produce quality work because they are not well trained or learn from others who were not well trained. There are insufficient people to teach digital creative industry skills in a number of African countries. Another challenge is to find people with the relevant skills and qualifications. Additionally, teaching personnel may not be paid well, and teachers thus require supplementary sources of income in addition to the salary paid by the training institution. This is a possible reason why the huge and exponentially increasing demand for local content still remains unmet and is being serviced by companies based outside the continent. Furthermore, many African artists trained outside the continent remain outside the continent, and therefore, gaps in DCM industry skills are not reduced. This problem

is also related to imbalance in the distribution of skilled people who can do training in these skills in Africa; they are either concentrated in urban areas or those who are really good exit Africa.

The DCM sector requires continuous innovation. However, people tend to duplicate the same applications, suggesting a gap in skills development, as people are unable to identify or meet market gaps.

Another challenge is that government agencies in the DCM sector are under-funded, compared to those involved with research and science. Thus, there is a need to raise the profile of the creative arts, so as to be able to lobby for the funds. Most challenges in the implementation of policies relevant to innovation and entrepreneurship are related to the lack of resources, including financial resources. Training providers highlighted the need for additional funds as current funding is not sufficient. Additionally, it is difficult for film makers to get funding such as loans from banks to pay for computer equipment and Internet access, and the high taxes and licenses were regarded as not being supportive to local artists. More concerning is the seeming lack of knowledge on the DCM industry, particularly by government institution representatives. Thus, despite the various initiatives focused on developing DCM skills, there are several skills gaps which need to be addressed in this sector. The paper therefore now shifts attention to the potential role that innovation hubs can play in developing these DCM skills.

The Role of Innovation Hubs in Developing DCM Skills

Technology innovation hubs are springing up in a number of African countries, increasingly contributing to economic development in Africa (Moraa, 2012b). They facilitate rapid technological advancement, speedy access to ideas and experiences, as well as development of technical and/or entrepreneurial skills. Innovation spaces also contribute to access to financial aid for start-ups, collaboration and networking, research, and competition in which innovative ideas are identified and shaped, as well as encouraging exchange of information (Moraa & Wangeci, 2012). At the same time, some innovation spaces, especially in rural areas of Africa enable the linking of communities, facilitate businesses, and empower communities both socially and economically (Arc-Kenya, n.d; Macha Works, 2012). Entrepreneurs congregate in innovation spaces to bounce ideas around, network, work, learn, programme, and design to turn their ideas into actions, offering an ideal environment to nurture fresh graduates (Moraa & Murage, 2012). Some hubs serve as incubation and training spaces, others co-working environments, yet others as urban community spaces, or even rural community spaces. These innovation spaces may also be described as business or innovation incubators, innovation hubs or living labs, and the paper considers these various definitions.

Innovation Hubs in Eastern and Southern African Countries

Throughout Africa, several innovation hubs have been established. In Eastern and Southern Africa, Kenya, Uganda and South Africa appear to have the most hubs .The desktop research revealed that there are 17 such hubs in Kenya, one in Ethiopia and two each in Zambia and Mozambique. Innovation spaces contribute to the development of various critical skills for the 21st century, mostly informally, such as technical, entrepreneurial, leadership, project management, communication, networking and collaboration, self-checking, self-regulation and metacognitive skills, among many others. A few of these spaces are directly involved in development of skills for the DCM industries, whilst others are involved indirectly by supporting start-ups working in the sector. The paper presents descriptions of how these

spaces are involved in the development of skills for the digital creative industries, as well as how they are supporting skills development.

Innovation Hubs and the Digital Creative Media Industry

Innovation hubs typically have a focus that is much broader than the DCM sector, and a specific focus on the DCM sector is usually included if requested. A Kenyan Interest Group also highlighted that there are insufficient incubation spaces specifically for creative companies. The one Innovation Hub that did indicate that it places special attention on the DCM sector did not appear to have a clear understanding of the DCM sector. Nevertheless, the need for innovation hubs, particularly their role in providing training and developing skills was highlighted.

Views on Approaches to Developing skills for the DCM sector

There were many different views on the most effective approach to developing skills for the DCM sector. On a broad level, it was proposed that a public private partnership (PPP) approach be adopted so as to provide a sense of ownership of projects, which would make people accountable for developing skills. Additionally, PPPs could assist in generating policy to guide government. Another general approach proposed was to develop a national curriculum for developing DCM skills. Specific suggested approaches focused on providing video training in a face-to-face setting, with additional mentorship. In particular, one-on-one training with specialists was considered to be most effective. One of the research participants felt that a mentorship model using online tools would be more sustainable as face-to-face training is likely to be too expensive. Additionally, it was felt that there was a need for a balance between theory and practical exposure. It was also pointed out that a prerequisite for developing skills is the provision of updated equipment, especially important in a sector where the technology is continuously evolving.

Learning Models Used in Innovation Hubs

Skills required by youth for a knowledge society are not just cognitive and technical skills which are often emphasized in formal curricula. They also need non-cognitive skills. Whilst there are some attempts to include 21st century skills in formal curricula, it is not clear to what extent these have been incorporated into informal learning environments. The approaches used by Innovation hubs to develop skills vary. These range from formal to informal approaches, or a combination of approaches. Formal training is typically structured, and usually leads to certification. Informal learning is learning resulting from daily life activities related to work, family or leisure. It is often referred to as experience based learning and can to a certain degree be understood as accidental learning (UNESCO, 2010). Formal establishments tend to use formal curricula for the development of DCM skills. Informal curricula appear to be most popular at innovation hubs due to their flexibility. Informal learning approaches used by DCM skill providers are motivational talks, network and collaboration opportunities, educational events, forums for interaction and to meet thought leaders and experts in the field, training in business skills and project management, mentoring, peer learning, access to facilities, hosting 'meet ups', and offering one on one coaching, sharing expertise, and providing support. The results from the study provide little evidence of the use of technology to assist in informal learning. Additionally, although some innovation hubs indicate that they follow an informal curriculum, the explanations provided indicates the formal approaches are also used.

Innovation spaces tend to offer facilities and equipment that may not be easily accessible elsewhere, such as Internet access, meeting facilities or prototyping labs. Perhaps one of the most beneficial aspects of informal learning spaces is the networking potential that they provide. Another stated role is that they address market gaps and therefore have potential to generate a demand for professional work. For students, it is significant that the hubs provide them with additional practical knowledge (as opposed to the theoretical knowledge they have when they graduate). It also assists students to further develop their ICT skills, business skills, as well as technical skills. Importantly, these hubs provide support to and guidance to trainees who benefit from others' experience, through mentorship. It is noteworthy that these spaces have also opened up opportunities for students to realise their passion and potential.

Conclusion and Recommendations

New and different skills are required for the 21st century workplace, to enable youth to become knowledge workers and assist in developing knowledge societies. Whilst youth require generic 21st century skills that apply to all sectors, they also require industry specific skills. The research indicates that innovation spaces have potential to contribute to the development of various critical skills for the 21st century. However, there appear to be insufficient innovation spaces specifically for creative companies, or incubations hubs focused explicitly on developing DCM skills.

The findings of the research suggest that entrepreneurship and innovation and creativity are the most important generic 21st century skills. However, the skills gaps identified for the DCM sector are difficult to pinpoint, as this varied depending on who was consulted. One of the limitations of this research is that it focused more on the film and animation sector, but nevertheless, there is some evidence that suggests that animation, business management and marketing skills are in demand. Importantly, there also appears to be a shortage of effective leadership skills in the African DCM sector, suggesting a need to develop leaders and role models among the African youth who are involved in DCM industries

Importantly, skills in this industry are lacking, and a challenge facing the sector is finding trainers with relevant qualifications and expertise, and an environment that does not encourage the development of teachers in the sector. The research does not clearly indicate whether the incubation hubs facilitate the appropriate skills for innovation and entrepreneurship. Additionally, it is not clear what relative contribution innovation hubs are making to developing DCM skills compared with more formal learning approaches. There also does not appear to be an apparent standardized theoretical model underpinning the various approaches to developing skills in the sector. Interestingly, Innovation Hubs may not necessarily provide an informal learning environment, and in some innovation spaces, there may be a replication of formal approaches to acquiring skills. Based on the research conducted, it is difficult to ascertain which learning model is most effective for the DCM industry.

Whilst innovation spaces are not necessarily well defined nor specifically structured for skills development for DCM industries, they do present approaches to learning that can provide lifelong learning opportunities. Additionally, while many students may be forced to seek work in the formal labour sector due to financial pressures, exposure to innovation hubs provide them with an opportunity to develop non-cognitive skills that they did not gather in the formal training to address 21st century needs. Innovation hubs are thus regarded as playing an important role in developing skills, and in particular, their role in providing employment and entrepreneurship opportunities has been noted.

Recommendations

Innovation Hubs demonstrate significant potential to develop 21st century skills, particularly by offering practical hands-on-exposure to real world problems. In order for such spaces to be successful, the following skills development recommendations are made:

- 1) There appears to be few innovation spaces located in rural areas, calling for a need to consider the location of these spaces to ensure adequate access to skills development.
- 2) Consider how innovation hubs focus on developing ICT skills. There may be potential for technology enabled informal learning, which has not been explored in this study in detail, and may therefore warrant further investigation.
- 3) There appears to be an imbalance in the distribution of skilled people who can provide DCM skills training in Africa, highlighting a need to develop such skills in teachers who would in turn foster these skills in learners.
- 4) Innovation spaces not only create opportunities for skills development, but produce useful models for customized learning to meet society requirements. It will be useful to conduct systematic processes to implement models and assess their effectiveness. Models with potential to work include internships, apprenticeships, mentorship models using on-line tools, practical critiquing sessions with peers and mentors, community consultation approaches and problem solving models.
- 5) Specific skills gaps that require further exploration are identifying and meeting market gaps and animation skills.
- 6) Skills development is likely to be aided by a positive and supportive regulatory environment. The research suggests a need for policy developments/amendments and incentives to participate in the DCM industry, consideration of public private partnership (PPP) approaches and developing a national curriculum for developing DCM skills.
- 7) Given that formal training may not be providing 21st century skills calls for an examination of systems and consideration of efforts towards common standards, assessment and terminologies as well as a holistic approach to planning and executing training for 21st century skills. Additionally, skills acquisition in the informal learning environment appears to not only be relevant Whilst informal learning environment can contribute to such skills development, there is clearly a need for a broader recognition of such skills in education systems, and therefore Innovation Hubs can fulfil an important function.

Whilst this preliminary investigation has provided some important understandings of the DCM sector in Eastern and Southern Africa, it is clear that additional research is required for a more rigorous understanding of the sector and its learning environments. Further research may focus on the following:

- 1) Policy environments and relevant policies to DCM industries and innovation hubs,
- 2) A wide range of DCM related sectors and a broader sample to obtain a clear picture of other activities in the sector,
- 3) Successful and unsuccessful approaches to developing 21st century skills in the DCM sector,
- 4) Informal learning environments that focus their attention on DCM skills as well as the contribution of innovation hubs to the development of the informal sector,
- 5) The role of technology in skills development and in learning models,
- 6) Documenting case studies on good practice in the field, drawing on international as well as continental initiatives, and
- 7) Administering the skills survey more broadly to all DCM skill providers in the region so as to obtain a clearer indication of the skills required for the 21st century in this context.

Drawing from the above analysis, policy recommendations are also proposed:

- 1) Increase knowledge of the DCM industry by raising government officials' awareness about DCM industries and their potential within the African context.
- 2) Consider the creation or adaptation of a national framework or policies or guidelines to promote the DCM sector, entrepreneurship, and recognition for 21st century skills and DCM skills with a focus on the youth.
- 3) Create a database of DCM skill providers as this will assist in mapping skills development in the sector. Additionally, focus on measurement of the work in the sector and contribution to the GDP.
- 4) It will be beneficial for education curriculum experts to also consider including DCM subjects within the schooling curriculum and teacher education curriculum, ensuring a balance between academic skills and industry requirements.
- 5) Consider investments in DCM content creation, and ensure that funding is allocated to the development of DCM skills.
- 6) Invest in on-going awareness-raising, capacity-building, and networking/sharing activities to develop the full range of DCM competences.
- 7) Encourage on-going evaluation and the promotion of good practice, as well as recognition of champions in the sector at a national level.
- 8) Consider how to promote DCM productions of the country.
- 9) For DCM workers, it may be useful to foster the creation of unions and associations for joint negotiation of issues, such as rates, the rights of artists and maintaining quality standards.
- 10) 'Professionalise' the sector by building capacity and placing the right people in the right jobs for the sector i.e. people who understand the sector, have experience, passion and good networks.
- 11) Consider other ways of reaching out-of-school youth, such as through community centres, and reaching youth from rural areas.

Introduction

GESCI is an international non-government organization founded by the United Nations ICT Taskforce. Headquartered in Nairobi, Kenya, GESCI provides strategic advice to relevant Ministries in developing countries on effective use of Information and Communication Technologies (ICT) in Education, Science, Technology, and Innovation systems for the advancement of Knowledge Societies in Africa.

One of GESCI's projects is the African Knowledge Exchange (AKE) 2012, which revolves around the thematic focus area of 'ICT, skills development, and employment in an inclusive knowledge society'. In particular, it focuses on the role of informal learning environments in the development of 21st century skills for innovation and enterprise. It considers the use of technology in skills development and in learning models for innovation, enterprise skills, and employment in knowledge societies. The overall goal of the project is to demonstrate the critical link between skills development/learning and innovation and enterprise as a requirement for knowledge society development. The project also focuses on investigating how new digital creative media (DCM) skills are, and could be, developed in Eastern and Southern Africa. The specific goal of this project is to demonstrate the potential of a new industry based on digital creative media skills. Thus, the project focuses on new digital creative media skills and arts and cultural industries.

In recognizing that information is used to create knowledge through learning in various ways, the project has involved identifying a research gap. Specifically, the following questions were identified as important:

- What is the role of informal learning environments?
- What is the role of ICT tools in the learning process?
- What is the role of innovation hubs and incubators in accelerating the learning and innovation process?

The project consists of the following:

- Piloting an innovative creative digital media skills development approach with 15 urban youth in Kenya. This involves a three month skills development course for youth with creative talent and an interest to develop creative digital media skills. Tutors teach basic skills for digital media creation, and provide an environment with mentorship inspiration, entrepreneurial links, and industry connections.
- Holding an AKE Research Competition for academic research at the M.Sc and Ph.D. levels, carried out in Eastern and Southern Africa. The competition aims to highlight research coming from Eastern and Southern Africa on the use of technology in skills development and learning models for innovation and employment in today's knowledge societies. The competition seeks to bring out fresh perspectives on how emerging technologies affect learning environments in Eastern and Southern Africa and how this correlates to innovation and enterprise development.
- A research exercise on the issues, challenges and solutions related to 21st century ICT-enabled skills development for disadvantaged youth out-of-school and/or in the informal sector. It specifically focuses on DCM skills. This is the basis of the current paper.

The findings of all these activities will be discussed in a policy seminar between African policy makers in early 2013.

Rationale for the Research

Innovation and ICT hubs are increasingly being established in Africa, usually focusing on identifying original ideas and assisting them to reach the market place. At the same time, it is recognized that there is a talent gap and an insufficient critical mass of skilled persons to sustain and drive innovation. Skills development and vocational training for youth job creation and enterprise are gaining attention on the international development agenda, while venture capitalists often refer to such capacity gaps as a weakness in assessing investment potential. Skills development for innovative capacity is thus required to prepare a sufficiently large talent pool with relevant skills to enable innovative ideas and enterprises to succeed. In particular, GESCI has indicated that the digital entertainment, gaming, and cultural industries are growing in the Eastern and Southern Africa regions. Against this background, the focus of this research study was decided to be:

The role of informal learning environments in the development of 21st century skills for innovation and enterprise: A case study of the role of innovation hubs in the development of skills and aptitudes for the digital creative media industries.

GESCI developed a research framework to guide research activities focused on the following questions:

- What 21st century skills do youth need in order to function as participative citizens of a Knowledge Society?
- What skills are required by the growing creative digital media industry in the 21st century?
- How are digital creative media skills developed in Africa, and what role can innovation hubs play in their development?

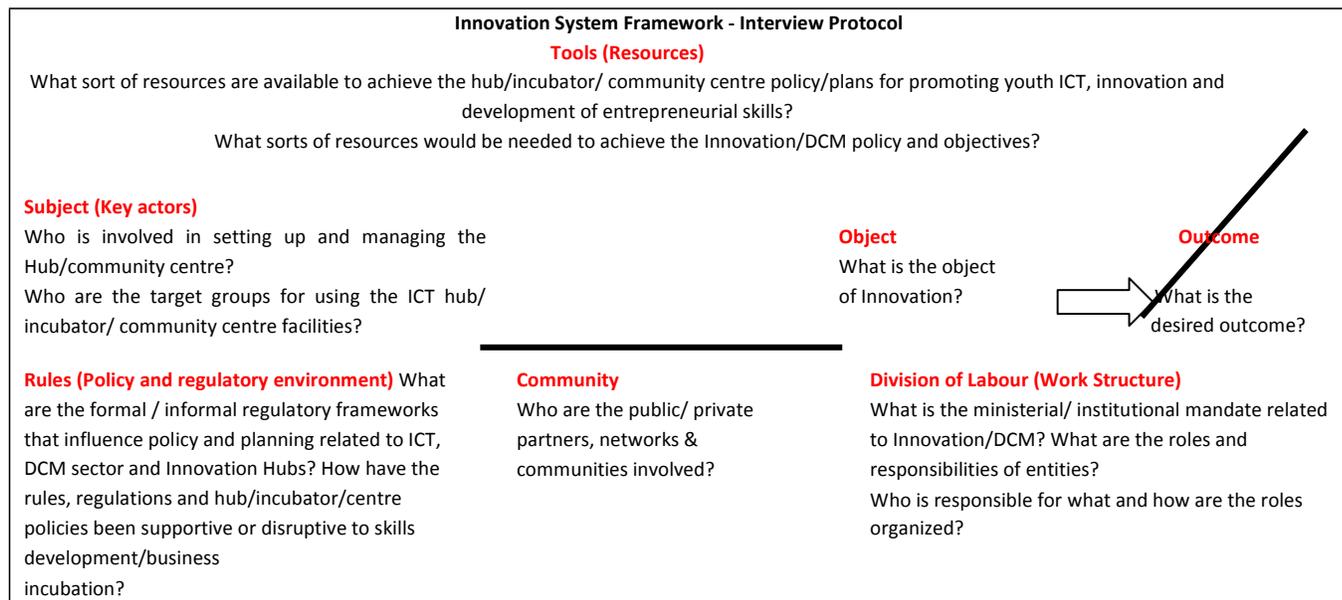
Methodology

The research was carried out through both desk and field research. Global and regional trends were researched through desk review, while field research was conducted in Kenya, Ethiopia, and Mozambique in October and November 2012. Although Zambia was also considered for the field research, the field research was delayed and thus these findings have not been incorporated into this report.

The desktop research was prepared for GESCI by Mr. Robert Oboko (contracted as a consultant for six months to this particular project). Field visits were conducted by GESCI employees in Ethiopia, Mozambique, and Kenya and a researcher contracted to GESCI for this assignment in Zambia. Neil Butcher and Associates was then contracted to analyse the results from the field visits and to collate the final report.

The research methodology was a mixed-method qualitative and quantitative approach consisting of interviews, focus group discussions and a survey conducted with government institutions, formal and informal training institutions in the DCM sector as well as several interest groups affiliated to the DCM sector. The interviews were based on an activity system (Engstrom 2001) protocol to examine the technology and innovation spaces and their role in skills development for the new age workplaces such as digital creative media industries, as outlined below:

Figure 1 Innovation Activity System Interview Protocol (Adapted: Engstrom 2003)



GESCI prepared a number of research instruments based on this framework to collect data from the field visits. These were created according to the stakeholder to be interviewed, and included the following:

- Tool Zero – This tool included general questions on the models for informal learning of creative and entrepreneurial skills at the innovation spaces. It was to be used for interviews or focus groups to create a common ground for discussions with managers/staff and the space members, investors, directors, and other stakeholders and supporters of ICT incubator/hub models.
- Tool One: Environmental Scan (Strategic level) – an interview protocol for management level to:
 - Identify general youth capacity building needs;
 - Identify general youth ICT and enterprise competencies and skills requirements; and
 - Map incubator/hub strategies for enhancing learning, ICT, and entrepreneurial skills to develop capacity for new job and employment opportunities.
- Tool Two: Organizational Scan – a focus group discussion protocol for members of incubators/hubs to clarify how technical, creative, entrepreneurial, and other skills such as project management are being developed through mentoring, coaching, participation in project development, and other forms of skills development. This protocol covered the following areas:
 - Policy – ICT usage and regulatory environment;
 - Curriculum and content – ICT and Enterprise skills, technical skills, business counselling (coaching and mentoring), and consulting;
 - Pedagogy – community, team (peer) and project-based learning, as well as personalized one-on-one coaching and mentorship sessions with experts;
 - ICT infrastructure, project support and implementation - level of sophistication with respect to technology availability, use & skills development;
 - Organization and management – business administration support, referrals to sources of finance, innovation space, infrastructure community management, and so on;

Training – types of training, including coaching, mentoring, apprenticeship, peer learning, and community collaborative learning.

- Tool Three: Technical Scan – this tool was to be used to verify the infrastructure present at an incubator, hub, or living lab, including electrical supply, ICT equipment, connectivity, and technical support. It was to be answered by the management with support from the ICT technician.
- Tool Four: Pedagogical Scan – this tool focused on the status of ICT and Enterprise skills and competency development for hub/incubator members, to identify:
 - Skills that youth require for employment in the 21st Century workplace; and
 - Skills that institutions should focus on in curriculum development and implementation.
 This was a skills survey to identify critical skills, and establish where the different institutions see themselves having a role in the skills development system. The ten-minute survey was completed by all research participants following the interviews or focus group discussions. The survey maps youth capacity development needs for skills and ICT use.

Tool Three was ultimately not used during the field research, whilst Tools Zero was used for just one interview in Ethiopia and Tool Two was used for just two interviews, one in Ethiopia and one in Mozambique. In Kenya, two additional tools were used. One was an interview tool at the Government Policy Level for interviews with ministries and representatives of other policy making bodies. The other was a combination of questions from tools to form an ‘Interest Group’ tool.

Countries for the field studies were selected using purposive and convenience sampling. GESCI considered countries from Eastern and Southern Africa that had the presence of Innovation Hubs. Additionally, Kenya was chosen in part for research convenience, as GESCI is located there. GESCI then identified the categories of stakeholders (Innovation Hubs, Formal/ Credited Training Institutions, Informal Training Institutions, Policy Level Institutions, Interest Groups) and then researched which actors/institutions seemed most influential and important.

The following interviews were conducted during the field visits:

Table 1 Interviews conducted

Country	Interviews conducted	Type of institution	Research Tool Used
Ethiopia	ICEAddis	Innovation Hub	Tool 0, Tool 1
	School of Fine Arts and Design – Addis Ababa University	Formal Training Institution	Tool 2
Kenya	PAWA254	Innovation Hub, Community Centre	Tool 1
	iHUB Nairobi	Innovation Hub	Tool 1
	MLab East Africa	Innovation Hub	Tool 1
	Multi-media University College of Kenya	Formal Training Institution	Tool 1
	Kibera Film School	Community Centre, Informal Training Institution	Tool 1 Tool 1 (focus group)
	Mathare Youth Sports (MYSA)	Community Centre, Informal Training Institution	Tool 1

Country	Interviews conducted	Type of institution	Research Tool Used
Kenya	Kenya ICT Board	Policy Level Institution	Interest Group - Combination of tools
	National Council for Science and Technology (NCST)	Policy Level Institution	Government Policy Level
	Ministry of Higher Education, Science & Technology (MOHEST)	Policy Level Institution	Government Policy Level
	Kenya Institute of Education	Policy level institution	Government Policy Level
	African Cultural Regeneration Institute	Interest Group	Interest Group - Combination of tools
	Kenya Film and TV Professional Association	Interest Group	Interest Group - Combination of tools
	Association of Animation Artists of Kenya	Interest Group	Interest Group - Combination of tools
	The Creativz (at iHub)	Interest Group	Interest Group - Combination of tools
	UNESCO	Interest Group	Government Policy Level
Mozambique	Maputo Living Lab	Living Lab	Tool 1 Tool 2
	Mozambique Information and Communication Technology Institute (MICTI) Incubator	Incubation Hub	Tool 1

Tool Four was completed by all those who participated in the interviews. In total, 39 people completed the skills survey. One of the Mozambican interviews was conducted with the assistance of a translator as the interviewee spoke in Italian.

In preparing this report, the findings from the interviews were integrated with the desktop research. It is clear from the above table that the majority of field data comes from Kenya, and thus the findings of the research may not be generalizable to all countries in Eastern and Southern Africa.

21st Century Skills to Build a Knowledge Society

This research focuses on skills development for the digital creative industries in the knowledge society. This first requires an understanding of a knowledge society. A *knowledge society* is one that creates, shares, and uses knowledge for the prosperity and well-being of its people. It brings greater access to information and new forms of social interaction and cultural expression (UNESCO Asia and Pacific Regional Bureau for Education, 2004). Information is a key driver of knowledge societies. As such, it is important to consider what information and skills are required for youth to be innovative and contribute to the development of their communities in the 21st century knowledge society.

Understanding 21st Century Skills

A skill may be defined as the ability to perform tasks and solve problems (OECD, 2009). The term ‘21st century skills’ is often used to refer to sets of cognitive, non-cognitive, and technical skills. Cognitive skills refer to basic mental abilities used to think, study, and learn, for example, literacy, numeracy, and the use of theory, concepts, or tacit knowledge. Non-cognitive skills refer to socio-emotional personality traits, behaviours, and attitudes, also called ‘soft’ skills), whilst technical skills include business, ICT, and specialized skills (Burton, 2012). The following table outlines these skills in more detail.

Table 2 21st century skills¹

Cognitive	Non-cognitive	Technical
<ul style="list-style-type: none"> • Basic skills: numeracy and literacy • Critical thinking & problem solving: Youth capacity to reason effectively based on critical reflection and solve problems in both conventional and innovative ways 	<ul style="list-style-type: none"> • Creativity & innovation: youth have ability to creatively generate new and worthwhile ideas • Entrepreneurial skills: youth knowledge of commercial skills such as innovation commercialization • Flexibility & adaptability: youth ability to work effectively in a climate of ambiguity and changing conditions • Initiative & self-direction: youth ability to use time and manage workload efficiently without direct supervision • Social & cross-cultural skills: youth ability to conduct themselves in a respectable, professional manner and work effectively with people from a range of social and cultural backgrounds • Productivity & accountability: youth capacity to prioritize, plan and manage work to achieve the intended results, collaborate effectively with teams and be accountable for results • Leadership & responsibility: capacity to guide and lead others and be responsible for the interests of the larger community • Communication: Youth have ability to 	<ul style="list-style-type: none"> • Business skills: youth have business skills such as accounting and finance • ICT Literacy: Youth have capacity to apply ICT effectively as a tool to research, organize, evaluate and communicate information to successfully function in a knowledge economy • Information and Media Literacy: Youth have ability to access and evaluate information efficiently, effectively, critically and competently as well as use and manage information accurately and creatively for the issue or problem at hand • General and Specialized Technical Skills: Youth have specialized ICT technical skills relevant to their area of ICT

¹ Adapted from: 21st Century Skills: Partnership for 21st Century Learning; Skills for Employability in Africa & Asia, Burnett & Anderson 2012

Cognitive	Non-cognitive	Technical
	communicate clearly using multiple media and technologies <ul style="list-style-type: none"> • Collaboration: Youth can collaborate flexibly and are willing to make necessary compromises to accomplish common goals and assume shared responsibility 	practice (for example animation, programming, graphic design and digital music production)

Groups such as the Partnership for 21st Century skills, World Bank, Organization for Economic Co-operation and Development (OECD), Partners in Education Transformation, and Canadians for 21st Century Learning and Innovation have identified and grouped these skills in different ways. However, one of the earliest and most commonly referenced groupings of these skills by Partnership for 21st Century skills (2008) comprises four groups:

- Core subject skills (such as numeracy and basic literacy),
- Life and career skills (flexibility and adaptability, initiative and self-direction, social and cross-cultural skills, productivity and accountability, leadership, and responsibility),
- Learning and innovation skills (critical thinking, problem solving, communication, collaboration, creativity, and innovation) and
- Information, media, and technology skills (information literacy, media literacy, and ICT literacy) (P21, 2008).

Skills required for 21st century life include ICT functional skills, which are required to master the use of ICT applications, ICT skills for learning, which combine cognitive abilities or higher order thinking skills with functional skills for using and managing ICT applications, and 21st century skills which are required in the knowledge society but for which the use of ICT is not a necessary condition (OECD, 2009). The latter way of classifying skills is helpful in distinguishing skills related to ICT from the 21st century skills that do not necessarily require ICT. This is important because, in some countries, citizens already have advanced ICT skills but still require the development of 21st century skills. It is also important because, in some countries, ICT skills development is planned for and implemented separately from the curriculum for other skills.

Participants from the field research were asked to rate the most important skills for youth entering the 21st century workplace. The results are indicated in the table below:

Table 3 Important skills for youth entering the 21st century workplace

21 st Century Skills		Important	Moderately important	Not important
Core Skills	Basic skills Youth have basic competency in numeracy and literacy skills	82%	16%	3%
	Business Skills Youth have business skills such as accounting and finance to enhance career options	39%	55%	5%
	Entrepreneurial skills Youth know how to use entrepreneurial skills such as innovation commercialization to enhance workplace productivity	87%	13%	0%

21 st Century Skills		Important	Moderately important	Not important
Life & Career Skills	Flexibility and Adaptability Youth are able to work effectively in a climate of ambiguity and changing conditions	76%	21%	3%
	Initiative & Self-Direction Youth have ability to use time and manage workload efficiently without direct supervision	84%	13%	3%
	Social & Cross-Cultural Skills Youth have capacity to conduct themselves in a respectable, professional manner and work effectively with people from a range of social and cultural backgrounds	79%	18%	3%
	Productivity & Accountability Youth can prioritize, plan and manage work to achieve the intended results, collaborate effectively with teams and be accountable for results	84%	13%	3%
	Leadership & Responsibility The youth have capacity to guide and lead others and be responsible for the interests of the larger community	82%	18%	0%
Learning & Innovation Skills	Creativity & Innovation Youth have ability to creatively new and worthwhile ideas, work creatively with others and implement innovations to make useful contributions to their field of work	87%	13%	0%
	Critical Thinking & Problem Solving Youth have capacity to reason effectively, make judgments and decisions based on critical reflection on learning experiences and processes, and solve problems in both conventional and innovative ways	71%	29%	0%
	Communication Youth have the ability to communicate clearly utilizing multiple media and technologies	76%	21%	3%
	Collaboration Youth can collaborate flexibly and are willing to make necessary compromises to accomplish common goals and assume shared responsibility	63%	37%	0%
Information Media and Technology Skills	Information and Media Literacy Youth have ability to access and evaluate information efficiently, effectively, critically and competently as well as use and manage information accurately and creatively for the issue or problem at hand	71%	26%	3%
	ICT (Information, Communication & Technology) Literacy Youth have capacity to apply ICT effectively as a tool to research, organize, evaluate and communicate information to successfully function in a knowledge economy	71%	29%	0%
	General and Specialized Technical Skills Youth have specialized ICT technical skills relevant to their area of ICT practice (for example animation, programming, graphic design and digital music production)	68%	26%	5%

N=39

The above table indicates that all identified 21st century skills are highly regarded, although entrepreneurial skills and creativity and innovation are considered most important, followed by initiative & self-direction and productivity & accountability. Interestingly, business skills and collaboration were regarded as least important.

Respondents were also asked to rank the top three priority skills they think their institution/organization should focus on for youth skills development. The results are noted in the table below:

Table 4 Priority skills for organizations to focus on for youth skills development

21 st century skills	1 st priority	2 nd priority	3 rd priority	Total chosen
Basic skills	11%	0	0	11%
Business Skills	5%	3%	0	8%
Entrepreneurial skills	11%	5%	8%	24%
Flexibility and Adaptability	8%	0%	5%	13%
Initiative & Self-Direction	0%	0%	3%	3%
Social & Cross-Cultural Skills	5%	5%	0%	10%
Productivity & Accountability	5%	11%	11%	27%
Leadership & Responsibility	3%	11%	0	14%
Creativity & Innovation	11%	13%	18%	42%
Critical Thinking & Problem Solving	8%	8%	8%	24%
Communication	8%	5%	3%	16%
Collaboration	0%	5%	3%	8%
Information and Media Literacy	3%	8%	8%	19%
ICT (Information, Communication & Technology) Literacy	3%	8%	11%	22%
General and Specialized Technical Skills	8%	5%	11%	24%

N=38

Based on the above table, it can be deduced that that creativity and innovation were identified as the top priority, followed by productivity and accountability and then entrepreneurial skills and general and specialised skills. The results from this overall collaborate with findings from respondents' rating of the most important skills for youth entering the 21st century skills, with the exception of general and specialised technical skills which were rated as a less important skill compared to other skills.

Skills development for innovation and entrepreneurship

Before considering the issue of skills development for innovation and entrepreneurship, it is useful to define these terms. Skills development refers to the process of enabling the acquisition of capacities through all levels of education and training, occurring in formal, non-formal, and on-the-job settings, which enables individuals in all areas of the economy to become fully and productively engaged in livelihoods and to have the capacity to adapt their skills to meet the changing demands and opportunities of the economy and labour market (Palmer, 2005).

The concept of innovation is centred on novelty. It is a process of introducing something new or useful, while the new thing itself can also be considered an innovation (Diyamett, 2009). Innovation can be considered to be the first use of knowledge over prevailing local practice in a country or region to create

competitive advantage (Dahlman, 2007). According to Chell and Athayde (2009), innovation is the engine of society and the economy. In this study, innovation may be considered as the use of both knowledge and skills, called understandings (Dede, 2007; OECD, 2008), to introduce something new or useful.

Innovation depends on people who are able to generate and apply knowledge and ideas in the workplace and in society at large. There is an increasing need to try to understand the types of skills needed for innovation and the best ways to build them through education and training (Lorenze, 2011; OECD, 2011). The skills needed for innovation vary according to individuals, firms, and industries. However, although individuals, firms, or industries may draw on different skill mixes at different times, in practice, many skills will be relevant across the innovation spectrum (OECD, 2011). This should guide policies for skills development for innovation. Since, in the 21st century, it is expected that more youth will be self-employed (Dede, 2007), while many will continue to be employed in the informal sector in the developing world (P21, 2008), there is need for them to run the jobs they do professionally and as businesses in order to reap the greatest benefit (Burnett and Jayaram, 2012). New economies (in the 21st century) are driven by entrepreneurship, innovation, and technology, whereby new ideas, discoveries and technologies have produced new industries and products (Dede, 2007; World Bank, 2011). Thus, non-cognitive skills sets such as entrepreneurship are thus critical in this context (Burnett and Jayaram, 2012).

Entrepreneurship is defined as the application of enterprise skills specifically to create and grow organizations in order to identify and build on business opportunities. It is a trans-disciplinary set of skills that has a high degree of application to key issues such as employability, innovation, knowledge transfer, commercialization, and intellectual property (QAA, 2012). Those involved in the informal sector need to be more self-reliant to run their own businesses when entrepreneurship is one of the non-cognitive skills that is required (Burnett and Jayaram, 2012). Entrepreneurship is regarded also as necessary in contributing to flexible and adaptable graduates as part of enhanced skills that graduates need in the current labour market to enable them to think on their feet and be innovative in a global economic environment (QAA, 2012).

The global economy has gone through a shift from an industrial economy to a service economy that is driven by information, knowledge, and innovation. Economic success therefore depends on effective use of intangible assets such as knowledge, skills, and innovative potential as a resource for achieving competitive advantage (Lisbon Council, 2007). Competitive advantage for a region, state, or nation is now built on the skills of its general workforce, and not its geography, trade laws, research laboratories, and patents. Education and skills training are critical to this competitive advantage. The level of workforce skills and the periodic need to update those skills are both steadily rising in new economies that are driven by knowledge (Dede, 2007).

Additionally, today's fast changing globalized world has seen rapidly changing jobs and the integration of ICT into most spheres of life (CISCO, 2008; Partners in Education Transformation, 2010). Societies today require citizens who can use the Internet to access e-government services, as well as communicate through email, Voice-Over Internet Protocol (VOIP) and Instant Messaging (IM) and other modern communication tools using networked computers or smart mobile devices. Today, people use the Internet to look for jobs, make friends, stay in touch with relatives, shop, book flights, run for elective office, share photos, maintain blogs, look for information, and carry out bank transactions, among others (Partners in Education Transformation, 2010). The 21st century work place also requires workers who keep re-inventing themselves as the world keeps changing (Kotelnikov, 2009; Dede, 2007) due to

new global challenges such as evolving technology, flatter organizational structures, changes in customer needs due to increased ease of access to information, globalized market place competition and customers who have become global and more sophisticated (Partners in Education Transformation, 2010). Workforce requirements have also changed due to advancements in ICT. Computers and related technologies are now taking more routine tasks from human beings as they can be automated. With advances in ICT, cognition (thought, action) is now distributed across human minds, tools and media, groups of people, and space and time. The process of individual and collective thought is increasingly dispersed symbolically, socially, and physically, with the result that business strategies include how ICT can be used as a means of individual and collective expression, experience, and interpretation (Dede, 2007).

The structure of companies and nature of work have also changed. Organizational structures have become flatter, decision making has become decentralized, information is widely shared, workers form project teams, even across organizations, and work arrangements are flexible. These shifts are often associated with increased productivity and innovativeness (Partners in Education Transformation, 2010). Employees are required to have skills such as the ability to use information to generate knowledge, use different types of media for collaboration, engage in collaborative problem solving, make decisions, be self-driven and organize and regulate themselves, and work well with and respect members of the team from other cultures. These are all 21st century skills which are rarely covered by formal school curricula or even delivered as planned (Dede, 2007; OECD, 2009; Partners in Education Transformation, 2010). For example, a U.S. Department of Labor study found a strong positive relationship between both information sharing and decentralized decision making and a company's innovativeness. Yet, typical educational practices in schools do not include collaboration, information sharing, or self-management (Partners in Education Transformation, 2010).

Education for innovation and entrepreneurship for the 21st century

The 21st century workplace requires that education prepares students for a world in which almost all types of routine cognitive tasks are done by computers, and workers need to do jobs which involve expert thinking, metacognition, decision making, and complex communication that evolves unpredictably (involving exchanges of huge amounts of verbal and non-verbal communication) as core capabilities. These higher order performances build on fundamental knowledge about how to do simpler types of work, so the need is not to remove the learning of routine cognitive skills (such as basic arithmetic operations) from the curriculum. Rather, the fundamental change requires de-emphasizing fluency in simple procedures as an end-goal of preparation for work and life (for example, counting bills as a bank teller) and rather using these routine skills as a basis for mastering complex mental performances which will be valued in the future workplace (Dede, 2007).

According to Dede (2007), there exists a skills development gap because students are prepared for 21st century workplace processes and institutions using legacy curriculum and methods suiting the 20th century. Students train to be employees who will act as followers of few 'captains of industry', yet it is expected that more and more students will own businesses instead of working for others and that they will constantly, quickly, and efficiently need to learn new skills and information to function effectively as entrepreneurs. They will assume roles of economic leadership and therefore, skills such as creativity, flexibility, and strong sense of self-efficacy need to be emphasized.

Whereas 20th century education emphasizes building fluency in routine problem-solving, there is need for students to learn how to filter data derived from experiences in complex settings to develop skills in sophisticated authentic problem finding, based on real-life applications of knowledge and not abstract problems, in order to make knowledge transfer to real world situations easier. The objective of education should therefore not be to learn a specific problem-solving routine to match every work situation, but to develop expert decision-making and metacognitive strategies that indicate how to proceed when no standard approach seems applicable. With 20th century learning, little time is spent on building capabilities in group interpretation, negotiation of shared meaning, and co-construction of problem resolutions as required in the 21st century workplace. Instead, communication skills stressed are those of simple presentation, rather than the capacity to engage in richly structured interactions that articulate perspectives unfamiliar to the audience. Educators also now need to build not only understandings but also experiences in a community of practice that lead to fluent, sophisticated behaviours, as opposed to using the high stakes tests to assess competencies (Dede, 2007).

In the global, knowledge-based economy and 'flat' world, workers need to be prepared to shift jobs and careers more frequently, to be flexible and adaptable in acquiring job skills, and to integrate and focus a changing mix of job-derived and education-based knowledge on business processes and problems. Those with high educational achievement and technical skills are the ones who are being rewarded. The 21st century worker also needs to have science and mathematics skills, creativity, fluency in information and communication technologies, and the ability to solve complex problems. To remain competitive, workers will also need to engage in lifelong learning to update their education and job skills (Dede, 2007; OECD, 2009)

The result of the above-mentioned developments is that employers increasingly require a new set of skills in employees, such as innovativeness, entrepreneurship, independence of thought and decision making, self-motivation, self-regulation, critical thinking, communication and collaborative problem solving (OECD, 2011). However, these skills requirements may not be confined to the formal sector. Evidence indicates that countries with the lowest per capita incomes tend to have the largest informal sector, and this includes countries in sub-Saharan Africa (Burnett and Jayaram, 2012). Informal workers comprise about half (49 %) of non-agricultural workers in 33 developing countries, thus making the informal sector very crucial to these economies (ILO, 2011 in Burnett and Jayaram, 2012). It has been argued that job shortages especially in the developing world can be addressed by encouraging the development of new employment opportunities in the informal sector. This also calls for an understanding of the development of 21st century skills in informal learning environments. Informal learning is learning resulting from activities of daily life related to work, family, or leisure. It is not structured in terms of time or objectives or learning support. It is not intentional from the learner's perspective and usually does not lead to certification. It is often referred to as experience-based learning and to a certain degree can be understood as accidental learning (UNESCO, 2010). However, it should be emphasised that skills acquisition in informal learning environments is not relevant only to those employed in the informal sector.

Trends in the Development of Youth Skills for the 21st Century Workplace

There are several emerging trends in the development of 21st century skills. Some countries are recognizing the role of these skills in the 21st century and therefore, are including them in the curriculum

of their schools. For example, in the United States of America (USA), by 2008, nine states had been enlisted as leadership states to promote the teaching and learning of 21st Century skills to all students in the country (P21, 2008).

There is also a trend towards emphasizing a holistic approach to planning and executing training for 21st century skills. This is in terms of policy reform, integration of ICT, changes in curriculum and assessment, research and evaluation, and teacher professional development (CISCO, 2008). For example, UNESCO's Triangular model (2011) supports the development of leadership, curriculum and teaching capacity, whilst Partners in Education Transformation (2010) have proposed a holistic approach that includes curriculum, pedagogy, teacher training, and school organization.

Mostly, cognitive and technical skills are covered in school curricula (Burnett and Jayaram, 2012). However, there is an increase in demand by employers for competencies beyond traditional cognitive skills (Dede, 2007; Lorenz, 2011). This is more so in cases where youth are opting for self-employment or to work in the informal sector (Dede, 2007; Burnett and Jayaram, 2012).

There is emphasis in, as well as capacity building towards, use of ICT to facilitate student-centred learning in the development of 21st century skills (Herring 2012; GESCI, 2011). There is a host of web-based technologies (including social, mobile, video, games, and personalized portals) that serve as tools to support the self-directed learner. This has been clearly articulated by Herring:

I'm seeing an increasing number of organizations in a wide range of industries begin to facilitate informal learning programs for their employees. For example, the use of social learning, which allows people to leverage their personal and social networks for knowledge, is rapidly growing. According to American Society for Training and Development (ASTD)'s Learning Executive's Confidence Index for the fourth quarter of 2011, almost 55% of learning executives expect an increase in the use of informal learning and Web 2.0 tools in their organizations over the next 6 months (Herring, 2012, n.p).

There are efforts towards common standards, assessments, and terminologies for 21st century skills. Besides several countries making an attempt to develop their own definition of 21st century skills (OECD, 2008), there are initiatives focused on the best way to assess these skills because 20th century assessment strategies based on 'high stakes' tests do not apply adequately to the assessment of 21st century skills (Partners in Education Transformation, 2010; UNESCO, 2011). Some of these initiatives are by The Partnerships for 21st Century Skills (P21, 2008), Partners in Education Transformation (2010), Assessment and Teaching of 21st Century Skills (ATCS21, 2010, 2012), and the Skills toward Employment and Productivity (STEP) Framework (World Bank, 2011).

School-based assessments (SBA) are emerging as a way of assessing 21st century skills. In countries such as Australia, USA, Canada, China, United Kingdom, Finland, Singapore, and Hong Kong, SBA complements the traditional high stakes, mostly national, one-off assessment that takes a short time, and is paper-based. SBAs are classroom-based curriculum embedded assessments that may occur over an extended period, during which students not only respond to questions or prompts, but also construct knowledge products and demonstrate skills through more complex tasks. SBA allows for the most authentic, complex, and applied demonstration of skills like unstructured inquiry and problem solving, learning to learn, creativity, communication, citizenship, collaboration, critical thinking, self-management, metacognition, and personal and social responsibility to be examined in contexts that allow tackling large-scale tasks over a longer period. Thus, SBA takes on an important role in assessment

of many, perhaps all, 21st century skill, along with assessment in internships or other employment or life contexts.

SBA typically involves students in activities such as making oral presentations, developing a portfolio of work, undertaking field work, carrying out an investigation, doing practical laboratory work, or completing a design project. These activities enable students to acquire important skills, knowledge, and work habits that are not readily assessed or promoted through on-demand, paper-and-pencil testing. Students also find these activities meaningful and enjoyable. SBA often constitutes 20% of the total examination score (ATCS, 2010).

Emergent Good Practices in developing 21st century skills

Looking at how youth skills are developed in the 21st century, various approaches stand out. One of these is double cognitive apprenticeship, which refers to direct instruction for cognitive and technical skills, followed by project-based learning in a group in the real world of work, supported by trainers and more able peers, which is faded as student skill levels increase. In formal, informal and other non-formal contexts for skills development, double cognitive apprenticeship has often been preferred, as it provides a balance between direct instruction and student-centred learning (DCU21, 2011). This nurtures non-cognitive skills, while providing opportunities for the honing of cognitive and technical skills. There is also increased use of internships and attachments as another variant of the apprenticeship model (DCU21, 2011; Lorenz, 2011). Apprenticeship involves active, situated learning, which is one way of implementing constructivist learning. There are also other constructivist learning designs, such as project-based learning, problem-based learning, and inquiry-based learning, which have either been used (UNESCO Bangkok, 2011; UNESCO Bangkok, 2012; Schleicher, 2012) or recommended (C21, 2012).

A need has also been identified for inclusive planning for 21st century skills training to include leaders in business, education, and technology (Lorenz 2011; C21, 2012). It has been argued that the broader society needs to be made aware of and provide support for the benefits of relevant models of learning (DCU21, 2011). The involvement of practitioners as part time trainers to mentor students based on real-life experiences are also encouraged (Kibera Film School, 2010; DCU, 2011).

Collaborative learning is emerging as a learning model for cognitive knowledge acquisition and to develop communication skills, although for now it is not adequately used for formal classroom learning, being mostly used for informal learning and does not incorporate group goals and individual accountability. When students engage with each other during learning, classrooms become vital, creative environments not only for acquiring knowledge, but also for learning the communication skills required in today's society and economy. Co-operative and/or collaborative learning can be achieved by using learning communities or student team learning methods (Schleicher, 2012).

In addressing the question of how to improve learning methods to enable the self-directed learner to develop critical 21st century skills that the workforce of tomorrow requires, Herring (2012) recommends the use of technology-enabled informal learning. This refers to technology-based learning that takes place outside a formal classroom environment. It makes sense for organizations because people learn in a variety of ways, and they often like to learn on their own terms. By using technology tools and resources, collaborative learners can easily share and exchange knowledge, while self-directed learners can continuously teach themselves (Herring, 2012).

There are recommendations to infuse 21st century skills and competencies in all learning curriculum outcomes (Canadians for 21st Century Learning and Innovation, 2012). These skills can be implemented by being integrated into the curriculum units (OECD, 2009). The number of learning outcomes can also usefully be reduced to allow for more instructional time and depth of understanding. As part of curriculum for 21st century skills, students should be guided to appreciate the learning which can be achieved through diverse and extra-curricular opportunities (Canadians for 21st Century Learning and Innovation, 2012). They should also be exposed to a range of opportunities, both formal and informal, to develop the priority proficiencies and skills identified in Generation 21 (DCU21, 2011).

There are also recommendations for governance geared towards the development of 21st century skills among the youth, and the need for a strategic and focused approach by governments. Central education agencies should also be included in policy development for 21st century skills (Canadians for 21st Century Learning and Innovation, 2012). Quality standards of performance need to be developed (Lorenz, 2011; Canadians for 21st Century Learning and Innovation, 2012). Strengthened training associations and worker associations can play a big role in maintaining quality standards (Lorenz, 2011). There is also need to develop a 21st century skills national framework to provide a learning vision for all those involved in the development of these skills (OECD, 2009; Canadians for 21st Century Learning and Innovation, 2012).

Conclusion

Whilst there are efforts to focus on recognition and development of 21st century skills, it is clear that countries need to place increased emphasis on the development of skills that will enable workers and citizens to use available and accessible information in new ways so as to generate knowledge that is relevant to their work and life in the society. This is in recognition of the reality that 21st century skills such as problem solving, collaboration, innovation, creativity, communication, adaptability and flexibility, metacognition, leadership, initiative and self-direction have become vital for employability. Knowledge drives the extent to which people approach their work innovatively and to which they convert their innovative ideas to successful enterprises.

With this background in place, it is now possible to examine the digital creative media industries in Eastern and Southern Africa in more detail in order to explore the extent to which 21st Century skills are growing in importance, and how skills are being developed for youth entering these industries (with particular emphasis on the role of informal learning).

The Digital Creative Media Industry

Increasingly, governments around the world are recognizing the important role that creative industries play in their economies (Singapore Government, 2002; Reis, 2008). Innovative ICT solutions and the rapid spread of digital technologies have changed the nature of the creative sector and given rise to digital creative media (DCM) industries. DCM industries refers to those industries which have their origin in individual creativity, skill, and talent, for which digital media are used for production, transmission or storage, and which have a potential for wealth and job creation through the generation and exploitation of intellectual capital (DCMS, 1998; Digital Media Centre, 2011). Examples of DCM industries include film and animation, music, computer games, design, photo imaging, interactive digital media (including web and multimedia interaction and user experience design), and advertising, as well as supportive industries such as post production, visual effects, processing laboratories, software development, and specialized education and training (DCMS, 1998; Canadian Ministry of Tourism and Culture, 2010; Government of Australia, 2011). The creative class of workers is much more than artists and people from the cultural word and now includes professionals, technically minded people, and scientists.

Key DCM Industries

The DCM industries for different categories may grouped as shown in the table below

Table 5 Grouping DCM industries by their categories²

Category	DCM Industries
Film and animation (online and mobile)	Digital animation, films, documentaries, co-creative digital story telling
Music	Music and sound recording
Computer games	Games for educational purposes, games for entertainment, social games
Design	Graphic design, use of avatars in games, business, and medicine, industrial design, visual arts using digital tools ('vigital' arts), architecture visualization
Photo imaging	Photography and photo manipulation
Interactive digital media	Multimedia and web design, web and mobile applications and content, user interface and user experience design, offline multimedia experiences
Supportive industries	Post production, studio and equipment hire, visual effects, special physical effects, processing laboratories and other services for film and television, software development, specialized education
Advertising	Advertisement production

There are also some new emerging DCM industries, including those focused on: 3D illustration and graphics; photo realistic illustrations; immersive experience design; 3D Internet and virtual realities; and interactive museums, galleries, and performances. These industries will, among others, be characterized by personalization, user-led content interfaces, continuous interfaces as well as web-based collaboration (Zaboura, 2009).

² Table collated during the desktop research from various sources: Government of Australia (2011), Department of Culture, Media and Sport (1998), Skillset (2011), UK Creative Industries Task Force (1998), Government of Ontario (2010), Zaboura, N. (2009), European Union (2010), and URBACT (2011).

Global Trends for DCM Industries

Creative industries drive creative economies, and it is believed that they thrive in specially organized metropolises and cities or regions and clusters which recognize the role of creative industries and also create an enabling environment. DCM industries form an important part of these creative economies (Government of Australia, 2011). Advances in ICT are regarded as playing a key role in their development (Zaboura, 2009).

Europe is seeing development in the DCM industry, which is rapidly evolving in that context. In the United Kingdom, 55% of music was sold digitally in the first quarter of 2012 and the games industry is worth one billion pounds annually, growing at 7.5 % (British Council, 2012). The European Union (EU) has made various deliberate efforts to develop DCM industries around Europe. These include the CReATE Project, the Creative Metropolises Project that was started to encourage the setting up of creative spaces and to link 11 European metropolises (European Union, 2010). Another example is the Creative Clusters in Low Density Urban Areas Project, involving seven medium sized European cities (URBACT, 2011). The EU has also formed the 'Creative Europe 2014-2020' Programme to accelerate growth of this sector (British Council, 2012). A creative space is a 'space' in which to work, live, learn and be creative. It serves as a new working environment that is conducive to employee satisfaction, and is important in the establishment of a meaningful relationship to one's work. For creative individuals, creative spaces can be broken into three parts: the mindset (mental space), the location and work environment (physical space), and the network (virtual space). For creative industries or communities of creative people, creative spaces benefit from a favourable environment with ICT services, business incubation, specialized schools, and entertainment, with an indistinct border between work and leisure, and a supportive governance framework (URBACT, 2011). The aim of such spaces is to spur their creative cultural industries. Creative spaces have all of the facilities required for creative economies, including incubation, entrepreneurial training, and marketing and distribution channels (Interarts, 2009; European Union, 2010).

In North America, both the USA and Canada have creative clusters which help to drive the creative economy forward. An example of this is the Content Production Cluster of Ontario in Canada, which mainly constitutes DCM industries (Government of Ontario, 2010). Likewise, the Australian government recognizes creative industries as a vital and innovative force in the 21st century. In 2008-2009, its software development and interactive content segment contributed 43% of industry gross product and 39% of total employment in the creative industries sector. The creative industry sector performs better than traditional sectors such as agriculture, forestry and fishing and is playing an increasingly important role in the 21st century Australia (Government of Australia, 2011).

There are also new players from the developing world entering the DCM industry sector, including China, India, Mexico, and the Philippines. Additionally, a number of smaller Asian players, such as Malaysia, Hong Kong, and Singapore, have been able to consolidate domestic industries and penetrate global markets. The growing importance of creative industries is most evident in developing countries in East Asia, such as Korea, Singapore, Taiwan, and, increasingly, China. Entry has been noticeable in areas such software development, publishing, design, music, video/movie making, and electronic games development, where links to ICT hardware are strongest and changing consumption patterns are moving closer to those in the OECD countries (UNCTAD, 2008). Many of these same countries are already targeting their creative industries for future growth. For example, South Korea has been investing in digital media and video game animation, Thailand has been successfully developing its film and

advertising industries, and Singapore's advertising industry has become an important driver in the growing creative industries cluster, with strong linkages among creative industries that link to heritage, design, and media (UNCTAD, 2008). Hong Kong has one of the biggest incubation-cum-training centres in DCM skills in Asia, called Cyberport.

There have also been speculations about where the industry is moving. For example, it is anticipated that new business models will emerge, levels of awareness and appreciation of DCM industry products and services such as animation and games will increase, and there will be greater collaboration between the 'creatives' to form bigger facilities and shared studio models (PWC, 2012). It is also expected that there will be a growth in gaming development, for both online and mobile modes, with 3D gaming growing and interest in social games played on social media increasing. Digital advertising is expected to grow faster than non-digital advertising during the next five years, but is still projected to be a third lower than print advertising in 2014. Digital distribution of music was expected to overtake physical distribution of music in 2012, and growth was also anticipated with regards to 3D movie screens and 3D releases of filmed entertainment. In terms of global geographical trends, Whilst North America is expected to dominate the media and entertainment industry, Asia Pacific (APAC), Latin America, and the Middle East are anticipated to develop rapidly, with APAC witnessing the highest growth during 2012–2017 (Lucintel, 2012). China and India are likely to remain the Asian countries with the most vibrant DCM industries (PWC, 2012).

DCM industries, like the wider creative and cultural sector, are seen not only as a way of enabling communities and nations to improve their economic standing but also a way of giving voice to the lives of the communities within which DCM are located (Kibera Film School, 2010; Omar, 2011). This is done in the spirit of localization of the DCM products while at the same time making them unique to increase appeal in the international market: As Adamu Waziri, a Nigerian Animator, notes about animation in Africa, 'certain viewers are willing to forgive certain technical deficiencies to watch content they can relate to or that speaks to them' (African Digital Art, 2011, n.p.).

A few other global trends are worth noting:

- 1) Changing consumer behaviour is becoming more and more favourable to the growth and development of DCM industries, driven by the power of mobility and devices, such as increasing engagement of the consumers with digital creative content and rise in their readiness to pay for content.
- 2) Growing dominance of the Internet over all content consumption is leading to increases in access to video and interactive content. Consumers increasingly expect to see digital creative content embedded in the internet and accessible using different types of devices
- 3) Gaming is growing, both in terms of developers and consumers. There is an increase in 3D games, increased demand and access to online and mobile games, and the emergence of social games played over social media, which have a huge following across the world (PWC, 2011).

DCM Industries in Africa

UNESCO's International Fund for Cultural Diversity has supported efforts to map creative and cultural industries in African countries. UNESCO has also initiated capacity building and development of appropriate policy frameworks to strengthen the creative and cultural industries in Africa. Their next aim is to focus on identifying how to leverage digital technologies to develop the much desired creative economies (UNESCO, 2012). Since 2005, UNESCO has put in place initiatives to build creative industries

in Africa, including skills development, mapping of creative industries, and the UNESCO Africa Animated Initiative (UNESCO, 2006). UNESCO has indicated that their next objective is to leverage these industries using information technology.

South Africa's DCM industries and training institutions are regarded as very advanced in Africa. With some of the best equipment, expertise and experience on the continent in animation, graphic design and film production, South Africa is a global location that Hollywood has been using regularly for film and animated content (African Digital Art, 2011). Other African countries in which there is some development in DCM industries include Kenya, Nigeria, Egypt, Mozambique, Madagascar, Ghana, Algeria, Tunisia, and the Republic of Congo. It appears that many DCM industry initiatives are taken on as private enterprises or are driven by international funding (African Digital Art, 2011)

Africa has some good examples of DCM industry products which have reached a global market. Examples of these are presented according to their categories in the table below.

Table 6 Examples of DCM Industry Products from Africa presented according to the industries³

Industry	Product	Country of Origin
Animation	Tinga Tinga series	Kenya
	Bino educational cartoon series	Nigeria
	Aya de Youpougon	Ivory Coast
	Bino and Fino	Nigeria
	The Household	South Africa
	Domestic disturbances – Story driven animation	Kenya
	Zarafa	Egypt
	ZYZ political animated series	Kenya
Music	The Ha-He musical featuring the Makmende character	Kenya
Graphic Design and Typography	Afrikan Alphabets and Digital Visual Arts (Vigital Arts)	Zimbabwe
Film	'Aoure' an animated short film	Niger
	The Slipper Cycle – a short film	South Africa
	Zambezia – a full film	South Africa
	Legend of Ngong Hills	Kenya
	The Legend of the Sky – Africa's first animation film	South Africa
Advertising	DDR Digital ads	Mozambique

Governments are setting up grants to support youth engaged in DCM industries, in line with policies geared to a future knowledge society in Africa. An example of such a scheme is the Kenya ICT Board's Tandaa Grant, which contributes to developing Kenya's Vision 2030. Data from the field work indicates that there has been skills development through Tandaa symposiums and workshops to highlight efforts to go digital by film makers, non-governmental organizations (NGOs), and Small and Medium Enterprises (SMEs). Additionally, the National Council for Science and Technology (NCST), which supports innovation and research in all fields, is mandated to administer the Science and Technology Grant, supporting and funding innovative ideas. This mostly funds mobile ICT projects, with funding up to one million Kenyan Shillings provided for each project. The NSCT has noted that its grant fund is not big enough to finance as many projects as it could, while at times the investment is insufficient and therefore innovators often need to contribute themselves to complete projects.

³ Table collated during the desktop research from a including the African Digital Art website (<http://www.africandigitalart.com>), (Interarts, 2009) and blogs on African Digital Creative Media Industries.

Skills Required for DCM Industries

DCM industries require multi-faceted skills, which can be grouped under technical, entrepreneurial, creative and organizational and management skills. Technical skills are industry-specific skills required for the production of products or services such as calligraphy, illustration, printing, web design, typography, photography, film recording and production, graphic design, and animation (Edwards., 2008; Prospects, 2010). Practitioners also need to know how to use the computer application packages for their field, as well as the equipment required for DCM industries (Edwards, 2008; Skillset, 2011). Programming is also considered a supportive skill for DCM industries (Canadian Ministry of Tourism and Culture, 2010; Skillset, 2011). Technical skills include skills to develop content for multiple platforms (Skillset, 2011).

Entrepreneurial skills include communication, which enables designers to be able to communicate effectively in their daily lives within the studio or laboratory, with their clients, employers, with marketers, sources of inputs to their works, collaborating colleagues, and throughout a DCM project. DCM industry practitioners also require social media marketing and networking and business development skills (Design reviver, 2009; Skillset, 2011).

Creative skills include creative thinking, inventiveness and innovation, which enable an artist to take something deficient or incomplete and turn it into something valuable and remarkable (Design reviver, 2009). They also include diagonal thinking across creativity and entrepreneurialism in order to link creativity and business and develop businesses based on creativity (Skillset, 2011).

Organizational and management skills include project planning, networking and teamwork, and capacity to work independently and determine one's own future learning needs (Prospects, 2010; Kibera Film School, 2010) as continuous improvement to keep up to date with the technologies and market requirements is required in the DCM sectors (Skillset, 2011). The other skills in this group are self-discipline, self-motivation, and time management as DCM practitioners need to come up with their own ideas and build personal projects (Prospects, 2010). They also require capacity to do research to inform their work.

Using Burnett and Jayaram's (2012) categorization of 21st century skills, these skills can also be organized as technical and non-cognitive, with creative and entrepreneurial skills referring to non-cognitive skills and organizational, and management skills referring to technical skills. As highlighted above, non-cognitive skills are generally regarded as more important for the informal sector than the formal sector, but curricula rarely focus on non-cognitive skills, even though these skills are part of many 21st century skill frameworks (Burnett and Jayaram, 2012).

Examples of DCM Skill Providers

There are several initiatives for developing digital creative industry skills in the AKE countries. Some are formal and others non-formal (and include informal training). Some of these, presented by country, are briefly described below. Note that the following tables, which are intended to be illustrative of the kinds of initiatives in each country rather than comprehensive, are drawn largely from desktop research, but has been supplemented by data from field research where appropriate.