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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 metropoles 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:
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**

<table>
<thead>
<tr>
<th>Country</th>
<th>Interviews conducted</th>
<th>Type of institution</th>
<th>Research Tool Used</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ethiopia</td>
<td>ICEAddis</td>
<td>Innovation Hub</td>
<td>Tool 0, Tool 1</td>
</tr>
<tr>
<td>School of Fine Arts and Design – Addis Ababa University</td>
<td>Formal Training Institution</td>
<td>Tool 2</td>
<td></td>
</tr>
<tr>
<td>Kenya</td>
<td>PAWA254</td>
<td>Innovation Hub, Community Centre</td>
<td>Tool 1</td>
</tr>
<tr>
<td>iHUB Nairobi</td>
<td>Innovation Hub</td>
<td>Tool 1</td>
<td></td>
</tr>
<tr>
<td>MLab East Africa</td>
<td>Innovation Hub</td>
<td>Tool 1</td>
<td></td>
</tr>
<tr>
<td>Multi-media University College of Kenya</td>
<td>Formal Training Institution</td>
<td>Tool 1</td>
<td></td>
</tr>
<tr>
<td>Kibera Film School</td>
<td>Community Centre, Informal Training Institution</td>
<td>Tool 1 (focus group)</td>
<td></td>
</tr>
<tr>
<td>Mathare Youth Sports (MYSA)</td>
<td>Community Centre, Informal Training Institution</td>
<td>Tool 1</td>
<td></td>
</tr>
<tr>
<td>Country</td>
<td>Interviews conducted</td>
<td>Type of institution</td>
<td>Research Tool Used</td>
</tr>
<tr>
<td>---------------------------------</td>
<td>----------------------------------------------</td>
<td>---------------------------</td>
<td>----------------------------------------</td>
</tr>
<tr>
<td>Kenya ICT Board</td>
<td>Policy Level Institution</td>
<td>Interest Group - Combination of tools</td>
<td></td>
</tr>
<tr>
<td>National Council for Science and Technology (NCST)</td>
<td>Policy Level Institution</td>
<td>Government Policy Level</td>
<td></td>
</tr>
<tr>
<td>Kenya Institute of Education</td>
<td>Policy level institution</td>
<td>Government Policy Level</td>
<td></td>
</tr>
<tr>
<td>African Cultural Regeneration Institute</td>
<td>Interest Group</td>
<td>Interest Group - Combination of tools</td>
<td></td>
</tr>
<tr>
<td>Kenya Film and TV Professional Association</td>
<td>Interest Group</td>
<td>Interest Group - Combination of tools</td>
<td></td>
</tr>
<tr>
<td>Association of Animation Artists of Kenya</td>
<td>Interest Group</td>
<td>Interest Group - Combination of tools</td>
<td></td>
</tr>
<tr>
<td>The Creativz (at iHub)</td>
<td>Interest Group</td>
<td>Interest Group - Combination of tools</td>
<td></td>
</tr>
<tr>
<td>UNESCO</td>
<td>Interest Group</td>
<td>Government Policy Level</td>
<td></td>
</tr>
<tr>
<td>Mozambique</td>
<td>Maputo Living Lab</td>
<td>Living Lab</td>
<td>Tool 1</td>
</tr>
<tr>
<td></td>
<td>Mozambique Information and Communication Technology Institute (MICTI) Incubator</td>
<td>Incubation Hub</td>
<td>Tool 1</td>
</tr>
</tbody>
</table>

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.
21\textsuperscript{st} 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 21\textsuperscript{st} century knowledge society.

Understanding 21\textsuperscript{st} Century Skills

A skill may be defined as the ability to perform tasks and solve problems (OECD, 2009). The term ‘21\textsuperscript{st} 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.

\textbf{Table 2 21\textsuperscript{st} century skills\textsuperscript{1}}

<table>
<thead>
<tr>
<th>Cognitive</th>
<th>Non-cognitive</th>
<th>Technical</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Basic skills: numeracy and literacy</td>
<td>• Creativity &amp; innovation: youth have ability to creatively generate new and worthwhile ideas</td>
<td>• Business skills: youth have business skills such as accounting and finance</td>
</tr>
<tr>
<td>• Critical thinking &amp; problem solving: Youth capacity to reason effectively based on critical reflection and solve problems in both conventional and innovative ways</td>
<td>• Entrepreneurial skills: youth knowledge of commercial skills such as innovation commercialization</td>
<td>• 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</td>
</tr>
<tr>
<td>• Initiative &amp; self-direction: youth ability to use time and manage workload efficiently without direct supervision</td>
<td>• Flexibility &amp; adaptability: youth ability to work effectively in a climate of ambiguity and changing conditions</td>
<td>• 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</td>
</tr>
<tr>
<td>• Social &amp; 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</td>
<td>• Productivity &amp; accountability: youth capacity to prioritize, plan and manage work to achieve the intended results, collaborate effectively with teams and be accountable for results</td>
<td>• General and Specialized Technical Skills: Youth have specialized ICT technical skills relevant to their area of ICT</td>
</tr>
<tr>
<td>• Leadership &amp; responsibility: capacity to guide and lead others and be responsible for the interests of the larger community</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Communication: Youth have ability to</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

\textsuperscript{1} Adapted from: 21st Century Skills: Partnership for 21st Century Learning; Skills for Employability in Africa & Asia, Burnett & Anderson 2012
Groups such as the Partnership for 21st Century skills, World Bank, Organization for Economic Cooperation 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**

<table>
<thead>
<tr>
<th>21st Century Skills</th>
<th>Important</th>
<th>Moderately important</th>
<th>Not important</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Core Skills</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Basic skills</td>
<td>82%</td>
<td>16%</td>
<td>3%</td>
</tr>
<tr>
<td>You have basic competency in numeracy and literacy skills</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Business Skills</td>
<td>39%</td>
<td>55%</td>
<td>5%</td>
</tr>
<tr>
<td>You have business skills such as accounting and finance to enhance career options</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Entrepreneurial skills</td>
<td>87%</td>
<td>13%</td>
<td>0%</td>
</tr>
<tr>
<td>You know how to use entrepreneurial skills such as innovation commercialization to enhance workplace productivity</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Communicate clearly using multiple media and technologies

- **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)
<table>
<thead>
<tr>
<th>21\textsuperscript{st} Century Skills</th>
<th>Important</th>
<th>Moderately Important</th>
<th>Not Important</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Life &amp; Career Skills</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Flexibility and Adaptability</td>
<td>76%</td>
<td>21%</td>
<td>3%</td>
</tr>
<tr>
<td>You are able to work effectively in a climate of ambiguity and changing conditions</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Initiative &amp; Self-Direction</td>
<td>84%</td>
<td>13%</td>
<td>3%</td>
</tr>
<tr>
<td>You have ability to use time and manage workload efficiently without direct supervision</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Social &amp; Cross-Cultural Skills</td>
<td>79%</td>
<td>18%</td>
<td>3%</td>
</tr>
<tr>
<td>You have capacity to conduct themselves in a respectable, professional manner and work effectively with people from a range of social and cultural backgrounds</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Productivity &amp; Accountability</td>
<td>84%</td>
<td>13%</td>
<td>3%</td>
</tr>
<tr>
<td>You can prioritize, plan and manage work to achieve the intended results, collaborate effectively with teams and be accountable for results</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Leadership &amp; Responsibility</td>
<td>82%</td>
<td>18%</td>
<td>0%</td>
</tr>
<tr>
<td>The youth have capacity to guide and lead others and be responsible for the interests of the larger community</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Learning &amp; Innovation Skills</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Creativity &amp; Innovation</td>
<td>87%</td>
<td>13%</td>
<td>0%</td>
</tr>
<tr>
<td>You have ability to creatively new and worthwhile ideas, work creatively with others and implement innovations to make useful contributions to their field of work</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Critical Thinking &amp; Problem Solving</td>
<td>71%</td>
<td>29%</td>
<td>0%</td>
</tr>
<tr>
<td>You 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</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Communication</td>
<td>76%</td>
<td>21%</td>
<td>3%</td>
</tr>
<tr>
<td>You have the ability to communicate clearly utilizing multiple media and technologies</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Collaboration</td>
<td>63%</td>
<td>37%</td>
<td>0%</td>
</tr>
<tr>
<td>You can collaborate flexibly and are willing to make necessary compromises to accomplish common goals and assume shared responsibility</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Information Media and Technology Skills</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Information and Media Literacy</td>
<td>71%</td>
<td>26%</td>
<td>3%</td>
</tr>
<tr>
<td>You 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</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ICT (Information, Communication &amp; Technology) Literacy</td>
<td>71%</td>
<td>29%</td>
<td>0%</td>
</tr>
<tr>
<td>You have capacity to apply ICT effectively as a tool to research, organize, evaluate and communicate information to successfully function in a knowledge economy</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>General and Specialized Technical Skills</td>
<td>68%</td>
<td>26%</td>
<td>5%</td>
</tr>
<tr>
<td>You have specialized ICT technical skills relevant to their area of ICT practice (for example animation, programming, graphic design and digital music production)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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

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

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 20\textsuperscript{th} 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 20\textsuperscript{th} 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 21\textsuperscript{st} 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 21\textsuperscript{st} 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 21\textsuperscript{st} 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 21\textsuperscript{st} Century Workplace**

There are several emerging trends in the development of 21\textsuperscript{st} century skills. Some countries are recognizing the role of these skills in the 21\textsuperscript{st} 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, 21\textsuperscript{st} 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 21\textsuperscript{st} 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 21\textsuperscript{st} 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 21\textsuperscript{st} 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

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

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).

Global Trends for DCM Industries

Creative industries drive creative economies, and it is believed that they thrive in specially organized metropoles 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 Metropoles Project that was started to encourage the setting up of creative spaces and to link 11 European metropoles (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>
<thead>
<tr>
<th>Industry</th>
<th>Product</th>
<th>Country of Origin</th>
</tr>
</thead>
<tbody>
<tr>
<td>Animation</td>
<td>Tinga Tinga series</td>
<td>Kenya</td>
</tr>
<tr>
<td></td>
<td>Bino educational cartoon series</td>
<td>Nigeria</td>
</tr>
<tr>
<td></td>
<td>Aya de Youpougon</td>
<td>Ivory Coast</td>
</tr>
<tr>
<td></td>
<td>Bino and Fino</td>
<td>Nigeria</td>
</tr>
<tr>
<td></td>
<td>The Household</td>
<td>South Africa</td>
</tr>
<tr>
<td></td>
<td>Domestic disturbances – Story driven animation</td>
<td>Kenya</td>
</tr>
<tr>
<td></td>
<td>Zarafa</td>
<td>Egypt</td>
</tr>
<tr>
<td></td>
<td>ZYZ political animated series</td>
<td>Kenya</td>
</tr>
<tr>
<td>Music</td>
<td>The Ha-He musical featuring the Makmende character</td>
<td>Kenya</td>
</tr>
<tr>
<td>Graphic Design and Typography</td>
<td>Afrikan Alphabets and Digital Visual Arts (Vigital Arts)</td>
<td>Zimbabwe</td>
</tr>
<tr>
<td>Film</td>
<td>‘Aoure’ an animated short film</td>
<td>Niger</td>
</tr>
<tr>
<td></td>
<td>The Slipper Cycle – a short film</td>
<td>South Africa</td>
</tr>
<tr>
<td></td>
<td>Zambezia – a full film</td>
<td>South Africa</td>
</tr>
<tr>
<td></td>
<td>Legend of Ngong Hills</td>
<td>Kenya</td>
</tr>
<tr>
<td></td>
<td>The Legend of the Sky – Africa’s first animation film</td>
<td>South Africa</td>
</tr>
<tr>
<td>Advertising</td>
<td>DDR Digital ads</td>
<td>Mozambique</td>
</tr>
</tbody>
</table>

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.

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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.
Table 7  Kenya DCM Skills Provision Initiatives

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<tr>
<th>Initiative</th>
<th>Courses</th>
<th>Training Approach</th>
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<tr>
<td>The Homeboys Animation Academy</td>
<td>They run an intense six month training course designed to offer the student a reliable skill set that includes the latest advances in digital imaging techniques and technology, basic animation skills for character animation and motion graphics and an introduction into the dynamics of the fast growing media industry in Kenya and the world. In summary, the course includes animation, digital graphic design and image development.</td>
<td>The training approach is formal, with some classes and studio works, with the students learning some of the content on their own. Lessons are spread through one daily 3 hour session, two daily sessions with two 25-student groups, open 1 hour session after class for practice and inquiry and an open full day session on Saturdays with lecturers available for help and inquiry. The sessions run between 9 to 5 PM weekdays and Saturdays. The course is a free space that introduces the students to methods of interaction and learning from valuable personalities and resource all over the world through the internet. This course is structured around online continuing self-improvement (students are inducted with online self-teaching skills and resource portals) because information has become free and easily accessible to anyone anywhere in the world. This allows them to update and advance their skills continuously, remaining marketable and becoming growing assets to their clients and employers (Homeboyz Animation Academy, 2011).</td>
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<tr>
<td>Nairobi Institute of Technology</td>
<td>NIT offers a diploma in animation and digital media design, which prepares their students for animation and graphic design careers. They also offer the Toon Boom diploma course which targets story Board artists, directors and producers, game designers, communication specialists, animators and creative specialists. The diploma level takes eighteen (18) months whereas the certificate level takes six (6) months.</td>
<td>NIT mainly uses a formal full time training approach for their courses. They offer regular programs for certificate and diploma levels with 3 intakes a year (January, May and September). They also offer short courses for specialized programs tailor-made for individuals or groups. They also have life drawing classes where students work with live models in class. Their diploma course is divided into 2 stages. The first stage introduces the students to the whole aspect of Animation and Digital Design allowing them to build an interest in any area of choice. The second stage lets the students specialize in one branch of Animation and Digital Media, letting them gain expertise in their area of choice. The students then undertake Industrial attachment to complete the course.</td>
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<th>Initiative</th>
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<td>have an academic curriculum that also puts emphasis on skill-based education as Animators are in a practical profession. NIT has signed Memorandum of Understanding (M.O.U) with Toon boom Animation Inc. Company to set up a Toon boom training center at the college. NIT is officially the only TOON BOOM Preferred Training Centre in East and Central Africa. Individuals and corporates can train there. NIT provides a fulltime tutor from TOON BOOM to conduct the training.</td>
<td>Careers for the graduates are Graphic Designer, Web Designer, Motion Artist, Sound Designer, Video Editor, 3D Modeler/Animator, 2D Animator</td>
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<tr>
<td>One of the courses is called Bachelor’s degree in Film and Animation. Careers for its graduates include film animation and other applications of animation leading to jobs in video games, special effects, web animation, advertising and e-learning, in addition to opportunities in traditional film animation. The course covers both technical and creative components of filmmaking including concept development, screen writing, camera operation, production management, directing, editing and sound design. The students also gain expertise in digital film production, (film) business management, marketing and communications for the film related industries (Multimedia University, 2012). Another course is a Bachelor of Arts degree in mass communication, which covers television and radio production.</td>
<td>The college uses a mixed approach to deliver the course but it is essentially formal training since on successfully completing the course, the students receive a bachelor’s degree certificate. Students cover concepts in class and also create their own projects to develop skills as directors, producers and editors with the aim to become proficient filmmakers. In the first two years of the bachelor program, students are introduced to the basics of film and animation including film theories, media ethics, cinematography, sound design, web design etc. In the third and fourth years, courses are more specialized and industrially oriented including make-up and costume design, multimedia authoring, 3D graphic design, music in film, location scouting and set design, sound design, film editing, commercials production, film policy, film marketing. They do their projects during this period (Multimedia University, 2012).</td>
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<tr>
<td>Multimedia University College is one of the public university colleges in Kenya. They admit graduates from Kenyan high schools to pursue degree courses for 4 years.</td>
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<tr>
<td>Shang Tao Media Arts College</td>
<td>The course areas of specialization are 2D and 3D animation, graphic design, video production, music/ sound production, web design and</td>
<td>Students choose from morning, afternoon as well as evening sessions. Various courses are offered in the evening to accommodate students with full time jobs. Training takes place</td>
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</table>
### Initiative

268986  
email info@shangtao.ac.ke  
website: www.shangtao.ac.ke

The whole college only offers one course i.e. Higher National Diploma in 3D Animation and Multimedia.

### Courses

development and motion graphics and effects compositing. It has done this for 11 years. The program is designed to serve the needs of our wide range of students. It is a 2-year program.

The course is a comprehensive program that puts equal emphasis on the artistic and the technical side of 3D modeling and animation. Courses cover material that will take the student through the whole production process and workflow of 3D animation, from storyboarding and conceptualization to the final delivery of the rendered product. Curriculum spans traditional animation techniques, life drawing and the technical fundamentals of 3D animation and modeling. The entire college is focused on movie/film, TV, Music and animation production training using modern digital film/movie making techniques.

### Training Approach

from Monday through to Friday.

The course is a highly practical, hands on qualification with no written examinations. Therefore, it is optimized for qualifications that are technologically advanced, heavily skill oriented and highly practical based.

They offer focused learning in a professional environment with emphasis in practical and portfolio development. Classes are taught in a state-of-the-art computer studio with the latest versions of industry-standard software packages. They use class demonstration approach with state of the art equipment and software such as 52’ PLASMAS and LCDs (Shang Tao, 2012).

Faculty members have extensive industry experience and their expertise is critical to the success of students in this growing field. The training is also practical with the instructors taking students through in depth 3D animation techniques (entire production process and workflow) that make one’s characters and environments come alive - from modelling and rigging to texturing and compositing.

For this course, the school acts as a literal production environment, thus offering authentic learning environment, where the student’s animation project must be completed within set deadlines while utilizing available resources. This course will help to prepare students for the methods, environments, and conditions to be experienced in the real world of 3D computer animation production (Shang Tao, 2011; Shang Tao, 2012). They offer the course as an immersive experience. This means that the training is extensively practical with emphasis on the latest technology in the industry today. They have a whole floor fully equipped with professional blue and green screens, shooting lights, reserved floor for TV virtual sets and video shooting, over 100 3d Visualization and animation benches with dual screen set up, over one hundred professional editing benches with dual
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<th>Initiative</th>
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<td>Kibera Film School’s Foundation Course in Filmmaking</td>
<td>The Foundation in Filmmaking course developed out of years of filmmaking in East African communities. Their approach is unique among training institutes in Kenya. It was initially informal and mainly focused on talent and practical skills with no curriculum. But the current version of the program takes 5 months full time. It covers scriptwriting, camera, production, sound, editing and entrepreneurship. It is open to youth between 18-25 years old. The focus is on talent more than academic achievement. The course contents are introduction to visual storytelling, social networking: facebook, twitter, blogs, vimeo, youtube, other tools; photography, photoshop: manipulate photos, basic design elements; storytelling: story development, research, script writing; pre-production: planning and preparation; directing: treatment and storyboard, how to direct actors; production: project management, production management, planning resources necessary to make film; cinematography: stills, flip cameras, DV camera &amp; semipro camera; post-production: data capture and management, offline editing on final cut pro; and sound: recording sound on shoot, music and sound design in post production. They also have weekly film screenings with discussion and critique; life skills and entrepreneurship: budgeting, film festivals, audience, marketing, distribution as well as recording at sound room. They undertake 3 projects in film making: project</td>
<td>Kibera Film School has a formal curriculum. Students do hands-on work for five months and need to finish three complete projects. Kibera Film School trains the entrants based on an evaluation of their competency. Each trainee is evaluated on her/his skill on each type of equipment and software before proceeding to the next level. This achieves a personal focus to the training. The trainees also make their projects in groups and also discuss them in class. From the first week, trainees learn through hands-on projects all aspects of filmmaking, from scriptwriting, storyboarding, production, directing, camera, sound, editing, marketing, distribution, film festivals, entrepreneurship, and social networking. The trainees make short films and working on projects throughout the training period. They also hold a series of outdoor community screenings to show their films to the community to make the training authentic and also for feedback (more than 30,000 people). They also show their work in an annual Slum Film Festival co-founded and co-organized with the Spanish Embassy in Nairobi. Local industry professionals work as instructors on a part-time basis, assisted by past graduates of the Foundation in Filmmaking course. They are assisted by experts from Kibera TV and Hot Sun Film studios in their works, as well as well-known film professionals from Kenya (Ian Mbugua and Cajetan Boy among others). Trainees show visitors how Photography is done. They also work with invited experts who offer them coaching services on how to do filming, such as guests from Hollywood such as director Dwayne Johnson-Cochran who coached the trainees on how to</td>
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<td>Initiative</td>
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<td>one: 2 minute, individual. Genre: personal experience, drama (My World), drama. Project two: 2 minute team Genre: Citizen journalism. Story is on art, sports, young entrepreneurs. These stories are distributed on Kibera TV, Roma Media and local channels. Project three: 1-3 min, team Genre: Promotional video. The trainees must complete at least one short fictional film and a short documentary about a Kibera community organization before they can receive certificates.</td>
<td>better their screenplays. The school’s is collaborating with the writer’s guild of America. They have also had Skype lessons with Charles Levitt the writer of the award winning Blood Diamond movie. The students also get attached under professionals hired to work on real projects (internship, participation in community of practice) under the Hot Sun Studio. This way, trainees of the school have participated in the preparation and production of award winning films such as ‘Togetherness supreme’.</td>
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<td>Global Education Network of Young Europeans (GLEN) Intern Program in Kenya at Mathare Youth Sports Association (MYSA)</td>
<td>An internship program is organized by INEX, the Association for Voluntary Activities, which is a non-governmental, non-profit organization for international voluntary work. The team to MYSA will have a Czech participant, a Polish participant and a German/Swiss participant. The program offers training for the youth in various forms of media. The youth in MYSA are to be trained between August and October, 2012. The interns should be specialized in film (filming, script writing, editing, directing, equipment maintenance/repair) and graphic design, photography (especially image editing and photo exhibition organizing) and/or journalism. They should also be used to working in an intercultural setting, as they will do project planning in cooperation with MYSA students (INEX, 2012). The MYSA youth are to be trained by the interns in Film &amp; Photography, TV &amp; Film Production, Digital Design, and Public relations using the English and Swahili languages. The training will also cover script writing, animation, documentary making and use of new media (internet</td>
<td>The GLEN internship program is made up by 10 organizations from 10 European countries with dozens of projects around the world. The internships last for three months. All interns receive two weeks of training before arrival. The Glen cycle last for 1 year, so once the interns return to their home countries they use their experience gathered in the field for some sort of exhibition, whether that be a film, photo exhibition or otherwise depends on the specific intern. The interns from GLEN arrive with skills in ICT, PR, photography, filmmaking and graphics. Shootback are request a particular set of skills of the interns before, and often have a detailed plan for them upon arrival. The GLEN-interns document MYSA activities using film and photography (and also involve the MYSA youth in this), as well as conduct media classes. The GLEN-participants also show the students opportunities about publicizing their works, either at photography exhibitions or through film festivals (INEX, 2012). MYS As does not have a formal curriculum. It hosts workshops (weekend classes) and conducts field work. The GLEN interns are involved in teaching and sharing their skills within their particular fields. Initially, the focus is on photography, with some learners transitioning to filmmaking or graphic design. Learners are issued with certificates, which are given by</td>
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</table>
One of Shootback’s partners, besides GLEN, is The Norwegian Filmsallskap (FK). Together they run an exchange program, with two participants coming to Nairobi and two participants going to Norway. At the end of the year the work at Shootback is presented through a film festival named Mathari Youth Festival (MYF). The films are selected through a competitive process. This year the focus is slum to slum (India, Brazil, Kenya etc.).

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<tr>
<th>Initiative</th>
<th>Courses</th>
<th>Training Approach</th>
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<tbody>
<tr>
<td>Zambian Open University, New foundland Campus, Farm 7096, Unity Road, Lusaka West, Off Mumbwa Road, P.O Box 31925 Lusaka, Tel: +260 211 214478/214479 Email: <a href="mailto:zaou@zaou.ac.zm">zaou@zaou.ac.zm</a></td>
<td>Degrees in this School are offered to school leavers, practicing artists and media practitioners with profound experience and holders of an Arts and Media Diploma. The duration of the programme is four years (Zambia Open University, 2011).</td>
<td>Participation, as there is no examination.</td>
</tr>
<tr>
<td>Technical Education, Vocational and Entrepreneurship Training Authority (TEVETA) Plot 4751 Birdcage Walk, Longacres, Private Bag RX16X Lusaka Zambia Tel: +260-1-251040/253331-4/253211 Email: <a href="mailto:teveta@teveta.org.zm">teveta@teveta.org.zm</a> Website: <a href="http://www.teveta.org.zm">www.teveta.org.zm</a></td>
<td>The curriculum will be innovative combining high level technical and artistic skills with understanding of development and global issues. The expected Creative and Digital Media products include animations, design for creative interactive media like games art and design, media design (music, visual arts etc), digital Media design (internet, mobile), television programmes, film and ‘soaps’ design and advertisements and documentaries.</td>
<td>The Digital Media programme would offer technical, artistic, personal, social, and entrepreneurship education and training with a focus on problem-solving and project based learning to equip graduates for the challenges of work in the emerging globalised digital media industry. The programme is in line with Zambian National 5th and 6th Development Plans and UNCTAD Creative Economy Report. The Digital Media programme accredited to the Technical Education, Vocational and Entrepreneurship Training Authority (TEVETA). Graduates of the proposed Digital Media Programme will have the skills and qualifications to find employment and to create small start-up businesses in multimedia, web and design</td>
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Table 8 Zambia DCM Skills Provision Initiatives
Ballyfermot College of Further Education of Ireland have partnered to introduce a three-year-Diploma programme in Digital Media, as part of an initiative designed to develop a skilled labour pool that drives the growth of Zambia’s Creative and Cultural Industries. It will empower Zambian graduates to shape the emerging digital industry and determine its contribution to cultural, economic and social development. This was launched in May 2012 (Irish Higher Education Authority, 2012). The Evelyn Hone college ranks 3rd in Zambia behind the University of Zambia and the Copperbelt University. The graduates can also create employment through designing computer games which can be marketed and sold.

Table 9  Mozambique DCM Skills Provision Initiatives

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<th>Initiative</th>
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<th>Training Approach</th>
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<tr>
<td>Higher Institute of Arts and Culture, Maputo, Mozambique</td>
<td>There are a number of areas of focus for the arts and culture course, such as visual arts, design and specialized technical services. Recently, efforts have been made in the line of digital creative industry skills development, such as co-editing of film and graphic design.</td>
<td>The students at the institute have computers and software to use in experimenting their design patterns. They are also assisted by coaches from co-operating arts institutions in Norway and Iceland. The institute follows a formal teaching schedule with defined classes and the classes have hours to be attended to, including on Saturdays. Studio periods were initially not well defined as is the case with many of the Northern and US design schools where there are studio periods with lectures planned at specific times and the students work in the studios and workshops all hours when they are not in classes. Nevertheless, now with adequate teaching and learning resources for all students, including computers and connection to Internet, it is changing (Gislason, 2011).</td>
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<tr>
<td>Higher Institute of Arts and Culture, Av.das Industries, 2671, Machava, Maputo, Mozambique</td>
<td>The institute offers graduate education in the arts and culture, with the focus areas being visual arts (painting and sculpture), design (product design, fashion design and visual</td>
<td>The students in Maputo are encouraged to link with other</td>
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Initiative | Course | Training Approach
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Addis Ababa School of Fine Art | The School of Fine Arts and Design at Addis Ababa University has five focus areas: painting, sculpture, art education, printmaking, and design. They plan on including more focus areas, and they are currently developing and launching an animation department and a master’s program in film studies. They are also setting up a digital fabrication laboratory in partnership with Massachusetts Institute of Technology and The Spanish Agency of International Development Cooperation. Their facilities are only used by staff and students at the university. | The School of Fine Arts and Design has an undergraduate (bachelor) curricula in all of their five departments and graduate (master) curricula in fine arts (multidisciplinary, more theoretical, and philosophical approach) and film studies. The fine arts master’s program is a multidisciplinary, more philosophical and theoretical program when compared to the others. In addition, they have an in-service summer program for teachers who want to get a undergraduate diploma in one of our departments. The curricula have been developed to spark creativity and artistry, but they are also designed keeping in mind resource requirements.

The printmaking Department is now revised to include Printmaking and Graphic Design. The Bachelor of Fine Arts (BFA) program is focused on Printmaking in all printmaking methods and the designing of graphics related material using students in other locations around the world using Facebook and so they all help each other globally on the internet (collaborative learning). The teaching itself is like in all design environments, not so formal but exploration based where everyone learns together through testing and distributing/sharing the latest tricks etc (Gislason, 2011).

The classes are complemented with practical training workshops, many times offered by coaches from Norway and Iceland. For example, there was a workshop for digital graphic design called Experimentation in Graphics in Mozambique, last held in February 2012, which was done using the project based learning approach.

Table 10  Ethiopia DCM Skills Provision Initiatives

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<th>Training Approach</th>
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<th>Training Approach</th>
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<td>foundation year courses.</td>
<td>both handmade and computer aided techniques.</td>
<td>The course includes opportunities both for structured learning of the principles and elements of design and for wide-ranging personal research of a more experimental nature. During the final year of the course, students follow their own artistic journey rather than respond to teacher-provided assignments. The focus is on personal interpretation and individual artistic statements. The students keep a portfolio of their work. They also keep a record of how they go about doing their work, using a candidate record booklet. Part of the training (in new media) is extensive work done in the studio at the school (ICS Visual Arts, n.d.).</td>
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<td><strong>International Community School (ICS), Addis - Visual Arts</strong></td>
<td>The course is called International Baccalaureate Organization (IBO) Diploma in Visual Arts. The students may begin the first year of a rigorous two-year program of study and art production, leading to the Standard or Higher Level IB Visual Arts in Year 2. Students in Year 1 will explore different media and techniques.</td>
<td>Student learning will be assessed using the students presentation of his or her studio work as part of an exhibition, the students research or investigation work as part of his or her project, the candidate’s record booklet which includes photographic record of his or her work, the amount of work presented, the authenticity of the work, and the student’s participation in collaborative work (ICS Visual Arts, n.d.).</td>
</tr>
<tr>
<td>International Community School, Addis Mauritania Road, P.O. Box 70282, Addis Ababa, Ethiopia Tel: 251-11-3711644 Email: <a href="mailto:info@icsaddis.edu.et">info@icsaddis.edu.et</a> Website: <a href="http://www.icsaddis.et">www.icsaddis.et</a></td>
<td>One of the course units called New Media offers a balance of practice and theory, fine art and commercial production. The course offers a focus on graphic design, digital photography, video and sound production. Crossing the boundaries of art, science and technology, this course helps students develop a truly unique twenty-first century perspective.</td>
<td>In the course, the students are expected to reflect the kind of developmental and creative thought processes demanded at the Diploma level, to be aware, perceive and be able to criticize the arts of various cultures, develop and enjoy various means of creative visual expression in the studio and elsewhere, build up a strong digital portfolio to join the IB visual arts (ICS Visual Arts, n.d.).</td>
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<td>Initiative</td>
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<td>Ethiopian Gemini Trust</td>
<td>The Ethiopian Gemini Trust runs a ground-breaking youth programme; on a daily basis over 300 young people come to Gemini to take part in community arts activities, dance, music, drama, film making. They work with international organizations to develop the skills for the disadvantaged young Ethiopians in Arts, such as film production and digital storytelling (using digital tools to help ordinary people tell their own stories in a simple but emotionally engaging form. These stories usually take the form of a relatively short story (less than 5 minutes) and can involve interactivity, photographs, music and voices) (Ethiopia Gemini Trust, 2010).</td>
<td>The youth are trained by experts from collaborating institutions who are invited by the foundation. For example, the film makers of GemTV were trained over a period of 5 years by a team of television professionals sent out from the UK. They were taught all aspects of production and post production. In 2005, the GemTV film makers were awarded a UK City and Guilds Diploma in Media Techniques, Television and Media competences. The youth also informally train their community to tell their own stories through script writing, acting and production of the films. The experts can also be invited to be part of skills development workshops. One such skills development workshop was held in September, 2010 in Addis Ababa by the Valley and Vale Community Arts (Ethiopia Gemini Trust, 2010), collaborating with the Ethiopian Gemini Trust and GEM TV. As part of the workshop, a digital stories film project was run to develop a collection of short films exploring the lives and experiences of individuals in Addis Ababa. The project involved skills sharing with the staff there.</td>
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The Gemini Trust was set up in 1987 to save and support twins born to needy families in Addis Ababa. Gemini directly helps over 2,000 families in the most deprived parts of Addis Ababa, working with over 11,000 people (Ethiopia Gemini Trust, 2010). The foundation also runs the Gemini TV also called GemTV.

The Gemini TV is made of a group of young, independent, Ethiopian filmmakers, who were recruited as a group of young people from Gemini families. Today they are one of the few professional video production companies working in Ethiopia. GemTV makes films on a range of social issues affecting the community such as HIV/AIDS, early marriage, education, human rights and the role of women.
Skills Gaps and General Skill Needs in African DCM Industries

The DCM industry has been regarded as being in its infancy with most people being self-taught:

*Most people are self-taught. When they teach others, what they pass is not the best. The standards are low. (Interest Group)*

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 in Africa. According to an informal training institution in Kenya, the biggest skills in demand are writing, animation, photography and documentary film making. A formal training institution also indicated the need for animation skills:

*There’s a virtual world which our artists have yet to explore, and there are so many Ethiopian stories we need to tell through animation (Formal Training Institution)*.

In Kenya, a formal training institution has indicated that the Kenya ICT Board (ICTB) conducted a skills gap analysis which identified the following skills gaps: critical thinking, problem solving, communication, project management, and leadership skills. They have thus established a programme called Chipuka to develop these skills for software developers.

Additionally, most African Digital Animation Studios also suffer from lack of education on core DCM skills such as animation and film techniques (Edwards, 2008). This was also confirmed in the findings from the field research. For example, an Innovation Hub in Kenya indicated that they require services of an animator to host training sessions. Additionally, one of the students from an informal training institution mentioned in particular that there is not enough equipment for animation, so all they can do is stop-motion animation. Although a formal training institution in Kenya offers a course in animation, some students from that institution felt that the course was theoretical and not practical in nature. Similarly the formal institution in Ethiopia pointed to the need for animation skills, although graphic design is also an identified area that requires capacity building, as they only have one department for that. The Animation Association of Kenya specifically pointed out skills gaps in motion capture and visual effects, whilst another Kenyan Interest group highlighted scriptwriting as being a skill in shortage.

The need for marketing skills was echoed by others in the research. Many film makers do not have the knowledge of marketing and distribution. Artists may not know how to bridge the gap between technical knowledge and their audience as there is no body for movie marketing/distribution. As a result, it is difficult to make quality films for cinema.

*Film experts work alone, but need other people such as negotiations expert, in order to take their work to a higher level. Distribution and marketing is not good and this provides an opportunity for growth and expansion (Interest Group).*

*(Skills in shortage are) confidence skills to sell, negotiate and market creative projects without fear of being rejected...Promotion of own products. The internet should remove a big part of shortage in marketing (Interest Group).*

Additionally, 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. This could partly be the case because more than 50% of African digital artists end up training in informal institutions (African
Digital Art, 2011). One of the Kenyan Interest Groups alluded to this informal training when they indicated that artists go for ‘meet-ups’ and use online facilities to attempt to level the playing field in terms of access to information and knowledge, as well as to improve their skills.

> With meagre resources, artists are required to be as creative as possible and improvise as much as possible. {Interest Group}

Another skills gap is entrepreneurial skills, including inadequate intellectual property management, and budgeting skills, which are required in order to manage DCM industries as enterprises (African Digital Art, 2011). The field research at an Ethiopian Innovation Hub found that, when incubating new enterprises, people prefer to have informal companies in order 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. Collaboration is required to be able to take on larger projects (African Digital Art, 2011). 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. Traditionally, what designers have lacked in knowledge they made up for in craft skills, such as sketching, modelling, detailing, or rendering. However, these skills may have limited use in new design domains. 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, with various opinions presented. Most indicated a combination of technical skills and entrepreneurship skills, for example:

> Filmmaking, but must also be able to pitch. Business in film, marketing, branding, to sell their idea and their product {Informal Training Institution}

> Product design skills plus personality and self-awareness which are very important aspects of entrepreneurship {Innovation Hub}

> Marketing, business skills and vocational trainings {Innovation Hub}

Others focused specifically on business and entrepreneurship skills:

> Entrepreneurship, IT-skills, marketing and how to start businesses {Informal Training Institution}

Interestingly, the Mozambique Living Lab representative felt that the most important skills are not technological but cultural skills, in particular, “to be open to the future, to know your own country and the world, and to be open to new challenges”.

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). For example, in Kenya, attending film schools is beyond the reach of many Kenyans as they are expensive, with fees as high as 500,000 shillings a year or 150,000 shillings for a single weekly event.

Related to this is the inadequate supply of resources and educational materials for DCM skills development (African digital Education Blog, 2010). Entrepreneurs may also face challenges with regards to electricity and access to equipment such as cameras and computers. Some of the initiatives for skills development lack basic necessities like space and computers (Martin, 2012). They are left waiting upon donors for contributions, and this not only reduces the number of trainees they can take (Kibera Film School, 2010), but it also makes it difficult for the initiatives to continue operating. Additionally most of the DCM training providers consulted in the field research indicated that they require additional resources, and thus seek funding to meet their resource requirements. These resource requirements differ, for example, one of the Kenyan informal training institutions indicated that they require the following equipment:

- More cameras
- More editing suites, including software, storage, data management, backup, cloud computing, sound equipment, mics

(Informal Training Institution)

Whilst they have the necessary equipment for day-to-day work, in order to expand there is a demand for new equipment. This concern was also echoed by another Informal Training Institution which indicated that whilst it does have some equipment, it requires additional items, particularly as student numbers increase annually. Specific equipment required includes cameras, sound equipment, computers, and software. At one of the formal training institutions, resource needs include scanners and light boxes. The institution finds that the procurement process is too long and thus inefficient.

As a result of insufficient equipment, training may tend to be more theoretical in nature.

*Though theory is needed for standardization, there is need for adequate and up to date equipment for skills development. There is inadequate comfort among the students in using online facilities, hence students end up learning theoretically* (Interest Group)

There is also a reported lack of creative space for animators to showcase their projects to an underdeveloped market, while financial constraints are also inhibiting creative expression through animation (African Digital Art, 2011).

A further challenge is that, in general, education systems in Africa may not emphasize creative arts, with arts education often not present until the secondary school level (African digital Education Blog, 2010). Where it is in the curriculum, the arts are not taken as seriously as other subjects such as mathematics and science. The divergence between mathematics/science tracks and the arts is so stark that they almost never meet unless students have the opportunity and interest to pursue education in both (African digital Education Blog, 2010). This was also mentioned in the field research in Kenya, where one of the interest groups indicated the lack of education structure and syllabus for training in digital
creative skills. Another Kenyan Interest Group called for a need to reintroduce arts and music in schools (free primary schooling led to their removal) as examined subjects.

Whilst 21st century skills were regarded as important in serving many sectors, a Kenyan government representative noted that the Kenyan educational system does not encourage creativity. Additionally, the Kenyan education system does not address DCM. According to the government representative, if teacher education colleges had ICT trainings things would change faster. There is a need to encourage and introduce Creative Media as an area of study in the college system, especially in teacher education, and then develop a market for it. 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.

A Kenyan formal institution further pointed out that a challenge is to find people with the relevant qualifications. Most people in animation and film are self-taught and do not have formal qualifications, and therefore it is difficult to get people who can teach. 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. There is a shortage of skills to develop local content for programmes for African media businesses/advertisers, billboards, and websites (African Digital Art, 2011). This was also noted in the findings from the field research where training providers indicated a general need for skilled people:

- It is difficult to get these (skilled) people. Those available are just familiar but not very skilled technical and in terms of problem solving (Interest Group)
- Even mentors are not enough. Some of the people are mentored by people outside the country.
- Even apprenticeships in (name of country) are hard to come by (Interest Group)

A Kenyan formal training institution has also noted the shortage of teachers who are qualified and willing to work in Kenya. Generally, teaching personnel are not paid well, and teachers thus require supplementary sources of income in addition to the salary paid by the university. Kibera Film School indicated that they have access to volunteers and other people within the industry who donate their time (for example, through Friday Talks, which include a guest speaker). They also have actors within Kibera who are teachers at the school and obtain advice from and collaborate with the Writers’ Guild of America. Additionally, various professionals come to mentor once a week. However, they also indicated that they have a need for marketing professionals to mentor and donate their time.

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 towns and lacking in rural areas or those who are really good exit Africa to follow bigger Western and Northern markets (Macha Works, n.d.; African Digital Art, 2011). Thus, there is lack of enough people who are well skilled to inspire others in the community (Macha Works, n.d.).

- Art teachers who are paid less for studying art, and who cannot use equipment, cannot teach well (Interest Group).

Additionally, there may be fears of competition:

- People who know or have these skills do not want to teach others because they will take their jobs (Interest Group)

Furthermore, only a small number of Africans are trained in DCM skills. For example, many animation studios in Africa are generally understaffed, hence the need to offer skills development to a bigger group of Africans, in an organized way so as to develop the much needed capacity (African Digital Art,
In Africa, there is also inadequate number of well-equipped schools or other types of learning spaces for the African youth to hone their DCM skills. This is why those few that exist always receive far more application for admission than they can handle (Kibera Film School, 2010).

Additionally there tends to be outsourcing of skills in the industry, from countries such as South Africa and India:

They pay them more because of standards of payments in South Africa. In South Africa, they have a structure that is lacking in (name of country) (Interest Group)

There is also a reported problem in Kenya of skills flight as people are unable to find opportunities in their home country. This likely applies also to other countries. There is also evidence that, while some African artists trained outside the continent have come back home to practise and develop art, most remain outside the continent, and therefore, gaps in DCM industry skills are not reduced. Simultaneously, some of the most successful DCM initiatives in Africa are associated with people from outside the continent, for example, Kibera Film School and Nathan Collett from the USA (Kibera Film School, 2010).

The DCM sector requires continuous innovation. However, a Kenyan Innovation Hub representative pointed out that one of the challenges facing Innovation Hubs with regards to the DCM industry is that people are duplicating the same applications. This indicates a gap in skills development, as people are unable to identify or meet market gaps.

In Kenya, government agencies in the DCM sector are underfunded, compared to those involved with research and science. According to one of the government institutions, 2% of national GDP is to be spent on science and technology research and development. However, because of the low profile of the Arts, agencies such as the Kenya Film Commission and Department of Culture are not well funded. Another Kenyan government institution noted that a proposal is being drafted to ensure that a percentage of the research grants to be spent in conjunction with creative industry/designers. Additionally 2% of building costs are to go to the creative arts aspects in the building, and there is a need to push for this to be implemented. Thus, there is a need to raise the profile of the creative arts, so as to be able to lobby for the funds. The input of the creative sector to GDP still needs to be determined.

Most challenges in the implementation of policies relevant to innovation and entrepreneurship are related to the lack of resources, including financial resources. In Kenya, there is a Youth Fund and a Women’s Fund, which provide general grants for funding that could include, but are not specific to, innovation. A representative from a government institution believes that innovation is key to the future of the DCM sector as well as to economic development. However, this requires an increase in funding and ‘technology transfer’.

Many ideas die due to lack of funding and understanding of the structure to acquire grants for innovation. Lack of access and knowledge. Also we need to train the youth on business skills and marketing strategies (Policy level institution)

Furthermore, there is a need to mobilize funds to start developing programmes.

If we want have serious training workshops, say conducted by people from USA, money becomes an issue. We are trying to build partnerships that can take care of this aspect in capacity building (Interest Group)

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.
Those who are not able to get loans use online resources to find out how others went round the problem. Others start businesses from their savings, others sell equity in their new companies because they have good ideas and people are willing to buy a stake (Interest Group)

Additionally, as highlighted earlier, entrepreneurs in the industry require computer equipment for editing and film, as well as broadband Internet access, but many are not able to afford this.

*It comes down to money...Can a 20 year artist have the money to buy a good enough computer? The best computers can be bought in Nairobi but are expensive (Interest Group)*

Due to import duties and VAT, the cost of equipment is high, and these taxes were regarded as not being supportive to local artists. Additionally fees for filming and to be a film agent, as well as the costs associated with licenses to shoot in different locations were regarded as discouraging to youth entering the sector. Thus, an Interest Group stressed the need for policy to change

*Policy needs to change. Incentives are lacking, repressing the sector (Interest Group)*

More concerning is the seeming lack of knowledge on the DCM industry. In Kenya, a government institution indicated that, with regards to DCM, there is lack of information as to who is working in this field, indicating that ‘we haven’t even mapped our creative media industries’. One of the government representatives interviewed appeared not to understand the concept of DCM completely. For example, when asked about government policy on the promotion of local digital creative content, the respondent spoke about ICT in education and digital content generally.

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 DCM skills.
The Role of Innovation Hubs in Developing DCM Skills

Technology innovation hubs and incubators are springing up in a number of African countries, gathering technology entrepreneurs for networking, knowledge sharing, idea generation, and co-creation of new ventures. These innovation spaces are 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 through training, workshops, talks by experts, mentoring and coaching, and interaction and collaboration in open innovation spaces.

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). Increasing access to information and communication services in rural and underserved areas is crucial in accelerating development as they form part of the innovation ecosystem. Innovation spaces have been used as a conduit to encourage and spur innovation by transforming the ideas of the graduates and young entrepreneurs into real products (Moraa & Murage, 2012).

Entrepreneurs congregate in innovation spaces to bounce ideas around, network, work, learn, programme, and design to turn their ideas into actions. These spaces seem to offer an ideal environment to nurture such fresh graduates. This is achieved through encouraging cohesion, co-working and entrepreneurship spirit (Moraa & Murage, 2012).

Some of these spaces have emerged from independent initiatives, such as single entrepreneurs or small groups of entrepreneurs joining hands to form a collaborative space, such as the iHub in Nairobi (White, 2011). Others have been formed by governments, such as the Botswana Innovation Hub in Gaborone, with others being formed by academic institutions, such as iLabAfrica at Strathmore University in Nairobi (Hersman, 2012). Some hubs serve as incubation and training spaces, others co-working environments, yet others as urban community spaces, or even rural community spaces such as the Macha Works in Zambia.

These innovation spaces may also be described as business or innovation incubators, innovation hubs or living labs (Cunningham, Herselman., & Cunningham, 2011; Zulu & Goredema, 2012). Other relevant terms used to describe these spaces include open innovation and collaborative space. It is thus worth exploring briefly the meaning of these key terms.

An innovation hub focuses on developers, whereas an incubation hub or centre focuses more on entrepreneurs with start-up businesses which need to be supported to grow, stabilize, and be up-scaled. An innovation hub is a collaborative, community-owned, open work environment for young technology entrepreneurs looking to focus on projects, access computing resources and bandwidth, have a quiet professional environment to develop their ideas, and collaborate with one another. Young technology entrepreneurs can also gain access to a network of investors looking to support some of the more promising ideas for investment (Mutua, 2010). An incubation hub provides a workspace/workstation for the start-up, high speed internet and operational support, planned speed dating meetings with angel investors and venture capitalists, access to mentorship and coaching by experts at no cost, office hours
with business management team to support them during tough times, and clients and contract referrals from the hub, among others (NaiLab, n.d).

The difference between an innovation hub and an incubation hub can be illustrated by the difference between iHub (an innovation hub) and NaiLab (an incubation hub):

*The iHub and NaiLab are largely symbiotic although we may compete. Nailab sees itself as less of a competitor and more of a value add to what ihub does, the ihub is an open tech space where you can benchmark your skills, meet new people, get contacts, network and collaborate on projects as soon as you are ready with a product and need incubation and acceleration the NaiLab takes over and moves you from that level to the point where you build your idea into an actual viable business (NaiLab, n.d).*

A living lab has been defined in various ways. The European Commission indicates that Living Labs are:

*Open innovation environments in real-life settings, in which user-driven innovation is fully integrated within the co-creation process of new services, products and societal infrastructures*. (European Commission, 2009, p.5).

According to the Massachusetts Institute of Technology (MIT) Living Lab, ‘Living Labs bring together interdisciplinary experts to develop, deploy, and test – in actual living environments – new technologies and strategies for design that respond to this changing world’ (MIT, n.d, n.p). The European Network of Living Labs (ENoLL)’s definition of Living Labs identifies and qualifies five key dimensions of Living Labs:

1) Innovation settings (‘open innovation environment’);
2) Operating environments (‘real-life settings’);
3) Affecting innovation processes (‘user-driven innovation’ and ‘co-creation process’);
4) User engagement; and

Open innovation is key to the success of innovation spaces. This is the process of combining internal and external ideas, as well as internal and external paths to market and advance the development of new technologies (Moraa, 2012a). It is the act of entrepreneurs, investors and techs interacting to create a nexus point of innovation (Moraa & Murage, 2012). Open innovation is made possible in a collaborative space. These spaces, as found in innovation hubs and living labs, offer a welcoming, open, and fun environment where members can share experience, skills, and friendship. In this way, a collaborative model is created that facilitates open discussions among young entrepreneurs, investors, potential business partners, mentors, and other experienced members of the community (Moraa, 2012a).

**Presence of Innovation Hubs in Eastern and Southern African Countries**

Throughout Africa, several incubation spaces have been established. There are also networks of these spaces in Africa, such as AfriLabs, Innovation, Collaboration and Entrepreneurship Labs (iceLabs), living labs and mobile labs or simply mLabs (Hersman, 2012). AfriLabs is a network organization of innovation hubs or labs in Africa motivated by the need to start collaborating more and also look for ways of supporting new initiatives. For iceLabs, sustainable business development should be tied to spaces of technological innovation and experience exchange (i.e. collaboration), enabling environmentally and socially conscious entrepreneurial thinking (i.e. entrepreneurship). An mLab is an environment conducive to the development of mobile solutions that have the potential to reach a commercial scale,
by providing state-of-the-art equipment to develop, test, and scale software, and technical training and workshops on business skills (mLab Southern Africa, n.d.).

In Eastern and Southern Africa, Kenya, Uganda and South Africa appear to have the most hubs, as shown in the table below.

Table 11  Examples of Innovation Hubs in Africa

<table>
<thead>
<tr>
<th>Country</th>
<th>Innovation Hubs</th>
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<tbody>
<tr>
<td>Kenya</td>
<td>• iHub</td>
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<tr>
<td></td>
<td>• AfriLink entrepreneurs international</td>
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<tr>
<td></td>
<td>• Kenyatta University’s Chandaria Business innovation and incubation centre</td>
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<td>• Sinapsi</td>
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<td></td>
<td>• Nokia Hub at the Green House</td>
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<td></td>
<td>• Agri-Hub Kenya</td>
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<td></td>
<td>• iLab Africa at Strathmore University</td>
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<td>• naiLab</td>
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<td></td>
<td>• m:Lab East Africa</td>
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<td></td>
<td>• JKUAT Enterprises at Jomo Kenyatta University of Agriculture and Technology</td>
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<tr>
<td></td>
<td>• Equity Bank Foundation centre</td>
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<td></td>
<td>• FabLab Nairobi at the University of Nairobi</td>
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<td>• PAWA254</td>
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<td></td>
<td>• growthHub</td>
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<td></td>
<td>• Tandaa Centre at the Kenya ICT Board</td>
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<td></td>
<td>• 88mph Garage</td>
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<td></td>
<td>• Aro FabLab</td>
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<td>Uganda</td>
<td>• Hive Colabo</td>
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<td></td>
<td>• Out Box</td>
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<td></td>
<td>• Finafrica Business Incubator</td>
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<td>• Mara Launchpad Business Incubator</td>
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<td></td>
<td>• Grameen Foundation AppLab</td>
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<td></td>
<td>• Makerere University-College of Computing and Information Sciences</td>
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<td></td>
<td>• The Hub</td>
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<tr>
<td>Tanzania</td>
<td>• Dar Tekinohama Business Incubator</td>
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<td>• TANZIT</td>
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<td></td>
<td>• Dar es Salaam Innovation Space</td>
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<td>Rwanda</td>
<td>• The iHills Network</td>
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<td></td>
<td>• KLab in Kigali</td>
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<td>Madagascar</td>
<td>• i-Hub Malagasy in Antananarivo</td>
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<td></td>
<td>• Madagascar Innovation Space</td>
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<tr>
<td>South Africa</td>
<td>• Reconstructed Living Labs (RLABs)</td>
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<td>• Silicon Cape</td>
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<td></td>
<td>• Impact Amplifier Business Incubator</td>
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<td>• Innovation by Design</td>
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<td>• Eastern Cape Information Technology Initiative</td>
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<td></td>
<td>• mLab Southern Africa</td>
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<td></td>
<td>• SmartXchange</td>
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4 Table collated during the desktop research and include the following sources: Zulu and Goredema (2012), MIT Living Lab (n.d.), and Cunningham, Herselman., and Cunningham (2011)
### Country

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<tr>
<th>Innovation Hubs</th>
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<tr>
<td>Bandwidth Barn</td>
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<tr>
<td>Angel Hub Business Incubator</td>
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<td>Umbono</td>
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<td>the House 4 Hack</td>
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<td>The Innovation Hub</td>
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<td>Gaetsho Tech hub</td>
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<td>Botswana Innovation Hub</td>
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<td>Wiki Start Up</td>
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<td>Burundi Business Incubator</td>
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<td>Worksgroup Innovation Centre</td>
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<td>BongoHive</td>
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<td>IceAddis</td>
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<tr>
<td>RLAB Namibia</td>
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<tr>
<td>Maputo Living Lab</td>
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<tr>
<td>Mozambique Information and Communication Technology Institute (MICTI) Incubator</td>
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<td>Motataisi Living Lab</td>
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<td>Mauritius Living Lab</td>
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<td>Jumpstart</td>
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### Examples of Innovation Spaces Involved in Developing Skills for DCM Industries

As has been highlighted above, 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, including PAWA254 and Tandaa Network in Kenya and the Eastern Cape Information Technology Initiative in South Africa. Others are involved indirectly by supporting start-ups working in the sector, such as the iHub, NaiLab and mLab East Africa in Kenya and the Macha Works in Zambia. Presented next is a description of how each of these spaces is involved in the development of skills for the digital creative industries, as well as how they are supporting skills development.

### PAWA254

PAWA254 ([http://www.pawa254.org/](http://www.pawa254.org/)), located in Nairobi, is a social enterprise and collaborative space for creative people and youth to achieve work that has social impact. The hub, which has been operating since January 2012, houses, fosters, and catalyses creative and community-driven projects for social change across Kenya. It facilitates the use of visual and graphic arts, independent and citizen journalism, documentary film and photography, and digital and social media as means of civic expression and social action. To do so, the hub facility brings together established and aspiring photographers, cartoonists, animators, creative designers, video and filmmakers, as well as entrepreneurs and activists, to work, learn, and share in an environment that inspires creativity and innovative efforts to bring about social change (PAWA254, n.d.).
PAWA254 mainly focuses on photography, but also on graphic design, filmmaking, graffiti, illustration, online and offline marketing. It also hosts discussions on how to determine rates. To a lesser extent, it also supports animation and assist cartoonists. It facilitates networking, provides project management advice, and hosts lectures, workshops and trainings, in an effort to spur Social Impact Projects. It also aims to develop a photography school due to the lack of learning facilities for photographers.

There are five full-time managers, with key skills and expertise in photography, filmmaking, graffiti, and graphic design. Other people are employed according to the needs of specific projects. With regards to human capital PAWA254 considers itself fortunate to have many collaborators who volunteer their time. The managers are also happy to have acquired the space and be able to offer it to creative people. However, the facility lacks much equipment, due to the expense of purchasing cameras, lenses, and other specialized gear.

PAWA254’s target group is young people from low-income backgrounds and creative individuals from middle to upper income groups. However, anyone is allowed to use its space, internet connection and equipment for work as long as they donate ten percent of their time to community work. People from middle or upper income groups sometimes opt to pay to use the facility, which contributes to its revenue. PAWA254’s like-minded and active professional community meets and works daily in its flexible co-working space. The space also serves as an open resource for a range of collaborative youth meetings and efforts, and an exhibition centre for photography and other artistic endeavours.

PAWA254 indicated that it has an informal curriculum. However, it has found a structured way to run classes, lectures, and workshops. It often hosts or teaches sessions in photography and film, which include professionals coming to talk about their work. This often includes a theoretical session followed by a question-and-answer session. PAWA254 also hosts what it calls a ‘Masters Class’. This consists of hands-on work where aspiring artists take pictures or shoot a movie, which is followed by a critiquing session. Any effort conducted is aimed to be as practical as possible. Thus far PAWA254 has conducted one ‘Masters Class’ to the benefit of 36 students. The next session will be with 30 students to respond to feedback in regards to more personal attention. PAWA254 offers no certificates, and is not a certified learning centre. Regular training programmes, workshops, clinics, and photography salons at the space are free of charge and open to the public, in line with its mission. In addition, it hosts some marketing sessions, both in regards to online marketing on social media and how to sell work online, as well as offline marketing and word of mouth marketing.

In the next two years, PAWA254 aims to become a hub for film and photography. It hopes to set standards for photographers and filmmakers, offer training programmes, and issue certificates. It also wants its students to teach others in order to facilitate exponential growth. PAWA254 also wants to start an animation class and a graffiti class. If it acquires more space, video editing and post production for film will be added to the repertoire. In addition, it hopes to be able to place content online, stream classes, and respond to support requests from Tanzania and Rwanda.

**Tandaa Kenya**

Tandaa is a brand of the Kenya ICT Board that promotes the creation and distribution of locally relevant digital content through the Tandaa Symposium. The objectives of the Symposium are to create awareness of the opportunities in local digital content, showcase some of the best digital content and
mobile and internet solutions in Kenya, and create an opportunity for content developers from different industries to meet and network.

Tandaa Kenya also provides grants (seed money) to Kenyan entrepreneurs involved in local digital content development, including computer games and animation of local stories, among others. There have been two rounds of grant awarding. Examples of initiative funded include Makutano Junction and Development of Digital Content for a TV series, a uniquely Kenyan Mobile Game Series, and development of mobile games by the Kenya Game Developers Initiative.

**iHub**

iHub is a Kenyan community space, which takes on entrepreneurs for up to a year, or a more extended time, depending on their portfolio. They get to access internet and meeting facilities and are able to collaborate with the incubator mLab. Together, they produce a quarterly magazine, perform research and consulting, and maintain the supercomputer cluster (hardware).

Some of the start-ups supported at the iHub have been involved in digital creative industries. Examples include Artylinks Designers (graphic and web design), Axis Media (digital branding), Distinct Element (Web and graphic design and animation), Exclusive Concepts (graphic design), Kikosi Concepts (creative and web design), Mediaflax (animation, visual effects, graphic and web design, and post production effects), Sage Revere (digital music distribution and marketing), SimTabi™ (web design and development, User Experience design, 3D animation and graphic design), Tiffs Enterprise (branding, internet marketing and graphic design), and Sprint-Interactive (interactive graphical user interface design, logo design, and branding).

The iHub also has recently plunged into infographic design as a way of improving visualization of data that has been made available through the Kenya Open Data Initiative and other similar open data initiatives. The iHub also has a robotics group to bring together members from diverse backgrounds, with basic knowledge in programming and a shared interest of building interactive hardware in robotics and embedded systems (Wanyiri, 2012).

The iHub has responded to the Kenya ICT Board’s initiative on local digital content by hosting events such as meet-ups targeting entrepreneurs in the film, education, entertainment and advertising industries. These are people who are involved with film, documentaries, visual effects and music. One such event was organized by Buni TV, Royal Media TV and Kwani Trust at the iHub in 2012 (iHub, 2012).

In terms of management, there is a Director of Operations who makes final decisions, a Human Resources Manager who deals with contracts, and other Managers who deal primarily with corporate partnerships. The Community Space Manager is in charge of the space, and ensures continuous progress on the work on location. There is also a Content Manager for the website, and a Webmaster and a Tech Team. The hub employs ten managers and 18 full-time staff. All managers and staff members are regarded as leaders and entrepreneurs. The managers have a proven ability of running projects, and skills in business, design, communications, project management, network experience.

The iHub targets the following groups: freelancers, start-ups, short term consultants, developers, web designers, game designers, individuals who work on democracy and governance websites. Additionally,
it targets people requiring meeting spaces to meet their clients. The iHub offers different levels of membership, which brings different benefits and services.

iHub’s interest aligns with the interest of the community. It aims to assist community members who wish to maximize their opportunity for employment and want to do so by remaining fiercely independent. It promotes skills-sharing and finding work for the community. The iHub does not have formal policies, because it is an organic community, and as such rules would become outdated before implementation. All work is also dependent on the unique needs of each project, and therefore policies applying across the board are not a priority.

The iHub representatives also indicated that the iHub was a ‘tech heavy space’ in the beginning, and that there were no graphic designers. They have found that, once technical people and designers get together, they can develop an idea, which is followed by business people coming in to support the idea (for example, mLab comes in as an incubator).

Other events are organized in line with the hub’s open and collaborative model to improve members’ skills and knowledge about relevant issues or current trends. Members engage in events which become possible due to the open innovation space approach, such as educative events, fireside chats with chief executive officers of leading companies, and thought leaders in technology industries. There are also workshops held within the community itself. Boot camps, hackathons, and pitching events are organized for both members and non-members, providing opportunities to polish skills and also acquire new skills that members can learn and apply. Community learning is also used because those who attend the competitions, both from within the iHub and other invited experts, provide feedback, which members use to improve their skills. Even seeing other members’ work also challenges members to improve their skills (Moraa & Wangeci, 2012).

The iHub model of training is mainly informal, with a few structured classes. It is regarded as successful in skills development because of factors such as commitment to and promotion of open innovation, clearly articulated core values and culture, emphasis on organized events and a community set-up from which all members feel that they get value (Moraa, 2012a). The Hub also hosts workshops, for example in project management, by trained, practising project managers. In addition, it hosts management training, and holds seminars on issues such as how to delegate, managing reasonable deadlines, and so on. Project teams are formed to work on clients’ projects, comprised of developers, designers, project managers and quality assurance personnel who collaborate on client projects. The iHub also organizes personalized, very specific and targeted mentoring and business skill training to focus on individuals in the project management skills programme. The aim is to improve on-time delivery, communication and productivity (including quality of work) skills.

Team members also make presentations as part of the project. There is a system through which, on project completion, clients rate the team or individuals involved in the project. The model for skills development is also open and collaborative. Open innovation is used to combine internal and external ideas to develop new skills and innovations. External participants include industry kingpins, investors, potential business partners, mentors, and other more experienced experts from companies in relevant business lines such as Nokia, Safaricom and Samsung, among others. This takes place collaboratively because of an open, welcoming and fun environment at the iHub, where the actors can partake of open discussions, share experiences, skills and friendship (Moraa, 2012a). The young entrepreneurs freely share knowledge and engage in continuous innovation (peer learning), help each other, share skills, network, and build capacity. There is also skill set sharing and mentorship through workshops, short
trainings, and also collaboratively working on iHub contract projects with fellow community members and even with other project team members drawn from elsewhere (Moraa, 2012a). The knowledge and skills of the community are distributed, and therefore, from time to time, members can refer to these sources through collaboration.

**NaiLab**

NaiLab is a Kenyan incubation hub. It supports start-ups in diverse sectors, including DCM industries. They aim to support Kenyan entrepreneurs to turn their ideas into viable businesses, and focuses on incubating knowledge driven businesses. In short, it is the incubator, “where ICT meets the rest of the economy and society”. An example of a start-up incubated at the NaiLab that is involved in digital creative industries is called Vive Visuals. Vive Visuals is a motion graphics company which produces creative animation and high-end visualizations for the local and global markets. Vive Visuals specializes in using animation it to its maximum to paint ideas, tell stories effectively and creatively, make captivating presentations, explain things visually, and market brands and products. It produces animations for both corporates and start-up companies.

**mLab East Africa**

The mLab is an incubator for mobile application start-ups. Its focus is mobile-oriented application developers. The role of mLab is to foster the development of entrepreneurs rather than people searching for employment. Its target group is people with mobile applications who want to venture into business. The mLab incubates all sorts of applications, either at the facility or at other collaborating centres, such as the Nokia Centre at the Green House on Ngong Road, Nairobi. Therefore, it also support start-ups working in the DCM sector. The content offered during training sessions is discussed with the existing group and new students, so as to agree on what training is required. An example of a start-up in the DCM sector is Planet Rackus Limited, which has a vision and passion to tell African stories using animation video games through a sustainable Digital Edutainment Framework. Their stories so far have revolved around the matatu (minibus taxi) industry in Kenya.

The mLab was founded by four organizations: iHub, eMobilis, University of Nairobi School of Computing and Informatics, and World Wide Web Foundation. The partners play different roles. For example, eMobilis provides training in mobile technology skills (offered by people who are practising the skills) and in entrepreneurship (offered by CEOs of start-up companies in developing countries). The University of Nairobi supports training by focus on technical and theoretical aspects. The iHub community provides an interaction forum for students, through which students can learn something that is not being taught currently at mLab. Students also get the chance to network since, as members of the mLab community, they automatically have access to events at the iHub. The World Wide Web Foundation provides a virtual training aspect to the training being offered at mLab.

Four management staff are employed on a full-time basis at the mLab. Their skills include communication and public relations skills, testing of computer science and mobile applications, and customer relations. They organize experts to speak to trainees and the training includes mentorship element.
The mLab East Africa offers a four-month East African Trainee programme to technology graduates from East African Universities. This is an intense full-time programme. During training, trainees learn technical, entrepreneurial, and 21st century skills such as communication, networking, and team work, among others. They attend classes, as well as interacting and networking with other developers and domain experts from industry and other development sectors through events organized by the lab and the iHub. Invited speakers, among them successful entrepreneurs and industry thought leaders, also give weekly inspirational and instructional talks. Often trainees further develop applications after they graduate and some have developed award winning applications.

Business skills that are covered include customer development, the business model canvas, marketing, operations management, project management, monetizing mobile applications, intellectual property and patent management, financial management, and pitching (which involves communication and presentation) to investors.

mLab indicates that it uses a combination of formal and informal curriculum. Trainees are trained on different platforms, user experience, mobile application platforms as well as entrepreneurships and how to pitch for funding. The programme lasts four months, and training is held every day between 9am and 3pm.

After the course, all students propose a final project (project-based model), and work on it for at least three months to gather market traction. The trainees thereafter return and present progress reports which form the basis for their graduation. The mLab is the largest testing laboratory in East Africa, with more than 80 testing devices. Additionally, it has a good Internet connection, as well as a number of training and meeting rooms. There are increasing requests for training support, but the lab currently only has capacity for 30 people at a time.

**IceAddis**

IceAddis was launched to foster Ethiopia’s economic growth, in recognition that there are insufficient jobs for graduates and thus a need for graduates to create their own jobs. IceAddis helps graduates and students (as an extracurricular activity) with their start-up businesses, through the Green Technology and Innovation Hub for High Potentials. This Hub takes environmental sustainability into consideration in its activities. It is a self-sufficient business incubation and open community centre aimed at supporting Ethiopia’s economic growth by promoting market-driven and environmentally viable innovations (Petzoldt, Abdulhafiz & Lemma, 2012).

IceAddis serves as a collaborative work space where aspiring young entrepreneurs, ICT-driven individuals, technically minded people and creative thinkers can come together. They support different entrepreneurial communities in different disciplines and offer a platform for networking and linkages between start-up businesses. For example, two of their members – a bicycle manufacturer and a packaging company – began working together through the network offered by ICEAddis.

The hub falls under the Institute of Architecture, and thus ICEAddis gets most of its financial and human resources, as well as infrastructure and access to laboratories, from the university. The incubator’s management oversees all projects. The hub has a small staff complement of four: community manager, innovation manager, program coordinator and product designer. These staff also performs other roles under the Institute of Architecture. Management’s role extends to all aspects of running the hub.
The hub is supported by its two founding partners, Digital Opportunity Trust (DOT; a Canadian NGO) and The Centre for Creative Leadership (CCL). It also gets support from Association Internationale des Étudiants En Sciences Économiques et Commerciales (International Association of Students in Economics and Management), AIESEC, the world’s largest student organization. Other relevant resource providers are GIZ (Deutsche Gesellschaft für Internationale Zusammenarbeit) from Germany, which provides funding and pays one of the staff members. Additionally Google provides annual funding of US$ 25,000. ICEAddis is also part of the international umbrella, Icehubs, which has other hubs in Cairo, Egypt, and Bauhaus, Germany.

ICEAddis provides business and life skills training. A team of enthusiastic advisors offers individual business coaching for entrepreneurs. Open communication and collaboration is encouraged, and all members are invited to become active participants in both growing and developing innovative ideas. The members also operate as a peer-to-peer network for skills and experience exchange. ICEAddis encourages the process of open innovation, which combines internal and external ideas, as well as internal and external paths to market, to advance the development of new technologies. It aims at providing professional support to network the different aspects of the technology and business community, as well as to enable them to create synergies, pool knowledge and source investment (Petzoldt, Abdulhafiz & Lemma, 2012).

ICEAddis indicated that it is in the process of developing a curriculum for coaching (one person) and training (group). It currently uses a workshop format for the prototype lab, where a few entrepreneurs at a time can come to work with the product designer. ICEAddis anticipates that the future curriculum will help them to create awareness of entrepreneurship, and that it will be easier to develop skills if there if more structure.

ICEAddis is in the process of developing a business plan. Its short term plans are to sustain the hub, create a financial structure through payback from established companies that have taken off in the market, and establish their own facilities that people from outside the university can access.

BongoHive

The BongoHive targets young, fresh graduates with few job prospects due to high rates of unemployment in Zambia. An informal learning model is used, through which young university graduates are provided a space where they can practise programming skills and subsequently gain skills for employability. They simply show up and programme. For now, the BongoHive focuses on technical skills. The hub is still looking for a permanent home. It is also trying to build a technology community in Lusaka, similar to the community at the iHub, which should make it easier to carry out business (Martin, 2012).

Macha Works

Macha Works is based in rural Zambia. It focuses on reversing the migration of talented youths to towns by creating suitable conditions for them to develop their skills, have a favourable living and working environment, and be visible. In this way, it is hoped that they can remain and develop their community.
It is acknowledged that competent management and entrepreneurship skills are important to the development of rural communities in Zambia. The role of ICT and communication skills is also prioritized. It is clear to the community that, by developing such skills and creating enabling spaces such as the Vision Community Centre (VCC), it is possible for the members of the community to start their own businesses and build a formal economy. There is a feeling that vocational training mostly takes place in cities and it is mainly technical, with no provision for cognitive development, self-awareness, result-oriented attitudes (productivity) and entrepreneurship. The people of Macha Works believe that soft skills are more important than cognitive knowledge in achieving results (Macha Works, n.d.).

The training model is not yet well defined. The centre offers training courses based on the needs of the local people. It offers training for development of ICT and entrepreneurial skills at the LinkNet Information Technology Academy (LITA) at Macha. It also offers training for skills such as project management and customer relationship management.

Macha’s Innovation Centre at the VCC is a meeting point of enterprising people in the community (collaborative space). VCC provides space for an internet cafe, restaurants, workshop rooms for training, a ‘community hall’, a craft shop, and a bank. People interact informally, and, in this way, their entrepreneurial skills are enhanced. Besides being an office and meeting place for young entrepreneurs, VCC’s workshop facilities are also used by professionals to share expertise and provide support, as well as offering one-to-one coaching and participating in network activities and peer learning (informal learning) (Macha Works, n.d.).

Some members, especially with specialized skills such as those for digital creative industries, are self-taught using resources available on the internet, which are accessed through internet cafes. Those members who are trained in ICT skills at LinkNet are also absorbed to do training of other community members in internet cafes around Macha. Others trainees are absorbed by LinkNet, which provides them with opportunities for on-the-job skill enhancement.

Macha Works also does business incubation. Potential entrepreneurs are offered space at VCC until their businesses are strong enough to afford rent space by themselves. This is important for the first important phase of starting a new business. There are examples of talented community members, also called heroes, who have started their own DCM businesses. One such example is Gregory Mweemba, who has started a web design and media company that deals with communication, video and photographing business. This is based in Macha, a remote rural area that is 380 kilometres from Lusaka, the capital of Zambia.

**Maputo Living Lab**

The Maputo Living Lab (MLL) is a consortium of the University of Trento in Italy (that functions as a laboratory to the initiative), the Mozambique Ministry of Science and Technology, and Faculties of Engineering in Mozambican Universities. The roles of the MLL are to build capacity in the area of ICT and provide solutions for development challenges in rural areas in Mozambique. The MLL’s focus is on the development of e-government applications, which involve the private sector in their delivery. However communities, particularly in rural areas, have limited access to services, and thus need a process that is more citizen-driven. The MLL is working on projects to develop software for the rural population of Mozambique. The Living Lab concept is a tool that was developed to meet the needs of the community, and which uses community consultation to identify those needs.
Funding for the initiative comes from the government of the autonomous province of Trentino (in Italy) provincial budget. At a management level, the MLL is governed by board of six people, consisting of an executive director and member representation from Mozambique and Trentino. Implementation of the MLL is led by working groups and team leaders in the field. The Italian team members are high-quality staff from the University of Trento, with experts from the Bruno Kessler Foundation. The Foundation conducts scientific, technological and humanistic research for the MLL. The Italian participants all have backgrounds in ICT. Mozambican team members are assigned by the Core Directorate within the Ministry of Information. The Mozambican universities provide resources in relation to researchers and students for the MLL projects.

The main goal of the MLL is to train qualified experts who will be capable of developing software and able to start their own businesses. The target audience for the laboratory is students from any of the eight universities in Maputo. MLL hosts an annual summer school of ICT for about four weeks, which focuses on building capacity in developing technology prototype solutions to meet the needs of the community. Top students from the final year of science and engineering and technology faculties are selected from Mozambican universities to receive training in ICT. In the process, they also develop prototypes to solve problems experienced in the country. The summer school course is developed on the basis of a needs analysis conducted in rural communities. The needs analysis is conducted as a qualitative research process, where questions are broad and open to create consultations and conversation with communities – and identify what are the issues they have related to the thematic area of the needs analysis (whether agriculture, health, sanitation, or some other priority). A project-based learning approach is adopted, whereby trainees learn how to solve problems (ICT competencies) and then go on to produce an artefact for their projects (i.e. process and product of problem-solving). Training is offered by internationally recognized professors from the participating institutions in Mozambique and Italy. The first summer school of ICT focused on the following skills: software project management, web development in the Java environment, and mobile applications development (Maputo Living Lab, 2012).

Maputo Living Lab also has an informal curriculum for the summer school programme. Participating students are provided with a hands-on experience on the topics covered to enable them develop small projects targeting Mozambican problems. Students with varying skills and from different universities are formed into project teams with mixed membership according to their skills, which enhances collaboration. Students are divided into three groups, each with a leader and a weekly programme. The lab creates fraternities or teams, related to culture, science, politics, or history to develop an ‘open vision’ and ‘focus on future perspectives’. This has been done as students tend to have ‘low cultural knowledge’ and experience difficulty in understanding problems faced in Mozambique. MLL organizes weekly international calls between the students and the teachers in Trento. The lab also schedules regular visits from staff in Trento to support students with their work.

The lab regards the advantage of the informal curriculum as being its flexibility. They believe that creating a formal curriculum would be difficult, partly because universities in Maputo have very different curricula from the University of Trento. Additionally, the lab can adapt training to the needs of the students and the necessity of developing software. Through the summer school, students are able to ‘learn by doing and not from a book’. The summer school has been supported by vocational teachers and opens up work perspectives for the students. The projects developed are the property of the students, who need to establish companies to carry out these projects.
Based on evaluation of the solution prototypes produced, the best students are selected for a second stage of capacity development. These students go to University of Trento to participate in project course work that has been developed on the basis of the needs analysis. This course activity is more hands-on and intensive, during which students start to conceptualize solutions and focus on the programming side of those solutions. The students are linked to supervisors and mentors from the University of Trento and the private sector. The involvement of private companies is in recognition of the need for private sector investment funds. The project is still in very early stages and only one person has gone to the University of Trento thus far.

The purpose of the MLL is to bring solutions to the community. The process of solution development starts with the assessment in the communities to identify problems. All MLL courses are designed to develop skills via development of a product, so that as students produce the product they are engaged in a diverse range of skills development that is practicable and production based. Thus, the approach is to start by providing students with technical skills and entrepreneur skills – to create enabling conditions for nurturing student entrepreneurial skills. The focus is to end up with a new company product – where the quality depends more on innovation than the processes to get to the innovation. The aim is to develop people that can be change agents – to identify problems, produce solutions and implement those solutions. As the private sector has little research capacity, the focus is to build a critical mass of young graduate researchers who are experienced in research that they can bring to the private sector in Mozambique.

_The main focus in the MLL summer school is to build confidence- build student personality to be different and to make a difference in the community and marketplace._

The World Bank supports MLL in one of its projects on social accountability. The project was implemented in the District of Moamba with 63 schools and 30,000 students and through software developed by the MLL to identify community issues and needs in relation to educational delivery. This project was presented to the Ministry of Education, which now wants to develop a similar project in another region. The MLL is sending two experts from University of Trento to study the feasibility of this project together with the Ministry of Education.

Additionally a project has been presented to the Ministry of Agriculture. This project aims to develop software which allows farmers to access current prices, and for traders to make proposals and offers on key product areas to farmers. MLL is also considering setting up a small association of computer companies in Maputo. Small companies typically compose two to ten staff members who are largely self-trained. However, these small companies tend not to grow and do not have commercial trading capacity. MLL’s idea is to organize an association for these companies to grow as a network together. In Mozambique there are very big multi-national ICT companies that are winning all the tenders and as such leaving out all the small local companies. This association could help these small companies to enter these tenders together.

**Mozambique Information and Communication Technology Institute Incubators**

The Mozambique Information and Communication Technology Institute (MICTI) is one of the priority programmes in the ‘Mozambique ICT Policy and Implementation Strategy’, and has a long-term vision to build ICT capacity in the country. MICTI comprises three interrelated components:

- Business incubator, to nurture entrepreneurial skills providing employment and wealth generation opportunities;
• Research and learning component, to meet the need for skilled personnel in the country and region;
• Science and Technology Park, to allow participation of international and domestic organizations that will provide expert input, seed knowledge and innovation capacities, coordinated under the Ministry of Science and Technology.

After participants complete writing business plans for these three components, MICTI provides them with technical assistance for implementation, offering technical and knowledge resources to the design and implementation of a science park in Manulana.

The Mozambique Incubator initiative started at Eduardo Mondlane University with five offices – one for the manager and another four for potential companies. There was a call for proposals for people who wanted to start companies. The target group was graduates from the university or technical colleges and entrepreneurs from the private sector who needed space, as well as mentoring and business support to incubate business ideas. The incubator space consists of laboratories and classrooms, with two classrooms and one cisco laboratory/library.

Initially, no courses for technology training were offered. The assumption at this time was that candidates already had technology skills, and thus the requirement was to provide start-up training-related to accounting, legal advisor assistance, and project management. Thus, the initial focus was on mentoring and business planning courses.

Thereafter, incubator learning components were developed based on needs assessment. Programme themes identified to date have included computer programming, networking, and web development. Courses run for 18 months, 12 of which comprise a full-time course and six an internship and project development in the field.

The project research and development component of the course aims to create a learning environment that nurtures the development of ideas to be incubated and brought to the market place. There has been only one successful group so far emerging from the incubator that has brought its ideas to market. The tendency to date is for most incubator participants to enter full-time jobs when they finish the course.

Of the first group that graduated from the incubators, some became teachers, while most of others were employed. The MICTI has model nevertheless created interest in incubation and a number of students entered the incubator to get exposure and to learn something new. The incubators graduated more than 20 students and five successful entrepreneurs.

MICTI indicated that it uses a ‘bandwidth barn’ / or the ‘barn’ incubator model. The idea is that students are brought into the incubator process and showered with ideas for prototype development in a short period of three months. The belief is that students who survive the three months will be those with the most potential for commercial success. The focus is on extracting as much as possible from students so that they develop the capacity to build companies or business models, or they are able to leave the incubator with products and design for implementing and creating a business. Students who do not complete the three months still leave the incubators with skills that they can use for research and development of ideas.
Innovation Hubs and the Digital Creative Media Industry

The above examples indicate that innovation hubs typically have an economic focus that is much broader than the DCM sector. A specific focus on the DCM sector is usually included if this is required, as highlighted by one of the research participants:

(Name of Innovation Hub) cannot push what developers do not want to do. Some very good applications seen during testing have not been pursued (Innovation Hub).

Thus, there does not appear to be a specific focus on the DCM industry. An Interest Group also highlighted that there are insufficient incubation spaces specifically for creative companies:

The government has tried to put incubation space for young businesses but no creative company has been given space in the incubation spaces (Interest Group).

One of the few hubs indicated that it does place special attention on the DCM sector, and it has community members with start-up businesses in this sector. DCM related skills in demand at this innovation hub are product design, especially prototyping and testing. However, when asked about their approach to developing DCM skills, the Innovation Hub representative indicated that they adopt an open approach:

The things we do here are available for everyone and we like to use open-source software as much as possible. Also, we’d like to help creating an own culture for entrepreneurship in (name of country) (Innovation Hub).

Thus, it is not clear whether the interviewee was, indeed, talking specifically about the DCM sector. Nevertheless, the need for innovation hubs, particularly their role in providing training and developing skills was highlighted.

These young people are very creative, but if they lack training, they can’t produce products. So we should focus on skills development. I think innovation comes from leaders, so they need to be brought on board (Interest Group).

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 development of these 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 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. The Animation Association of Kenya 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 proposed that theory should be taught, followed by practical experience, so that practical experience is informed by a knowledge base.

People who just learn practical find it hard to learn how to use new skills because they do not understand the concepts (Interest Group).
With regards to developing business skills, it was proposed that mentorship be adopted to fill gaps in terms of how to manage funds. Interestingly, one of the Kenyan Interest Groups noted that 60% of start-ups at Nailab do not make it beyond eight months as they lack such money management and other relevant business skills.

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.

When considering the issue of incubation in a development context, one of the respondents felt that it was important to consider the context of students who have already passed through university courses, often at considerable sacrifice to their families. The priority for these graduates is immediate earnings and it is a particular challenge in an African context to attract youth/graduates to get involved in incubators. Social influences and expectations are aspects which significantly affect these models of youth skills development. Technology-based incubators demand graduates of computers studies – and there is a very big demand for these graduates in the private sector. It is therefore difficult to attract graduates who can be motivated to go through an incubator – more especially while they see other colleagues who have graduated earning money in employment.

Another challenge, especially for innovation spaces, is that there are insufficient people interested in innovation through ICT. For example, the development of the BongoHive has partly been slowed by lack of a strong community of independent and freelance innovation-based workers (Pisani, 2012).

**Learning Models Used in Innovation Hubs**

It is recognized that 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.

When considering the descriptions of the innovation hubs noted in the previous section, the approaches used to develop skills vary. These range from formal to informal approaches, or a combination of both. Formal training is typically provided by an education or training institution, is structured (in terms of learning objectives, learning time or learning support), and leads to certification. Formal learning is intentional from the learner’s perspective (UNESCO, 2010). Informal learning is learning resulting from daily life activities related to work, family, or leisure. Informal learning is part of non-formal learning. It is often referred to as experience-based learning and can, to a certain degree, be understood as accidental learning (UNESCO, 2010). As highlighted in tables 7 to 10, formal establishments tend to use formal curricula for the development of DCM skills, in which skills development is intentional, structured, and ends with a certificate. However, specifically for innovation hubs, informal curricula appear to be most popular due to their flexibility.

Based on the descriptions provided by innovation spaces, the following list provides an indication of some informal learning approaches used by DCM skill providers:

- Motivational talks by professionals in various fields;
- Networking opportunities and opportunities for collaboration;
- Educational events such as bootcamps and pitching events;
- Forums for interaction and to meet thought leaders and experts in the field;
- Training in areas such as business skills and project management (for example, through workshops or instructional talks);
- Mentoring;
- Peer learning (including peer to peer networks);
- Access to facilities such as the Internet and meeting facilities;
- Hosting ‘meet ups’;
- Offering one-on-one coaching, sharing expertise, and providing support.

Whilst technology-enabled informal learning through web-based technologies (including social, mobile, video, games, and personalized portals) can support self-directed learners, study data has provided little evidence of use of technology to assist in informal learning. Additionally, although some innovation hubs indicate that they follow an informal curriculum, explanations provided indicate that formal approaches are also used. For example, one of the Innovation Hubs indicated that they have an informal curriculum, but they also indicate that their talks include a ‘theoretical session’ followed by a question-and-answer session.

**Possible Roles Offered by Innovation Hubs**

Innovation spaces tend to offer facilities that may not be easily accessible elsewhere, such as Internet access, meeting facilities, or prototyping laboratories. Additionally, they offer access to necessary equipment:

*(We have access to resources such as) cameras, editing equipment, internet, everything that we need for production (Informal Training Institution, student focus group).*

Perhaps one of the most beneficial aspects of informal learning spaces is the networking opportunities that they provide. Their networks often include professionals from different backgrounds who can contribute to the members’ skills development.

- *In these hubs people with different entrepreneurial ideas can benefit from each other, so the networking aspect of the hub presents a great opportunity in this respect. (Innovation Hub)*
- *One of the advantages of the incubator is that it has a pool of technically minded people in one place. This allows trainees to learn from more experienced people. (Innovation Hub)*
- *(Name of institution) is a place to develop oneself (with) members exchanging ideas and interact with people from different universities and countries discussing same idea. They have people who guide them on how to make projects. The members work in groups, projects and this involves people from multiple disciplines working together. (Living Lab, student focus group)*
- *We discuss and learn among ourselves. Also (name of institution) organized a business start-up course, which gave me basic knowledge. (Informal training institution, student focus group)*
- *Around this environment there are so many techies that you can connect with and expand your skills, even your entrepreneurial skills. (Innovation Hub, student focus group)*

Another stated opportunity of iHubs is that they address market gaps and therefore have potential to generate a demand for professional work. For students, what is significant is that 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, and technical skills:

- *I learned business skills here, and met a community that helped me out. (Innovation Hub, student focus group)*
• (Name of institution) allows students to develop their skills such as IT skill and communications skills. They also interact with persons from different universities which provides them with the chance to learn how to use IT in projects to help people. (Living Lab, student focus group)

• They have instilled integrity in us, as well as business plans. I learned to work with design. Before I used to develop, but not focus on the user experience. (Innovation Hub, student focus group)

• The curriculum focuses on mobiles, mobile web, sms, ssb, android etc. But it also has a business component; how to work with partners, find partnerships, how to make money, study your competition, do marketing, how to pitch, and make presentations etc. (Innovation Hub, student focus group)

• I learned how to register a business. I no longer make an app that sits in my laptop, but one that is going to sell. (Innovation Hub, student focus group)

Importantly, these hubs provide support and guidance to trainees who benefit from others’ experience. The mentorship aspect offered by these facilities was also highlighted as important in developing skills:

• My mentors have helped with business decisions (Informal Training Institution, student focus group).

• I’ve met outside actors and learned how the market works. (Innovation Hub, student focus group)

• The members also have opportunities to participate in real software development. During this process, they not only share ideas and skills as colleagues but also get support from people from various disciplines who provide guidance. They are also able to share experiences, which is helpful in developing them. This is learning by solving authentic problems. (Living lab, student focus group)

It is noteworthy that these spaces have also opened opportunities for students to develop and realize their passion and potential:

• (Name of institution) has been a turning point in my life. I make my money doing freelance jobs. (Informal training institution, student focus group)

• It gave me the opportunity to live my dream. I dreamt about working with film, it thought it was magic. So this opportunity is everything. (Informal training institution, student focus group)

• I knew nothing when I joined, but over the years I’ve been here, I’ve learned leadership, directing and I’m a junior editor. I never thought I could do that. (Informal training institution, student focus group)

Thus, Innovation Hubs appear to play an essential role in developing DCM Skills, particularly in terms of providing access to facilities and supporting students and entrepreneurs in developing and refining their skills.
Conclusion and Recommendations

New and different sets of skills are required for the 21st century workplace, to enable youth to become knowledge workers and assist in developing knowledge societies. These skills, classified as cognitive, non-cognitive, and technical in this research, are increasingly required for youth to be innovative and contribute to the development of their communities in the knowledge society. However, these are not necessarily developed in traditional training institutions, thus calling for an exploration of other ways to prepare youth for the knowledge society.

Additionally, it is recognized that, whilst youth require generic 21st century skills that apply to all sectors, they also require industry-specific skills. Given this, a preliminary investigation of the DCM sector was done to illustrate some current practices in developing skills in the industry. This included exploring educational environments that produce 21st century skills such as formal training institutions, as well as alternate ways of developing skills through informal environment such as innovation hubs.

The research indicates that innovation spaces have potential to contribute to the development of various critical skills for the 21st century, mostly informally, such as technical, entrepreneurial, project management, communication, networking and collaborative skills. However, there appear to be insufficient innovation spaces specifically for creative companies, or incubations hubs focused explicitly on developing DCM skills. Innovation hubs appear to be a fairly recent development in African countries, and their growth is testament to their potential benefits in developing required 21st century skills. Additionally, they appear to plug an important gap in current formal training, providing opportunities for real life applications of knowledge, and making knowledge transfer to real world situations easier – taking formal training a step further.

The findings of the research suggest that entrepreneurship and innovation and creativity are critical generic skills for youth entering the 21st century workplace. However, the skills gaps identified for the DCM sector are quite broad and it is difficult to pinpoint specific skills that are in demand, as this varies depending on who is consulted. Nevertheless, tentative 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 in Africa. Additionally, the research has identified the need for marketing skills as artists may not know how to bridge the gap between technical knowledge and their audience. Another skills gap identified is entrepreneurial skills, including inadequate intellectual property management, business plan development and budgeting skills, which are required in order to manage DCM industries as enterprises.

Additionally, 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. However, it should be noted that the development of such skills need not be in the same person. For example, those with entrepreneurial skills need not necessarily also have detailed business management skills, provided they can find a good business manager to help them establish a new enterprise. Likewise, contrary to the opinion of many entrepreneurial training initiatives, the key requirement is not necessarily to train everyone to become an entrepreneur, but rather also to ensure that new enterprises established by entrepreneurs will have ready access to the skilled labour they require to grow and become successful and sustainable. This is supported by evidence from the iHub, which revealed that, when technically
minded people and designers get together, they can develop an idea, and, collaborating with business partners, help support the idea.

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. Particularly, 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.

The digital creative media industry also appears to be a relatively new industry in many African countries. Information from this study suggests that the DCM sector appears to be largely untapped, with no clear guiding approach for its development. As one respondent noted:

[DCM] is burgeoning but it is not yet at a serious sector. There is a lot of activity, restricted to people working independently or in small groupings (Interest Group).

The DCM sector is very broad, and this study has hopefully assisted in identifying key DCM sectors and some providers of DCM skills in Eastern and Southern African regions, noting that no single training provider provides all the skills required for the sector. One of the limitations of this research is that it focused more on the film and animation sector, but this is possibly due to the focus area of identified interviewees.

It has been argued that job shortages, especially in the developing world, can be reduced by encouraging the development of new employment opportunities in the informal sector. From the research, it is not yet clear whether incubation hubs are creating new employment opportunities in the informal sector as anecdotal evidence suggests that most graduates are entering formal employment. It is thus not clear whether these facilities 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.

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. This is a possible reason why the huge and exponentially increasing demand for local content still remains largely unmet and is being serviced by companies based outside the continent. Without cognisance of training and rewarding teachers of DCM skills, it is possible that this will perpetuate this cycle of lack of trainers. However, it is not clear whether this is generalizable to all African countries, or peculiar to Kenya (the country from which most data for this study was sourced). Nevertheless, this calls for a need to encourage and introduce DCM as an area of study in the college system, especially in teacher education. It also calls for a broader need for a policy environment that supports DCM skills development and the growth of innovation spaces dedicated to their development.

Skills development for the DCM industry is done through formal and informal training providers. Whilst there has been an identification of learning models based on whether they are formal, informal, or mixed, there is no apparent standardized theoretical model underpinning various approaches to developing skills in the sector. One of the concerns raised is that formal training providers provide training that is more theoretical in nature. Interestingly, innovation hubs do not necessarily provide an informal learning environment, and in some, there may be a replication of formal approaches to acquiring skills, particularly as they include theory and have a format of traditional classes. Furthermore, various training providers adopt different approaches, depending on their context and needs. Thus, it has been difficult to ascertain which learning model is most effective for the DCM industry.
Additionally, informal training in some instances appears to be an extension of formal training – in terms of access to facilities, it favours those who are already privileged and have access to formal learning institutions. For example, some innovation spaces are based at universities and target graduates. This may have some advantages (for example, in some instances, informal learning environments provide opportunities for double cognitive apprenticeship – direct instruction provided by formal institutions, followed by project based learning in the real world, supported by trainers and more able peers in informal training institutions). It also appears that many training institutions tend to follow such a model, providing formal training and then following it with a project (such as m-lab), and research respondents highlighted the value of such an approach so that practical experience is informed by a knowledge base. Thus, innovation hubs do perhaps address the development of 21st century skills that may be lacking from formal training providers.

Thus, 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. The figure below provides an illustrative indication of the status of innovation hubs and the DCM sector, according to the systems perspective provided in the introduction to the report.
Figure 2  Status of Innovation Hubs and their contribution to skills development / new learning models for DCM sector industries

<table>
<thead>
<tr>
<th>Status of Innovation Hubs and the DCM sector</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Tools (Resources)</strong></td>
</tr>
<tr>
<td>Available tools: equipment, Internet access, staff, mentors and volunteers, business incubation space, teaching and learning resources, technical business and entrepreneurial skills development through business coaching, mentorship, collaborative and project-based learning, access to ideas and experience, workshops, and interaction with experts.</td>
</tr>
<tr>
<td><strong>Subject (Key actors)</strong></td>
</tr>
<tr>
<td>Ministries</td>
</tr>
<tr>
<td>Government bodies</td>
</tr>
<tr>
<td>DCM Interest Groups</td>
</tr>
<tr>
<td>Innovation Hub players/stakeholders</td>
</tr>
<tr>
<td>Groups of entrepreneurs and DCM workers</td>
</tr>
<tr>
<td><strong>Rules (Policy and regulatory environment)</strong></td>
</tr>
<tr>
<td>Limited national policy direction on Innovation Hubs</td>
</tr>
<tr>
<td>Lack of education structure and syllabus for DCM skill training and no specific curricula for DCM.</td>
</tr>
<tr>
<td>Some reference to supportive policies for DCM sector, but no clear priority for this sector.</td>
</tr>
<tr>
<td>Little funding priority given to developing DCM skills.</td>
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<tr>
<td>Formal DCM providers tend to have policies that direct their work, however, innovation hubs tend to not have such policies.</td>
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<tr>
<td><strong>Community</strong></td>
</tr>
<tr>
<td>Educational institutions</td>
</tr>
<tr>
<td>Private sector</td>
</tr>
<tr>
<td>Government bodies</td>
</tr>
<tr>
<td>Formal training institutions</td>
</tr>
<tr>
<td>Donors and funders</td>
</tr>
<tr>
<td>Potential business partners and mentors</td>
</tr>
<tr>
<td>University graduates</td>
</tr>
<tr>
<td>DCM entrepreneurs</td>
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<tr>
<td>Youth in community</td>
</tr>
<tr>
<td>Freelancers, consultants, developers and designers</td>
</tr>
<tr>
<td>Community members requiring meeting spaces</td>
</tr>
<tr>
<td>Communities/consumers and their needs.</td>
</tr>
<tr>
<td><strong>Object</strong></td>
</tr>
<tr>
<td>Develop 21st century skills for a knowledge based society</td>
</tr>
<tr>
<td><strong>Outcome</strong></td>
</tr>
<tr>
<td>Creating DCM skills &amp; employment in an inclusive knowledge society</td>
</tr>
<tr>
<td><strong>Division of Labour (Work Structure)</strong></td>
</tr>
<tr>
<td>Innovation Hubs are sometimes part of formal institutional structures.</td>
</tr>
<tr>
<td>Informal learning environment use mentors and facilitators to develop skills. But they face a challenge of lack of teaching skills due to skills flight and fear of competition.</td>
</tr>
<tr>
<td>Innovation Hubs have managers and expert staff in addition to collaborators who volunteer their time.</td>
</tr>
<tr>
<td>Students learn from mentors, trainers, peers and via collaborative learning.</td>
</tr>
<tr>
<td>Institutional mandates focus on providing training, building capacity, and providing facilities to develop entrepreneurs. However, further research is required with regards to specific institutional mandates related to Innovation and DCM.</td>
</tr>
<tr>
<td>The research did not identify national policy relevant to the DCM industry and innovation, and thus it is difficult to ascertain ministerial mandates on Innovation and DCM. Further research is thus required.</td>
</tr>
</tbody>
</table>

**Potential Skills Development Opportunities and Recommendations**

The research has demonstrated the continued role of formal institutions, and the supplementary role of Informal training institutions, particularly in developing 21st century skills. Inasmuch as there is a lot of natural creative talent in Africa, there is little in terms of means for developing these skills. 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 (these should be read in conjunction with the research and policy recommendations noted below):

1) There appear to be few innovation spaces located in rural areas (aside from Macha Works, and the MLL which specifically focuses on rural development). There is thus a need to consider the location of these spaces to ensure adequate access to skills development.

2) ICT skills have been specifically identified as an important and necessary skill in today’s society. However it is unclear how innovation hubs focus on developing this skills and what the level of sophistication is with respect to technologies available. Programming is regarded as a supportive skill for DCM industries, but some evidence points to students not being comfortable in using technology whilst other evidence indicates that formal training institutions such as Shang Tao Media...
Arts College has up-to-date computer studios with the latest industry-standard software. 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, which calls for a need to focus on developing such skills in teachers who would in turn foster these skills in learners.

4) Innovation spaces not only create opportunities for skills development, but also potentially produce models for customized learning and linking learners to communities and industries and thus producing environments for more authentic and meaningful learning that is linked to real needs and requirements of society. Whilst the research has identified the double cognitive-apprenticeship model and project-based models as having an impact in developing skills, there is a need for more systematic attempts to implement more models and assess their effectiveness. Models that show 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. It will also be interesting to explore models based in rural areas to consider how to reach and encourage innovation in underserved areas.

5) The DCM sector requires continuous innovation. However, one of the challenges facing innovation hubs with regards to the DCM industry is that people are duplicating the same applications, which indicates a skills gap in being able to identify or meet market gaps. This is an important and necessary skills gap to explore and address further.

6) Animation has been identified as a skill in short supply in the DCM industry. Whilst it is encouraging that several institutions – such as Homeboyz Animation Academy, Nairobi Institute of Technology, Multimedia University College of Kenya, and Shang Tao Media Arts College – already focus on this area, further investigation is required as to how this skills gap could be addressed.

7) 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. Approaches that could be considered are a public-private partnership (PPP) approach to provide a sense of ownership of projects, accountability for skills development as well as a potential driver for relevant policies. Another approach would be to foster the development of a national curriculum for developing DCM skills (discussed in more detail under policy recommendations).

8) Given that formal training may not be providing 21st century skills, there is need 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 to those in the informal sector, but is also applicable to the formal employment world. 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. Innovation Hubs can fulfil an important function.

Research Recommendations

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. Given this, the following recommendations are worth noting:

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5 Note that these ideas are drawn from a limited sample and are thus not yet proven approaches.
1) Whilst some understanding has been achieved on the Kenyan policy environment, it is unclear what the governmental and institutional mandates are related to innovation and DCM. Additionally, it is likely that the policy environments would differ across countries. Thus, further research is required on policy environments, and relevant policies governing DCM industries and innovation hubs. It may be useful to focus on countries where multiple innovation hubs exist, as it would be interesting to note whether a favourable policy environment has an impact on the establishment of such centres or hubs.

2) Future research may consider specifically targeting a wide range of DCM-related sectors (broader than film and animation) to obtain a clear picture of other activities in the sector. Additionally, it may be useful to consider a broader sample (across more countries). This will allow for a country-level analysis of the informal DCM sector, and provide a clearer picture of related activities and approaches in the region.

3) Given the relatively recent development of innovation spaces, it would be interesting to conduct a systematic study to track the achievements of Innovation Hubs.

4) This research did not provide interrogation of the characteristics of successful and unsuccessful approaches to developing 21st century skills in the DCM sector, and this therefore warrants further investigation in future research. This may include conducting impact studies and evaluations of innovation spaces and formal training institutions to obtain a clear identification of emerging DCM industries, as well as an evaluation of approaches to developing skills.

5) It may also be useful to focus on informal learning environments that specifically target DCM skills. The contribution of innovation hubs to development of the informal sector also warrants further investigation, given anecdotal information which suggests that most students going through these hubs are going into formal employment (as opposed to informal sector).

6) Given the important role of ICT in 21st century skills, further research could explore in greater detail the role of technology in skills development and in learning models.

7) Consideration may also be given to preparing case studies on good practice in the field, drawing on international as well as continental initiatives. This will assist in guiding decision-making processes.

8) The current research used a skills survey which was completed by all interviewees. It may be useful to administer this 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.

Policy Recommendations

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

1) Increase knowledge of the DCM industry by raising government officials’ awareness about DCM industries and their potential within African contexts. This will include an awareness of the various elements of the DCM sector such as content production, music, graphic design, marketing and advertising, multimedia, artistic creation and cultural research, as well as an understanding of the resource requirements to grow a vibrant DCM sector.

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. Such policies and strategic frameworks will assist in creating an enabling environment to foster the development of DCM skills and growth of local DCM industries. Additionally, they will create direction as to how DCM skills development should be formulated and/or implemented.

3) In order to obtain a clear picture of DCM training activities, it may be worthwhile to create a database of DCM skill providers as this will assist in mapping skills development in the sector.
Additionally, there is a need for focus on measurement of the work in the sector to more accurately to measure the progress of the sector and contribution to the GDP.

4) It will be beneficial for education curriculum experts to consider including DCM subjects within the curriculum. This will require a holistic approach that pays attention not only to definition of the skill set but also to the pedagogy, assessment strategies, monitoring and evaluation, policy frameworks, learning environments, leadership and teacher/instructor education needed to better prepare youth for the new demands of life and work in the 21st century. Ideally, there should be a balance between academic skills and industry requirements. Additionally, it may be useful to consider adding these skills to the teacher education curriculum to ensure that teachers are able to impart the required skills to learners.

5) Consider investments in DCM content creation, and ensure that funding is allocated to the development of DCM skills. This will include ensuring that donors and government invest and support innovation spaces that focus on DCM skills. Additionally, attention should be placed on creating finance for individual artists, such as facilitating loans.

6) Invest in ongoing awareness-raising, capacity-building, and networking/sharing activities to develop the full range of DCM competences.

7) Encourage ongoing evaluation and promotion of good practice. It may also be worthwhile to focus on recognizing champions in the sector at a national level, perhaps through awards.

8) Consider how to promote DCM productions of a country, in particular, through using websites and social media for promoting DCM products.

9) For DCM workers, it may be useful to foster the creation of unions and associations for joint negotiation of issues such as content shown on local channels. These institutions can also drive negotiation of rates for the sector. Additionally, they can focus driving the establishment of legal mechanisms to protect the rights of artists – for example, through consideration of the intellectual property rights of artists and how to foster sharing of products whilst ensuring recognition. Additionally, they can play a role in maintaining quality standards in the sector.

10) ‘Professionalize’ 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) Innovation hubs hold promise for developing young people with 21st century knowledge workers. However, there is a need to consider other ways of reaching out-of-school youth as some innovation hubs appear to target youth who already have access to formal learning. A possible area of exploration is the role of community centres and consideration of whether they can also fulfil some of the roles of Innovation Hubs. Additionally, focus can be placed on reaching people from rural areas in the creative economy.
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