

## ANALYSIS OF KENYA'S PROGRESS TOWARD A KNOWLEDGE BASED SOCIETY

Jane Kerubo

School of Business and Education, Kirinyaga University, Kenya

[jkerubo@kyu.ac.ke](mailto:jkerubo@kyu.ac.ke)

### Abstract

*Education and training plays an important role in creating the required human resource necessary for the development of a country. Kenya's development blue print, the vision 2030 in its social pillar recognizes the education sector as vital in meeting the human resources requirements of "a rapidly changing and more diverse economy" (Republic of Kenya, 2013). Kenya has made great progress in the development of skills and competencies necessary for effective participation in a knowledge based society. This paper seeks to explore how the country has made progress in educating its citizens and developing a human resource for the knowledge based society. The paper explores the concepts of knowledge based society and human development in general and in the Kenya context. The country's aspirations as contained in the vision 2030 are summarized with a view to showing how the country is transforming into a knowledge based society through the adoption of information communication and technology (ICT), Science, technology and innovation (ST&I), mobile communication, internet penetration and increased access to higher education. University education in Kenya is analyzed in order to show how it can contribute to the realization of the knowledge based society. Some of the emerging issues and challenges that affect Kenya's educating for the knowledge based are highlighted and suggestions given on the way forward.*

**Keywords:** development, education, knowledge based society, training

### Introduction

Education and training plays an important role in creating the required human resource necessary for the development of a country. Kenya's development blue print, the vision 2030 in its social pillar recognises the education sector as vital in meeting the human resources requirements of "a rapidly changing and more diverse economy" (Republic of Kenya, 2013). Kenya has made great progress in the development of skills and competencies necessary for effective participation in a knowledge based economy. This article seeks to explore how the country has made progress in educating its citizens and developing a human resource for the knowledge based society. The article explores the concepts of knowledge based economy and society in the Kenya context. The country's aspirations as contained in the vision 2030 are summarised with a view to showing how the country is transforming into a knowledge based society through the adoption of information communication and technology (ICT), Science, Technology and Innovation (ST&I) and education and training. University education in Kenya is analysed in order to show how it can contribute to the realization of the vision 2030. Some of the emerging issues and challenges that affect Kenya's educating for the knowledge based society are highlighted and suggestions given on the way forward.

This section seeks to define certain concepts used in this article. The section starts with the definition of knowledge based economy and moves on to define knowledge based society. There are various definitions given on the concept of knowledge based economy. It is used to

describe economies in which information and knowledge plays an important role in the welfare of the economy and the nation. In a knowledge based economy, a country's growth and economic development depends on the quality, quantity and accessibility of information and knowledge rather than physical or natural resources (IGI Global: International Academic Publisher (igi-global.com)). Powell and Snellman (2004,p.201) define knowledge based economy as:

...the production and services based on knowledge- intensive activities that contribute to an accelerated pace of technologies and scientific advance as well as rapid obsolescence. The key components include a greater reliance on intellectual capabilities than on physical inputs or natural resources combined with efforts to integrate improvements in every stage of the production process.

In a knowledge based economy, knowledge plays a major role in development instead of natural resources, physical capital and low skilled labour force (OECD,1996). In this economy knowledge is the central source of innovation and growth. A knowledge-based society uses information and knowledge to bring about economic development (Lungu 2019, p.97). In a knowledge based society, knowledge plays a major role in development instead of natural resources, physical capital and low skilled labour force (OECD 1996). Knowledge based societies are founded on increased specialization, research, innovation and learning. In this article the concepts knowledge based economy and knowledge based society are used interchangeably.

### **Rationale for knowledge based economies and societies**

There are a number of push factors that have contributed to growth of knowledge based economies (KBE) (Schiliro, 2012, p.42). First, is the information communication technology (ICT) revolution which has been instrumental in the development of KBE as it involves technologies aimed at the production and dissemination of knowledge and information. ICT also helps in the storage and exchange of information which is important in KBE.

The second factor is globalization which has led to the creation of global labour markets for highly skilled workers, the provision of investments capital and access to new technology, information, ideas and knowledge flows. With globalisation people can move freely and work anywhere in the world using new technologies. With globalization, knowledge is considered a main driver of growth and the information and communication revolution all require an educated population (Mukhwana et al., 2016).

Thirdly, there has been significant growth of higher education institutions which are training highly skilled human resources. This has been accompanied with development of large scale research laboratories and the expansion of knowledge intensive activities in universities and research institutions. There is also a rising share of GDP arising from intangible capital which is made of intangible assets, which are non-materials and nonphysical assets such as Research and Development (R&D), patents, trademarks, copyrights, brands, employee skills,

discoveries of new products or processes, software programs, new ideas and new processes used in the organizations (Schiliro,2012, p.45).

A knowledge based economy/society is also a learning economy. This is where learning processes in universities and other learning institutions seek to enhance competences that are fundamental for the economic performance of organizations and the whole economy. Kefala (2010) observes that a 'knowledge driven economy/society demands a larger proportion of the workforce with a university education and with access to lifelong learning opportunities.' In this regard countries including Kenya have witnessed increased participation in higher education which has in turn led to massive increase in the global supply of highly educated workers who are able to compete globally based on price and knowledge.

Given these push factors for knowledge based economies/societies countries have experienced a shift in investment towards the creation and exploitation of knowledge and other intangible assets such as research and development, software, design, development, human and organizational capital as the basis of competitive advantage.

In this articles the definitions of knowledge based economy and society are used to analyse Kenya's progress towards a knowledge based society. The country's development blue print, the vision 2030 is used as the framework for analysis. Three sectors form the basis of the analysis, namely Information Communication and Technology-ICT, Science Technology and Innovation-ST&I and Education and Training at the university level.

### **Kenya's Development Blueprint: Vision 2030**

Kenya Vision 2030 was launched in 2008 as Kenya's development blueprint covering the period 2008 to 2030. It was aimed at making Kenya a newly industrializing, "middle income country providing high quality life for all its citizens by the year 2030" (Republic of Kenya, 2018, p. 96). The overall objective of the vision is to realize a higher and sustainable growth of the economy in a more equitable environment, accompanied by increased employment opportunities. The vision has identified three key pillars for fostering economic growth in the country. These are the **economic pillar** whose aim is to raise GDP growth rate to the region of 10 per cent in a number of years. The sectors under this pillar include: Tourism, Agriculture and Livestock, Wholesale & Retail, Trade, Manufacturing, Financial Services, Business Process Offshoring and IT-Enabled Services.

There is the **political pillar** whose vision is "a democratic political system that is issue based, people-centred, result-oriented and accountable to the public". Under the political pillar the Vision 2030 envisions a *country with a democratic system reflecting the aspirations and expectations of its people*. Kenya will be a state in which equality is entrenched, irrespective of one's race, ethnicity, religion, gender or socio-economic status; a nation that not only respects but also harnesses the diversity of its people's values, traditions and aspirations for the benefit of all. The **social pillar** aims to improve the quality of life for all Kenyans by targeting a cross-section of human and social welfare projects and programmes. The vision

under the social pillar is “*Investing in the Kenyan people*”. There are eight key social sectors: Education & Training, Health, Water & Sanitation, Environment, Housing & Urbanization and Gender, Youth, Sports & Culture. This pillar also makes special provisions for Kenyans with various disabilities and previously marginalized communities.

Since its launch in 2008, the vision 2030 has been implemented using five-year Medium Term Plans (MTPs). **The First Medium Term Plan (MTP1 2008-2012)** was rolled out in 2008. The objective of MTP 1 was to realise a higher and sustainable growth of the economy in a more equitable environment, accompanied by increased employment opportunities. A number of projects were identified and implemented during this period including: **Information & Communication Technology (ICT)** with the vision of *Strengthening the Foundation for a Knowledge Economy*. The Government recognised that ‘information was a resource that had to be generated, collected, organized, leveraged, secured and preserved to enhance national prosperity’ (Republic of Kenya, 2018, p. 3). **Science, Technology & Innovation (ST&I)** was also embraced with a vision of “*Harnessing Science, Technology and Innovation for Regional and Global Competitiveness.*” STI capabilities are considered important by the Kenyan government in promoting sustainable development, especially through social integration, conservation and sustainable management of biodiversity; sharing opportunities and benefits of a knowledge-based society and economy and strengthening local and indigenous knowledge and culture (ibid, p. 5).

For **Education and Training** some of the aspirations expressed in the First Medium Term Plan of Kenya’s vision 2030 include: to improve equitable access to quality education at all levels; continuously bridge the gender gap in access to education at all levels; promote science and technical education at all levels; integrate ICT into education and training; strengthen the linkage between tertiary education and industry and deliver quality and reliable education management information to facilitate objective planning (Republic of Kenya, 2008).

**The Second Medium Term Plan -MTP** was implemented between 2013 and 2017. The theme for this MTP was “*Transforming Kenya: Pathway to Devolution, Socio-Economic Development, Equity and National Unity.*” and it gave priority to devolution as spelt out in constitution 2010 and to more rapid socio-economic development with equity as a tool for building national unity. The Second MTP also aimed to increase the scale and pace of economic transformation through infrastructure development, and strategic emphasis on priority sectors under the economic and social pillars of Vision 2030 (Republic of Kenya, 2018, p. 42). Various emphasis was put on the key sectors as summarized below:

***Information & Communication Technology (ICT):*** In the second MTP the government continued to recognise ICT as a foundation for economic development. Kenya’s vision of knowledge-based economy was aimed at shifting the industrial development path towards innovation where creation, adoption, adaptation and use of knowledge remained the key source of economic growth (ibid,p. 45).

**Science, Technology & Innovation:** In the second MTP, the sector was to adopt various supporting initiatives including: Public Private Partnerships (PPPs); linking industry with academia; value chain analysis; synergy (as opposed to institutional competition) and initiatives for closed-cycle cluster approach for enhanced cooperation. The sector was to play a critical role in ensuring that all sectors of economy have access to the necessary technologies that would increase production and quality in a diverse range of products, processes and services (ibid p.47).

**Education and Training:** The second Medium Term Plan focused on the creation of an adaptable human resource for a rapidly changing and more diverse economy equipped with the necessary technological skills for a dynamic labour market. The government sought to provide education that meets high quality standards which is relevant to the needs of the economy and society (Republic of Kenya, 2013).

The **Third Medium Term Plan (2018-2022)** was implemented under the theme *Transforming Lives: Advancing socio-economic development through the "Big Four"*. It built on the achievements of the first and second MTPs and prioritized implementation of the "Big Four" initiatives contained in the ruling party's Jubilee manifesto. The initiatives are: increasing the manufacturing share of GDP from 9.2 per cent to 15 per cent and agro-processing to at least 50 per cent of total agricultural output; providing affordable housing by building 500,000 affordable houses across the country; enhancing Food and Nutrition Security (FNS) through construction of large-scale multi-purpose and smaller dams for irrigation projects, construction of food storage facilities and implementation of high impact nutritional interventions and other FNS initiatives; and, achieving 100 per cent Universal Health Coverage. Additionally, the Plan targeted to improve Kenya's ranking in the Ease of Doing Business Indicator from position 80 to at least 45 out of 189 (Republic of Kenya, 2018b, p. xxi)

In the next section the article explores some of the achievements, challenges and opportunities realized in the implementation of the vision 2030 in relation to some of the flagship projects identified in the medium term plans that is, ICT, Science, Technology and Innovation and education and training (university education). The purpose is to show how Kenya as a country is laying a firm foundation for a knowledge based economy and society. Examples are drawn from the education and training sector specifically university education.

### **Information and Communication Technology (ICT)**

ICT has been identified as a major push factor for the development of a knowledge based economy and society. Kenya aspires to leverage on ICTs for increased competitiveness. The country is keen to take advantage of the Fourth Industrial Revolution which brings together digital, biological and physical technologies to realize its vision 2030. To achieve this objective, it proposes to improve the quality of ICT in national infrastructure, regulatory and



business environment, human capacity, ICT usage and investments among others (Republic of Kenya, 2018a).

During MTP I (2008-2012) the government of Kenya implemented a number of projects geared toward ensuring that the country has a “competitive telecommunications industry which delivers reliable and affordable services and products for the economic and social benefit of citizens.” Key among the projects implemented was the development of ICT Parks and Digital Villages in order to reduce the cost of ICT goods and services. The government, therefore collaborated with the United Arab Emirates to install “The East African Marine Systems (TEAMS)”. This is a submarine cable that is extending from the coastal city of Mombasa to Fujairah in the UAE. This cable provided Kenya with an affordable high-capacity bandwidth. Another project implemented during the period was the National Terrestrial Fibre Optic Network Project: which was intended to complement the TEAMS project by ensuring maximum utilisation of capacity and connectivity in all districts in the country. Consequently, the implementation of the National Terrestrial Fibre Optic project is divided into three main components that will include the Central, Western, Coast and North Eastern regions of the country (Republic of Kenya, 2008, p.27).

The Kenyan government also aspired to make government services digital through Government Common Core Network (GCCN). The GCCN was implemented in order to integrate work processes and information flows, as well improve inter-ministerial sharing of databases and exchange of information. Local and Wide Area Networks were installed in all government ministries to facilitate information sharing. These LANS were linked to the GCCN to form the basis of a national information infrastructure that will allow for seamless communication within the government. A national ICT Integrated Information Infrastructure and e-Government Services was established using various electronic systems to streamline tracking, retrieval and storage of documents within public sector. It involved development of workflow for conversion of physical documents and integrate already digitized registries. These interventions resulted in the establishment of Personal Data Hubs for National Population Register; Rolling out e-Citizen platform for business, marriages, driving, lands, immigration and civil registration services together with e-Citizen payment gateway; digitization of over 107 Civil Registration Centres, 13 land registries and the High Court Registry; development and implementation of Transport Information Management System (TIMS)-NTSA and development of the National Spatial Data Infrastructure (NSDI) as land data hub ( Republic of Kenya, 2018a)

A Kenya Transparency Communication Infrastructure Programme (KTCIP) was launched during the first MTP in order to ensure equity in the provision of ICT services in the country. The KTCIP had two components namely:

- Establishment of Digital Villages: These were centres established at the constituency level to enable citizens access online government services and enable the government to capture statistical data right from the constituency level.

- Bandwidth subsidy: The government provided bandwidth subsidy for universities and colleges, business processing outsourcing, e-government and content development and digitisation so as to accelerate the usage of ICT in learning, social and government institutions (Republic of Kenya 2008, p. 27).

In addition to increasing the ICT connectivity in the country the government also zero rated ICT hardware with the objective of increasing access to affordable ICT services. A number of centres of excellence were set up to develop a critical mass of human resources in the ICT sector.

Universities and tertiary institutions played an important role in the development of the critical mass needed to support ICT. In order to increase access to the ICT hardware a project known as Madaraka project was implemented in collaboration with ICT incubators in a number of universities including Jomo Kenyatta University of Agriculture and Technology (JKUAT), University of Nairobi (UoN), Kenya College of Communications Technology (KCCT), and Strathmore University (SU). The project goal was to provide an incubation environment for students in local universities and to assemble a low cost personal computer (PC) for the local market (Republic of Kenya 2008, p. 28).

In addition to the ICT hardware project implemented, there was need to get the necessary software. In this regard the government held negotiations with the software providers like Microsoft and oracle to increase accessibility to ICT Software: The government also provided fiscal on software and promoted local software development by encouraging a scheme to ensure that at least 50 per cent of government software procurement is sourced from local software developers (Republic of Kenya 2008, p. 29).

The development of ICT infrastructure during the first Medium term plan led to a number of achievements. By the time of the second medium term plan (2012-2018) the use of ICT had increased significantly. The use of internet and mobile phones reported great gains. For example,

Internet users increased by 125 % from 16 million users in December 2012 to an estimated 36 million in December 2015 resulting in an increase of the internet penetration ratio from 41 % to 83 %. Mobile phone subscriptions grew from 31 million in 2012 to 38 million by December 2015. This increased the mobile phone penetration ratio from 78 % to 88 %. The number of mobile money transcriptions grew by 28 % from 21 million in 2012 to 27 million in 2015. Mobile money transfer agents grew by 129 % from 62,000 in 2012 to 142,000 in 2015 (Republic of Kenya, 2018, p 46).

Regional and international telecommunications was made possible through the establishment of the one-area network with a harmonized EAC rate 10 cents US \$ per minute for outgoing calls and zero charges for incoming calls between Kenya, Uganda and Rwanda. This resulted

in reduced cost of doing business. The 4G Networks was rolled out in 2014 starting with Nairobi and Mombasa. The migration from analogue to digital TV was completed in time to meet the global deadline of 17th June 2015 (Republic of Kenya, 2008, p.26).

There was established a National Information Security system to protect ICT from increased cases of cyber-attacks affecting networks and service delivery. The Government established the Kenya Computer Incidence Response Team, the Cyber Command and Incidence Response Centre and developed Information Security Policy to guide in the secure use of ICT within government.

The projects implemented under the ICT sector indeed show that Kenya is making good progress towards a knowledge based economy/society. Universities are also contributing to this transformation through the training of the required human resource. In the next section some of the challenges that Kenya has faced in the development of ICT for the knowledge based society are highlighted.

### **Emerging Issues and Challenges in the ICT sector**

The previous section highlighted some of the progress that Kenya has made in the development of the ICT as part of its development blueprint vision 2030. In spite of the progress made, a number of issues and challenges have been reported by the government. Some of the challenges experienced in the development of the ICT sector include the following:

- i. Lack of an institutional and legal framework to implement automated services including electronic transactions across government departments. This is compounded by lack of standardisation of components and systems being procured and applied across the government departments.
- ii. There is limited country-wide ICT awareness which affects uptake of ICT services.
- iii. High costs associated with ICT utilisation and maintenance has made it difficult for the whole country to embrace the new technologies. Moreover, most communities especially those in the rural areas do not have access to electricity.

### **Science, Technology and Innovation (ST&I)**

For Kenya to benefit from globalisation, it must enhance the global competitiveness of its exports by using ST&I. The theme for this sector under the Vision 2030 is "*Harnessing Science, Technology and Innovation for Regional and Global Competitiveness*". The government therefore embarked on the development of the necessary scientific and technological infrastructure, as well as the technical and entrepreneurial skills necessary for the transformation of the country into a knowledge-based society.

During the MTP I the country prioritised on social and regional equity in the development of technological infrastructure, technical and entrepreneurial skills. The sector focused on the



development of innovative ideas into products, processes and services; measures aimed at creating more jobs; safeguarding the environment against disasters; and mitigating the effects of climate change. More effort was put to ensure that there is an adequate supply of scientific and technological skills. Some of the strategies the government employed to enhance the STI sector included the acquiring and retaining highly skilled staff; strengthening policies to enhance awareness and public understanding of science; improving the quality of scientific and technological learning; encouraging individual creativity and broadening opportunities and support for students to pursue STI studies; adapting curricula to changing skill demands; including interdisciplinary knowledge and managerial/entrepreneurial skills and Developing partnerships with the industry (Republic of Kenya, 2018, P. 6).

Under MTP II (2013-2018) the Government committed to facilitate the development of a highly skilled human resources base that would sustainably support and trigger innovation in priority areas. For the third medium term plan (2018-2022) the theme for Science, Technology and Innovation sector was “*Accelerating the Transition to an Innovation-Led and Knowledge Based Economy*”. During MTP III, the sector targets to increase research funding from 0.79 per cent to 2 per cent of the GDP in order to attain position 85 in Global Competitiveness Index ranking out of 137 countries by 2022 from position 91 in 2016 (Republic of Kenya, 2018a, p.12).

A number of projects were implemented by the government during the MTP I and MTP II. First the legal and policy framework was improved in support of ST&I. The ST&I policy and ST&I 2013 Act were enacted. Second was the establishment of the National Biosafety Authority in 2009. Third was the start of the National Science, Technology and Innovation Fund; an Award Scheme for recognition of outstanding scientists in Kenya and Construction of new laboratories and workshops in all Technical and Vocational Education and Training (TIVET) Institutions. (Republic of Kenya, 2018b, p.6).

The government also increased the capacity of universities to offer Science, Technology, Engineering and Mathematics (STEM) courses to meet the increased enrolment. Research funding was also increased from 0.48 per cent to 0.79 per cent of the GDP. Increased spending on R&D by private companies and the existence of high calibre sector-based scientific research institutions led to the improved ranking of Kenya in the World Economic Forum Global Competitiveness Index from position 96 in 2013 to 91 in 2016.

At the university level the Pan African University Institute of Basic Sciences, Technology and Innovations was established at the Jomo Kenyatta University of Agriculture and Technology (JKUAT) to undertake capacity building in STEM related subjects. The government also established three (3) Centres of excellence under the Southern and Eastern Africa Higher Education Centres of Excellence project (ACE II) at Egerton, Moi and Jaramogi Oginga Odinga Universities. These centres were aimed at providing advanced laboratory equipment and accesses to e-learning resources (Republic of Kenya, 2018a, p.22-24).

In May 2021, construction of a science park for innovation and incubation worth Ksh 5 billion was launched at Dedan Kimathi University of Technology (DeKUT). The science park is one of two that the Kenyan government plans to establish, the other one being the Kenya Advanced Institute of Science and Technology at the Konza Technopolis which focuses on applications and software in support of the agro-tech sector (Kinogu, 2021, p.5). In order to boost STEM courses in institutions of higher learning and quest to create a pool of specialists to industrialise the economy by 2030, the government of Kenya in April 2021 signed a pact with South Korea aimed at raising Ksh 9.4 billion to aid the establishment of the Kenya Advanced Institute of Science and Technology (KAIST) at the Konza Technopolis. The Institute which will be modelled on the Korean Advanced Institute of Science and Technology University in South Korea is set to be completed by 2023. It will comprise of 10 research science labs working with specialised local and international researchers in science, technology and engineering. This Institute is a vision 2030 flagship project. The Konza Techno city is nicknamed Africa's Silicon Savannah and focuses on science and technology (Macharia, 2021, p.6).

To improve the legal and policy framework for ST&I a number of key policy and legal reforms were put in place including: Biosciences Policy and Bill, Atomic Energy Policy and Bill, Nanotechnology policy, Kenya Space Science and Technology Policy and Bill and the Natural Products Policy and Bill. In addition, the following institutions were established: Kenya National Innovation Agency (KENIA), National Research Fund (NRF), National Commission for Science, Technology and Innovation (NACOSTI), and Kenya Space Agency (Ibid, p. 23).

### **Emerging Issues and Challenges in the ST&I sector**

There are a number of challenges that have faced the ST&I sector. First the country lacks a strong national innovation system. Second, there are not enough skilled human resources in the area of science and technology. Although Kenya has a pool of talented human resource, there is a shortage of skilled workforce in many ST&I fields that support the national priority sectors. There has been a decline in the number of science and engineering graduates resulting on skills shortage in ST&I. Concerns have also been raised about the gender gap in the ST&I whereby there are more males graduating in this field compared to females especially at the doctorate level (Republic of Kenya, 2008, p. 31). A survey of programmes offered by universities in Kenya carried out by the Commission for University Education in 2016 (Mukhwana et al., 2016, p.32) revealed that public and private universities in Kenya have prioritized programmes in Business Administration, Humanities and Arts. This disadvantages the country as the labour market requires people with practical skills acquired in the science orientated programmes. In terms of enrolment students in the various degree programs it was found that Business and Administration had a majority of students (120,233-22.3%) Education (79,368), Humanities and Arts (46,139), Veterinary (1,148-0.2%), Manufacturing (2,293-0.4%) and Architecture (5,057) (ibid, p.38). This suggests that the

country is not training enough human resource power in the area of ST&I and therefore might not realise its vision in this sector.

Third is the issues of intellectual property rights. There is global clamour for the need to protect intellectual property of individual scientists especially in the developing world. The country lacks the necessary legal and policy framework to integrate ST&I in the national development agenda. The labour market is also not attractive for researchers. This sometimes has contributed to brain drain of personnel in the ST&I who are attracted to well-paying jobs abroad.

Fourth, there is concern regarding lack of absorption of ST&I graduates in the local job market. An example has been given of students who studied biotechnology in Kenyan universities who have not been employed. The job opportunities for biotechnology graduates are few in Kenya because biotech has not been embraced sometimes due to misconceptions associated with the field. Some people have argued that biotechnologies like GMOs are not good for human beings. This has forced many graduates of biotechnology to branch to other unrelated fields to earn a living (Kimuge, 2021, p.3).

### **Education and Training: University Education**

Education and training play an important role in the creation of a sustainable pool of highly trained human resource capital that contributes to a knowledge-based economy/society. The vision guiding the education and training sector is *Globally Competitive Quality Education, Training and Research for Sustainable Development*” (Republic of Kenya, 2008, p.86). The national goals of education embodied in Vision 2030 focus on enlarging learners’ knowledge, experiences and imaginative understanding as well as developing an awareness of moral values and capacity for life-long learning. To realise these goals, the education systems requires a curriculum which will provide knowledge, skills, competencies and values to enable learners to move seamlessly from the education system into the world of work (Republic of Kenya, 2013, p.29).

Kenya is a signatory to several international conventions and agreements, including those on commitment to the development of education. The country was one of the few that were close to meeting the Universal Primary Education under the Millennium Development Goals and the Education for All targets. To achieve the targets, Kenya adopted the Free Primary Education Policy (2003) and Free Day Secondary Education Policy (2008). Kenya has also ratified Sustainable Development Goals-SDGs. The SDG-4 which calls for inclusive and equitable quality education and promotion of lifelong learning opportunities for all has been domesticated in the 2018-2022 National Education Sector Strategic Plan (NESSP) (Republic of Kenya, 2019, p.2).

During the second Medium Term Plan (2013-2018) the education sector undertook curriculum review and reforms with a focus to having a competence based system aimed at improving knowledge, skills, values and attitudes to enable learners to successfully perform a

function. Key achievements in the review process included preparation of a needs assessment report and development of a Curriculum Assessment Framework for teachers' education. Basic Education Curriculum Framework which proposes a new education system with 4 tiers (early years; middle school; senior school; tertiary and university) was developed (Republic of Kenya, 2018b, p.81).

One key reform is the introduction of Competence Based Curriculum (CBC), which is aimed at creating an ethical, engaged and empowered citizen. CBC emphasizes formative rather than summative evaluations. In the implementation of the new curriculum, the 8-4-4 structure will eventually be replaced by the 2.6.3.3.3 structure which translates to 2 years of preschool, six years in primary school, three years in junior secondary school, three years in upper secondary school and three years in tertiary/university education. The CBC focuses on 4Cs which are Communication & Collaboration (Languages and Literacy skills), Critical Thinking & Problem-Solving (Math, Science, Technical & Career Education and Business Studies) Creativity & Imagination (Creative Arts, Visual Arts, Performing Arts, Sports & Physical Education) Citizenship (Religious Education, Social Studies, Health & Environmental Education) (SERIES 1/2019: Curriculum Reforms in Kenya). The system was rolled out in the year 2020.

In this section some of the projects and achievements made in the education and training sector are summarized using the Medium term plans I, II as the basis for the analysis. The focus is on university education since it is where the human resource development, ST&I and ICT are anchored especially in relation to transformation towards a knowledge based economy and society. Some of the challenges facing the sector are summarized and suggestions given on the way forward.

### **University education during the First Medium Term Plan (2008-2012)**

Kenya has witnessed rapid expansion of university education over the years. In 2008 the transition from secondary to university education stood at about 3 per cent. There were about 28 universities in Kenya. Enrollments in universities has been rising as well. For example, enrollments rose from 112,229 during the 2006/2007 academic year to 118,239 in the 2007/08 academic year. Female students constituted 31 per cent of the total university student population (Republic of Kenya, 2008, p. 88).

At the launch of the vision 2030, the number of universities in Kenya had failed to meet the demands for university education. There was limited access to marketable and science based degree programmes. There was uncoordinated expansion of universities through opening of satellite campuses by both public and private universities. This expansion compromised the quality and relevance of university education because of inadequate infrastructure and personnel. During the first MTP the government rolled out a number of programmes geared towards realizing the vision 2030. First was the enactment of the University Education Act, 2012 which streamlined governance in the University sector and fast-tracked the establishment of Universities. Second was the expansion of university facilities to ensure

Kenyans access university education and provide the much needed skilled human resources for the country. The number of private universities increased from 13 in 2003 to 26 in 2012, while the number of public universities and constituent colleges increased from six universities and one constituent college in 2003 to seven fully fledged universities and 24 constituent colleges in 2012. Enrolment in public universities increased from 100,649 in 2008/09 to 195,528 students in 2012/13. In private universities, enrolment for 2008/09 was 22,198 growing to 45,023 in 2012/13 (Republic of Kenya 2018a, p.29).

The government increased funding to Kenyan students pursuing undergraduate and post graduate university education in Kenya and in universities within the East African Community through the Higher Education Loans Board which disbursed a total of Kshs. 5.1 billion to 106,136 students (Republic of Kenya, 2013, p. 14).

A key achievement in the University sector during MTP I is the establishment of the Pan African University of Science and Technology hosted at the Jomo Kenyatta University of Agriculture and Technology. Other strategies employed to enable university education contribute to a knowledge based economy/society include:

- i) **Streamlining and fast-tracking** of postgraduate programmes in order to increase the number of PhD holders required for university education and other national needs. To achieve this the government increased postgraduate student enrolment to at least 10 per cent of the undergraduate enrolment and increased government scholarships for students enrolled in local universities.
- ii) **Research and Development:** The government provided incentives to universities through the research endowment fund in order to increase the quantity, quality and relevance of their research output with a view to creating innovations and inventions that will enable Kenya to effectively transform into knowledge based economy.
- iii) **University-Industry Linkages:** Universities were also encouraged to build strong partnerships with other universities, industries, international organisations and communities.

A number of challenges were experienced during the implementation of the MTP I which prevented the realization of the vision 2030 goals and objectives. These include:

- i) **Inadequate funding for research:** Most research in universities remained big donor-driven, fragmented and uncoordinated. Since the funding was from donors the research priorities at the national and international levels was not clearly aligned to the vision 2030. Again the absence of a national research agenda during this time led researchers and universities to develop their own research programmes without reference to the priorities set out in the vision 2030.
- ii) The absence of a national skills inventory made the development of the required human resource difficult. This is because there was no data on the labour market demands and the distribution of the skills available in the country. There was also a mismatch between the skills possessed by the job seekers and those required by

industry, which leads to under-utilization of the existing human resources capacity. (Republic of Kenya, 2013, p. 26)

### **University Education during the Second Medium Term Plan 2013-2018**

During the 2013-2018 Medium Term Plan the overall goal of the Education and Training Sector was to:

Engage in the creation of a national human resource that the development plan will place significant emphasis on developing requisite values, character, talents, knowledge, skills and competencies for moving the country towards the achievement of Vision 2030 (Republic of Kenya, 2013, p. 59).

During this period the government set out the following priorities for university education

(a) **Expand Access and Equity** in university education through establishment of the Kenya Universities and Colleges Admission Service, establishment of new public universities and expansion of the enrollment capacity of public university constituent colleges, encouragement of private universities to expand degree programs offered and strengthening and expanding e-learning degree programs in all public universities.

(b) **Improve Quality and Relevance:** This would be achieved through upgrading of the Commission of Higher Education to Commission of University Education, establishment the Pan African University of Science Technology and Innovation, establishment of at least one publicly funded specialized university in the area of ICT and engineering, developing the capacity of academic staff in the use of modern e-learning teaching methods and evaluation techniques and increasing of the number of graduate researchers in areas of technology, innovation and entrepreneurship.

(c) **Human Resource in Support of University Education:** This would be done through the provision of 1,000 Government-funded teaching assistantships annually in both public and private universities for post-graduate students who would be transited straight from their undergraduate studies, allowing these students to attain their PhDs, and serve as teaching assistants to support the increased enrolment of undergraduates, while gaining valuable training and hands on experience in teaching and learning (Republic of Kenya 2013, p. 90).

A number of achievements were realized during the implementation of the second medium term plan including **Increased enrollment** in universities from 361,379 (male 213,967, female 147,412) in 2013/14 to 564,507, (Male 330,347, female 234,120) students in 2016/2017. The number of students who benefited from higher education loans increased from 139,646 in 2013/2014 to 198,032 in 2015/2016 while, the number of students who benefited from bursaries increased from 15,257 to 30,492 during the same period. (Ibid, p.81-82). The student enrolment continued to rise to 494,896 in 2017/2018 in the public universities and 80,928 in private universities (Republic of Kenya ,2018, p. 27).

The number of universities also continued to increase. By December 2020 there were 31 public universities with 7 constituent colleges, 20 private universities with 3 constituent



colleges and 13 institutions with letters of interim authority. To strengthen teaching and learning in public institutions of higher learning, 82 lecturers and tutors from technical colleges and officers from public institutions were enrolled for various Masters and Doctorate study programmes in Engineering and Applied Sciences.

A survey of programmes offered by universities in Kenya carried out by the Commission for University Education in 2016 revealed that Student enrolment has continued to rise after the introduction of free primary education in 2003 and free day secondary education in 2008. The highest enrolment was at bachelor's level with 475,750 students and the lowest enrolment at Post graduate at 1392. Enrolment per academic level, was found to be as follows: bachelors had 475,750 (88%) 55,461 masters (10%), 7,146 doctorate (1%) and postgraduate diploma at 1,392 (1%) (Mukhwana. et al, 2016, p.40). This finding suggests that the country is not training enough researchers at the postgraduate level to be able to meet the aspirations of the vision 2030 and the knowledge based society.

An analysis of the enrolment in the various degree programs found that Business and Administration had a majority of students (120,233) Education (79,368), humanities and Arts (46,139), veterinary (1,148), manufacturing (2,293) and architecture (5,057) (Mukhwana. et al, 2016, pp. 37-39).

**Increased graduation from Kenya universities:** There has been a progressive increase in graduation since 2012 when a total of 23,523 (14,159 males and 9,364 females) graduated. In 2015, there were 49,020 (28,224 males and 20,262 females). This represented an increase of 108% in public universities. In private universities in 2012 a total of 13,323 (6,138 males and 7,189 females). In 2015 the number increased to 22,323 (10,785 males and 11,538 females) Mukhwana. et al, 2016, p.82). Increased university graduation trends suggest that Kenya has the capacity to train the requirement human resources with specialized knowledge and skills for a knowledge based society.

The survey further analyzed the academic staff composition in the universities during the same period by academic qualification, rank and field of study/specialization. The total number of academics in the universities was in public 12,013 (74%) and private universities 4,305 (26%) (Mukhwana. et al, 2016, p.57) This shows that public universities had three quarters of the entire academic staff in the university sector while private had about 25%. In terms of academic qualification PhD holders comprised 5,604-34%, (4,215 males and 1,389 females) masters 8661-53%-, (males 5,555 and females 3,138) bachelors (1,365-9% (923 were female and 452 male) and diploma holders 656- 4% (471 males,185 females). Public chartered universities had the highest number of PhDs at 26%, masters at 35% followed by private chartered universities with 6% and masters at 12% respectively (Mukhwana. et al, 2016, p.82) .

Further analysis of the staff distribution by academic rank revealed the following; Professors (10%), senior lectures (13%), lecturers (39%) assistant lecturer (32%) graduate assistants

(6%). The distribution of academic staff by rank across disciplines also found that most professors were in science related fields such as agriculture 211(1%); health and welfare 250 (2%); life and physical sciences 248(2%). A survey of staff by academic programmes revealed that business administration had highest at 19% followed by health and welfare (11%) then humanities and arts (10%) education arts and lastly life and physical sciences (9%) (Mukhwana. et al, 2016, pp. 62-70). The staff distribution across academic disciplines and academic ranks has implications on the country's transformation into a knowledge based society. The fact that there are few academic staff at the senior ranks and in the science, technology and innovation fields poses a challenge on mentorship and leadership in Kenyan universities.

There have been other reforms in the university education sector in Kenya. For example, the enactment of the universities Act, No 42 of 2012 brought the management of universities under a single act which hitherto were managed under different Acts and provided for the formation of Commission for University Education to replace Commission for higher education (CHE). The Commission was established as a body corporate charged with the responsibility of addressing the need to regulate, coordinate and assure quality in university education as a result of growth and expansion of the university sub sector in Kenya (Kirui & Sang, 2019, p. 27-28).

### **Emerging issues in the university sector**

Concerns have been raised regarding the quality and relevance of university in Kenya in the recent years. This is because of the high rate of unemployment of university graduates. With the increased enrolment in universities in Kenya it is estimated that a significant percentage of unemployed youth are university graduates (Oanda & Sifuna, 2016 cited in Kirui & Sang, 2019, p.28). This is supported by the country's quarterly labour force report of July 2020 where it was reported that the highest proportion of the unemployed was reported in the age groups 20-24 and 25-29 at 17.6 per cent and 10.7 per cent, respectively (Republic of Kenya, 2020, p.4).

### **Conclusion and Recommendations**

In this paper attempts have been to summarize the progress Kenya as a country is making towards a knowledge based society. The vision 2030 which is the country's development blue print has identified priority projects in various sectors which can help the country realize its development objectives. Key among these sectors are Information Communication and Technology (ICT), Science, Technology and Innovation (ST&I) and Education and Training. While good progress has been made in these sectors there are still a number of emerging issues and challenges that are hindering progress.

There is no doubt that transformation towards a knowledge based society will result in the creation of knowledge based industries, job opportunities in the knowledge based jobs and innovations resulting from the use of new technologies. Education and training especially at the university level has an important role to play in educating for a knowledge based society.

A knowledge based society depends heavily on appropriate government policies resulting from economic incentives and strong institutions supporting the efforts made by individuals and industries involved in knowledge production and circulation.

For Kenya to educate for a knowledge economy and develop her human resource the following suggestions are given:

- i. There is need for the country to establish a strong regulatory framework in terms of laws and statutes that encourage universities, industry and research institutes to invest in knowledge production. This should be supported by strong institutional regimes that seek to protect and promote competitions with the industry and coordinate the set standards
- ii. There is need for close ties and communication between industries and institutions such as universities and research institutes which specialise in the generation of new technological knowledge.
- iii. Education and training plays a very important role in the realization of the social pillar in vision 2030. There is need for universities to consider current and future trends in the labour market before mounting academic programmes. There should be continuous review of the programmes offered to ensure alignment to the current and future market demands.
- iv. For Kenya to advance the ST&I sector for transformation to a knowledge based society there is need for the government and all stakeholders to increase awareness related to ST&I. The citizens and policy makers need to appreciate the importance of ST&I in everyday life. This can be achieved through wide publicity of new ideas, discoveries and innovation among the general public. Various forums can be used including professional associations, community based organisations, educational institutions through science congresses (for Primary and secondary schools) scientific and interdisciplinary research conferences (Universities). This will create and nurture a passion for learning, creativity, technology and innovation.
- v. In order to intensify innovation, there is need for funding for basic and applied research at higher institutions of learning, as well as for research and development conducted in collaboration with industries. To encourage innovation and other scientific endeavours, a system of national recognition needs to be established to honour innovators in various fields.

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