

WIPO MAGAZINE

NOVEMBER 2019

Special Issue



Boosting business competitiveness in Africa with IP and innovation

p. 12



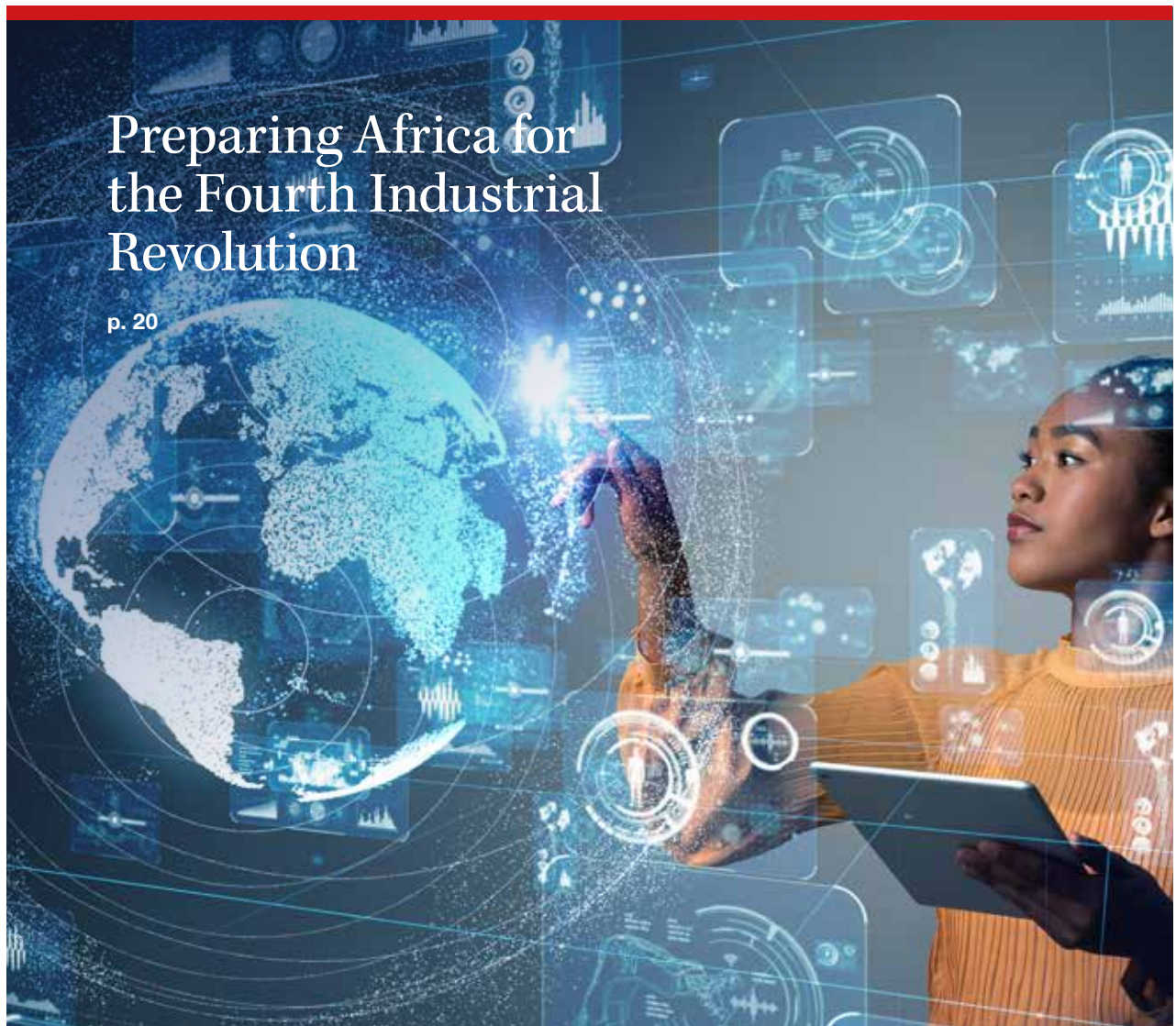
Recalibrating innovation: science at the center of Africa's development

p. 36



Gender equality in African agriculture: an innovation imperative

p. 44



Preparing Africa for the Fourth Industrial Revolution

p. 20

Table of Contents

2	Creating an enabling environment for socio-economic, scientific and technological development in Africa
4	Japan's commitment to promoting IP and innovation in Africa
6	ARIPO: promoting innovation in Africa
9	Supporting innovation and business growth in OAPI member states
12	Boosting business competitiveness in Africa with IP and innovation
20	Preparing Africa for the Fourth Industrial Revolution
28	WIPO's TISC program: helping inventors unlock their potential
36	Recalibrating innovation: science at the center of Africa's development
44	Gender equality in African agriculture: an innovation imperative
50	Intellectual property policies for universities

Acknowledgements:

Marc Sery-Kore, Loretta Asiedu, Yasunobu Numaoui, Rwaka Emmanuel Rugomboka, Regional Bureau for Africa
Guy Pessach and **Kasiet Kachaganova**, SMEs and Entrepreneurship Support Division

Editor: **Catherine Jewell**
 Layout: **Ewa Przybyłowicz**

© WIPO, 2019



Attribution 3.0 IGO
 (CC BY 3.0 IGO)

The user is allowed to reproduce, distribute, adapt, translate and publicly perform this publication, including for commercial purposes, without explicit permission, provided that the content is accompanied by an acknowledgement that WIPO is the source and that it is clearly indicated if changes were made to the original content.

Adaptation/translation/derivatives should not carry any official emblem or logo, unless they have been approved and validated by WIPO. Please contact us via the WIPO website to obtain permission.

When content published by WIPO, such as images, graphics, trademarks or logos, is attributed to a third party, the user of such content is solely responsible for clearing the rights with the right holder(s).

To view a copy of this license, please visit <https://creativecommons.org/licenses/by/3.0/igo>

Cover images:

Left to right:

Alamy Stock Photo / © Maciej Dakowicz;

Courtesy of The Next Einstein Forum;

Courtesy of AWARD

Main image:

Getty Images / © metamorworks

Creating an enabling environment for socio-economic, scientific and technological development in Africa

By **Francis Gurry**,
Director General, WIPO

The Conference on Intellectual Property, Innovation and Value Addition for Business Competitiveness and Sustainable Development in Africa, co-organized by WIPO, the African Regional Intellectual Property Organization (ARIPO) and the African Intellectual Property Organization (OAPI) with the support of the Japan Patent Office and the Government of Zimbabwe will take place from November 6 to 8, 2019, in Harare, Zimbabwe. The conference offers an exciting opportunity to exchange information and experiences on how African countries can better use the intellectual property (IP) system to create an enabling environment for socio-economic, scientific and technological development in Africa.

In 2018, WIPO, ARIPO and OAPI signed a tripartite agreement that marks a milestone in inter-agency regional cooperation in sub-Saharan Africa. This strategic agreement will allow WIPO and its partners to develop more coherent, appropriate and practical responses to the needs of African countries. This development is particularly important at a time of heightened interest among policymakers, academia and businesses in Africa to explore concrete and practical ways to use the IP system to foster innovation and cultural production to put the continent as a whole on a more sustainable footing.

In recent years, countries in Africa have achieved among the fastest and sustained rates of economic growth in the world. However, a rapidly expanding young population – estimates suggest that by 2050 more than 60 percent of the African workforce will be under the age of 25 – and advanced and globalized technological developments, are fueling the imperative for countries in Africa to find ways to leverage the continent's wealth of innovative and creative talent.

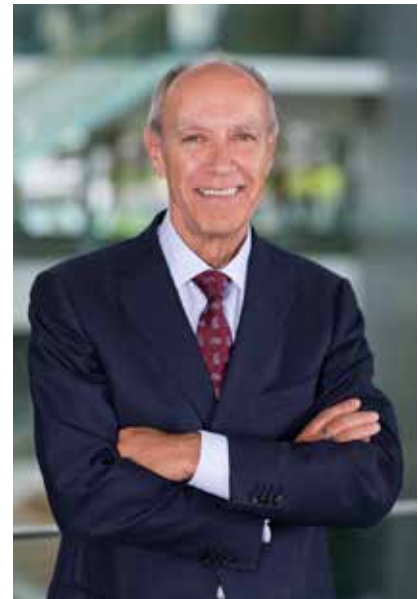


Photo: WIPO / Berrod

The link between IP and development is undoubtedly very complex, but in the global knowledge economy, innovation, creativity and IP hold great promise in spurring economic growth, trade and employment in all regions, including Africa.

At a time when technological developments are advancing at an increasingly rapid pace, IP has become an indispensable mechanism for translating know how into tradeable commercial assets and for capturing the competitive advantage that they represent. Stimulating innovation and greater use of the IP system in Africa is of pivotal importance to the continent's ability to generate the business growth needed to create employment and to secure long-term social and economic sustainability.

The Conference offers an opportunity to explore a range of practical measures to create the conditions for innovation ecosystems to develop and thrive. Discussions will explore the advantages of strengthening university-industry linkages and the benefits that could flow from the adoption of IP policies by universities and research institutes across Africa. Such policies could help improve the relevance of research programs to local needs and enable universities and research institutions to monetize their outputs and thereby secure research funding. By facilitating the transfer of new knowledge to the market, such policies are also pivotal in supporting the development and growth of a more competitive business sector. The Conference will also examine the support mechanisms that need to be put in place to promote greater use of the IP system by small and medium-sized enterprises in order to foster innovation and business competitiveness in Africa.

Developing the capacity for innovation and creative production is a challenging long-term game and can take decades. A concerted commitment to IP and innovation by all economic actors is critically important, especially amid the gathering pace of the Fourth Industrial Revolution. The impact of the rapid technological change that this transformation involves will resonate across the globe. Take for example, the rapid evolution of advanced manufacturing, which includes a range of technologies – robotics, sensors, additive printing and artificial intelligence – that will replace low-cost labor. Inevitably, this will have an impact on global value chains, and the situation of African countries in those value chains. Similarly, greater connectivity has already transformed the production and distribution of creative and cultural products and will continue to influence and transform local business models. The Conference in Harare is therefore a timely occasion to explore the opportunities and challenges associated with the ongoing digital transformation and the practical steps required to enable African countries to navigate them to their best advantage.

This exciting event is an opportunity for those who are in the front line of knowledge creation and its commercialization to contribute to shaping an action plan for an advanced innovation ecosystem for the continent that will enable African countries to thrive in the years ahead.

Japan's commitment to promoting IP and innovation in Africa

By Mr. **Kunihiko Shimano**, Deputy Commissioner,
Japan Patent Office, Tokyo, Japan

In May 2019, the Agreement Establishing the African Continental Free Trade Area (AfCFTA) came into effect, resulting in the creation of a common market comprising 1.3 billion people. This landmark agreement promises to promote trade among African countries and to contribute to the further economic growth of Africa. In the 21st century, Africa has huge potential to overcome the long-standing challenges of low productivity and under-employment. The uptake and use of advanced technologies associated with the ongoing digital transformation promise to support business growth and employment in Africa in the future.

Innovation and the policies to support it, including in the field of intellectual property (IP), are essential to achieving sustainable economic growth in Africa. I believe that the particular needs of African countries will drive innovation and the development of cutting-edge technologies. A talented and young workforce – and their passionate belief in a bright future – will help fuel the development and design of innovative products that are “made in Africa.” We can accelerate this momentum by supporting the implementation of initiatives that promote greater understanding, awareness and use of the IP system across the continent.

In August 2019, the Seventh Tokyo International Conference on African Development (TICAD7) took place in Japan, around the theme of “Advancing Africa’s Development through People, Technology and Innovation.” That event culminated in the adoption of the Yokohama Declaration 2019, which focuses on three key initiatives:

- Accelerating economic transformation and improving the business environment through innovation and private sector engagement;
- Deepening sustainable and resilient society; and
- Strengthening peace and stability.

The Conference on IP, Innovation and Value Addition for Business Competitiveness and Sustainable Development in Africa in Harare, Zimbabwe, in November 2019, is a valuable opportunity to identify and discuss the elements of a five-year roadmap and a practical action plan to establish a robust and comprehensive innovation ecosystem in Africa.

The Japan Patent Office is fully committed to supporting initiatives taken by African countries to promote the uptake and use of IP in support of their national economic development goals, including within the context of the AfCFTA.



Photo: Courtesy of Japan Patent Office

“Innovation and the policies to support it, including in the field of intellectual property, are essential to achieving sustainable economic growth in Africa.”

ARIPO: promoting innovation in Africa

By **Fernando dos Santos**, Director General,
African Regional Intellectual Property
Organization, (ARIPO), Harare, Zimbabwe

For the last four decades, the African Regional Intellectual Property Organization (ARIPO), established with the conclusion of the Lusaka Agreement in 1976, has been working to strengthen Africa's intellectual property (IP) system. The Lusaka Agreement effectively called on all ARIPO member states to pool their resources to develop an effective IP system that would support the region's economic, social, scientific, technological and industrial development. ARIPO plays a central role in this process by facilitating cooperation among its 19 member states.

The Organization administers four protocols covering patents, utility models, industrial designs, marks, new varieties of plants, traditional knowledge and folklore. ARIPO also has a mandate to coordinate initiatives regarding copyright and geographical indications. ARIPO's member countries span an area of 7 million square kilometers, have a combined population of 230 million people and a GDP of USD 368 billion.

Key among the objectives outlined in the Lusaka Agreement is ARIPO's role in assisting "its members, as appropriate, in the acquisition and development of technology relating to intellectual property matters" (see Article III (h)). The founding fathers of the organization recognized that although innovation and creativity thrive across the continent, low uptake and use of the IP system meant that Africans were not fully leveraging the potential value of their ingenuity. More than four decades later, the numbers of applications for IP rights filed with ARIPO remains low. From 1984 – when the Harare Protocol for the protection of patents and industrial designs took effect – up to October 2019, ARIPO received 11,896 patent applications. Just 2.5 percent of those applications originated from ARIPO member states, with 8.5 percent from the rest of Africa. Eighty-nine percent of the patent applications received by ARIPO in that period originated from countries outside of Africa. A similar pattern exists with respect to industrial designs. In the same period, ARIPO received 1,421 industrial design applications. ARIPO member states accounted for 19.4 percent of those applications, 18.3 percent came from other African countries and 62.3 percent came from applicants from the rest of the world. With respect to trademark applications, since 1997 – when the Banjul Protocol became operational – up to October



Photo: Courtesy of ARIPO

2019, applicants filed 3,961 trademark applications with ARIPO; 31.8 percent of them came from ARIPO member states, 7.7 percent from other African countries and the remaining 60.5 percent were filed by applicants outside the continent. Applications for utility models are the only exception to this trend. In the period from 1984 to October 2019, of the 169 applications for utility models received, 78.7 percent were filed by applicants from ARIPO member states; 7.1 percent of applications came from other African countries, and the remaining 14.2 percent from applicants beyond Africa.

The low uptake of IP rights by African innovators and the disproportionate number of IP applications filed by non-ARIPO residents, suggests that the regional system is not yet fully aligned with national development policies. It also suggests that there is still some way to go in terms of raising awareness among users of the IP system about the potential social and economic advantages that can flow from the strategic use of IP rights.

INITIATIVES TO IMPROVE THE UPTAKE OF THE IP SYSTEM IN AFRICA

Recognizing the need to build broader recognition of the role that IP can play in Africa's development and to address the gap in IP skills, in 2006, ARIPO established its IP Academy. As the focal point for training at ARIPO, the Academy is responsible, on the one hand, for developing and delivering training programs to enhance general understanding of IP, and, on the other hand, to offer more specialized programs for IP professionals. Between 1992 and 2016, ARIPO organized 112 training programs for more than 5,000 participants from the public and private sectors.

Between 2014 and 2017, ARIPO also began rolling out its roving seminars program to build understanding of the benefits of IP among the business community and academia in its member states. In that period, roving seminars took place in 15 ARIPO countries and attracted over 2,000 participants. An additional 800 plus participants benefitted from seminars tailored to the specific interests of academic and research institutions. With its partners, ARIPO has also developed a number of academic programs. Such programs are crucial to the emergence of a critical mass of African IP professionals that can help catalyze the development of national innovation ecosystems, support IP awareness among key generators of IP and enable African countries to harness their creative and innovative resources in support of sustainable national economic development.

With this goal in mind, in 2008, ARIPO launched – with its partners, WIPO and the Africa University in Mutare, Zimbabwe – its flagship Masters in Intellectual Property (MIP) program. So far, the program has produced 324 graduates from 26 African countries. Buoyed by the program's success, ARIPO has gone on to launch similar programs in Ghana and Tanzania in 2018 and 2019, respectively.

Protocols administered by ARIPO

- The Harare Protocol for the protection of Patents, Industrial Designs and Utility Models (1982);
- The Banjul Protocol on Marks (1993);
- The Swakopmund Protocol for the Protection of Traditional Knowledge and Folklore (2010); and
- The Arusha Protocol for the Protection of New Varieties of Plants (2015).

Member States of ARIPO

Botswana
 Gambia
 Ghana
 Kenya
 Lesotho
 Liberia
 Malawi
 Mozambique
 Namibia
 Rwanda
 Sao Tomé and Príncipe
 Sierra Leone
 Somalia
 Sudan
 Swaziland
 Tanzania
 Uganda
 Zambia
 Zimbabwe

Since 1976, ARIPO has been working with its member states to develop an effective IP system that supports the region's economic, social, scientific, technological and industrial development.



Photo: Courtesy of ARIPO

ARIPO has also been working with WIPO to encourage universities and research institutions in the region to focus on innovation and the strategic use of IP. To this end, in collaboration with WIPO, we have established a series of practical guidelines, which we are encouraging universities and research institutions in the region to use in crafting their own institutional IP policies and strategies. Some universities are already implementing such policies.

In terms of professional development in the area of IP, ARIPO has launched two practical initiatives that promise to further strengthen the region's IP system. The first is the Regional Patent Examiner Training (ARPET) program developed in partnership with IP Australia, which aims to improve the competency of patent examiners from ARIPO and its member states in conducting search and examination bringing it into line with international standards. The second initiative is a patent drafting course that seeks to enhance patent drafting skills in African countries and to increase patenting levels across the region. Launched in 2009, so far, the program has taught patent drafting skills to 250 individuals from 19 countries.

In another important step that promises to further boost innovation in the region, ARIPO and WIPO recently agreed to leverage existing national Technology and Innovation Support Centers (TISCs) in ARIPO member states. So far, TISCs are operating in 10 ARIPO member states, with Uganda, Kenya and Mozambique hosting the highest numbers of TISCs on the continent. Under the agreed new ARIPO-WIPO cooperation agreement, these TISCs will form an integrated regional network with ARIPO as its hub, enabling optimal use of resources and invaluable exchanges of information and experiences.

Finally, ARIPO is working to improve public recognition of the critical contributions that creators and innovators make to our lives – thereby promoting greater uptake and use of IP across the continent – through various awards and prizes. The Organization serves on jury panels to identify outstanding inventions and confers prizes for best inventors at exhibitions of inventions organized by the patent offices in various member states. ARIPO also continues to promote innovation within the region through its active participation in trade and innovation fairs.

The aforementioned initiatives are already translating into greater general awareness of how use of the IP system can foster innovation, business growth and economic development in the region. We have come a long way in creating the conditions to enable greater uptake and use of the IP system in the region, but we still have some way to go until this translates into higher numbers of IP applications filed by residents of ARIPO member states.

Supporting innovation and business growth in OAPI member states

Photo: Courtesy of OAPI



By **Denis Bohoussou**, Director General,
African Intellectual Property Organization (OAPI),
Yaoundé, Cameroon

The African Intellectual Property Organization (OAPI) is at the forefront of African integration, serving the intellectual property (IP) needs of 17 countries in Africa. Since its establishment in 1962, OAPI has been building on the willingness of countries in the region to pool their efforts to establish a balanced and effective IP system to protect and add value to the region's innovative and creative outputs.

OAPI administers a uniform system for the protection of industrial property (e.g. patents, trademarks, designs, geographical indications, plant varieties) covering all of its member states. That system is underpinned by the Bangui Agreement, which was concluded in March 1977 and revised in February 1999.

Not only do OAPI's members share a common IP law, they also share the same IP office, OAPI, the headquarters of which are based in Yaoundé, Cameroon. OAPI offers simplified, accessible and affordable services that make it easier for inventors and businesses to protect their technologies, brands and designs in all 17 OAPI member states.

THE FOURTH INDUSTRIAL REVOLUTION

Today, as the Fourth Industrial Revolution gathers pace, IP is becoming an increasingly important part of the development and growth strategies that companies and countries are using to improve their competitive advantage and foster national economic growth.

Without doubt, the advanced technological innovations and new business models spawned by the ongoing digital transformation will, and are already beginning to, disrupt traditional industries and challenge the status quo. But they also promise significant new opportunities for economic growth.

Member States of OAPI

Benin
Burkina Faso
Cameroon
Central African Republic
Chad
Comoros
Congo
Côte d'Ivoire
Equatorial Guinea
Gabon
Guinea
Guinea-Bissau
Mali
Mauritania
Niger
Senegal
Togo



Photo: Alamy Stock Photo / © AMIEL Jean-Claude



Photo: Courtesy of OAPI



Since its establishment in 1962, OAPI has been building on the willingness of countries in the region to pool their efforts to establish a balanced and effective IP system to protect and add value to the region's innovative and creative outputs.

OAPI is working with communities of producers to add value to regional African products like Penja pepper (above) and red cocoa from Cameroon through the use of geographical indications and collective marks.

OAPI supports innovation and inventors in the region in a number of ways, including through its participation in international and African trade fairs, such as the International Exhibition of Inventions in Geneva, Switzerland (right).



Photo: Courtesy of OAPI

Within this dynamic, OAPI's top priority – and one that lies at the heart of its Strategic Plan 2018-2022 – is to support member states in their strategic use of IP to catalyze technological, economic and social development. To this end, we are working with universities, research centers and small and medium-sized enterprises (SMEs) across OAPI member states to enable them to increase their contribution to the technological and commercial innovation that is essential for socio-economic development and business competitiveness.

Our aim is to encourage universities and research centers within the region to embrace the IP system to improve the quality and quantity of the innovations that flow from their cutting-edge research and to facilitate their commercialization. That is why we are working to raise awareness among universities and research centers about the benefits of following the guidelines formulated by WIPO and the African Regional Intellectual Property Organization (ARIPO) on the implementation of IP policy in universities.

As a further incentive for researchers to use the IP system, OAPI has halved the costs associated with filing patent applications for inventions and innovations that come from universities and research centers in OAPI member states.

We are also supporting innovation and inventors through our participation in international and African trade fairs, including the *Salon Africain de l'Invention et de l'Innovation Technologique* (the African trade fair on invention and technological innovation), which OAPI organizes once every two years.

Recognizing the brake that a lack of financial resources can put on innovation, OAPI is also working to redesign financial support mechanisms for invention and innovation across the region. Our aim is to develop dedicated financial structures to strengthen the region's capacity

to produce high-quality patented innovations and to support their commercialization.

SUPPORTING SMALL AND MEDIUM-SIZED BUSINESSES

In addition to our awareness-raising and training activities, which take place within all member states, OAPI also works directly with SMEs through its IP audit program. This initiative seeks to help companies optimize their IP assets by working with professional IP consultants who evaluate their IP situation and suggest strategies to optimize the value of their IP. The program also encourages companies to recognize the importance of intangible assets to their business and to move towards more up-to-date and IP-focused business practices.

Also, given the central importance of agriculture to the region and the need to improve agricultural productivity and efficiency in an environmentally neutral way, OAPI is working to promote the development of an effective system of plant variety protection. Such a system will boost the development of agriculture in OAPI member states.

We are also working with communities of producers to add value to regional African products through the use of geographical indications and collective marks. Africa has a wealth of high-quality regional products, the commercial value of which is largely ignored. Our aim is to turn this situation around by encouraging effective and strategic use of the IP system across the region.

Central to all of OAPI's activities is its commitment to helping member states embrace the modern technologies that can support their economic development goals. In a world characterized by ever more intense economic competition, only by laying the groundwork now will we be able to create opportunities for future generations and ensure that everyone enjoys the benefits of innovation in the years ahead.

A photograph of a man in a field of corn plants. The man is on the right side of the frame, looking down at the crops. The field is filled with rows of green corn plants. In the background, there are more green fields and a blue sky with some clouds. The overall scene is a rural agricultural setting.

Boosting business competitiveness in Africa with IP and innovation

By **McLean Sibanda**, Managing Director, Bigen Global Limited, Harare, Zimbabwe, and Professor **Tom Peter Migun Ogada**, Executive Director, African Centre for Technology Studies and Chairman of the Kenyan National Commission for Science, Technology and Innovation, Nairobi, Kenya

Most jobs in Africa arise within the agricultural sector. Manufacturing, the sector with the greatest scope to add value to raw materials, accounts for just 6.5 percent of jobs. The development of vibrant innovation ecosystems supported by balanced and effective IP systems is essential to ensuring that African economies are able to create employment opportunities and compete in the global knowledge economy.



Photo: Alamy Stock Photo / © Maciej Dakowicz

“Economic diversification is a priority for African countries, especially in sectors with the potential to create employment and produce high-value outputs.”

This article was first published in Issue 5/2019 of the *WIPO Magazine*.

Estimates suggest that by 2050 Africa's population will double, rising from 1.2 billion today to 2.4 billion, with over 60 percent of people under the age of 25. Such a large young population presents significant opportunities and challenges. On the one hand, with a higher proportion of economically active people, African countries could benefit from accelerated economic growth. On the other hand, low levels of industrialization in most African countries, and associated high youth unemployment, are of growing concern.

How can policymakers in Africa ensure inclusion of Africa's youth in the global economy? What initiatives are needed to develop the requisite skills and expertise for Africa's youth to participate in innovation and the knowledge-based economy? What should African governments do to accelerate the transition from natural resource-intensive to knowledge-based economies? And how can policymakers promote innovation through better understanding and greater use of intellectual property (IP) rights to boost the competitiveness of African businesses and put the continent's economy on a sustainable footing?

OPPORTUNITIES AND CHALLENGES

Over the past two decades, countries in Africa have achieved rapid and sustained economic growth rates. Projections by the International Monetary Fund (IMF) and African Economic Outlook 2019 suggest that this trend will continue. Uganda, Benin, Kenya, Tanzania, Senegal, Côte d'Ivoire, Ghana, Rwanda, Ethiopia and Libya are set to enjoy growth rates ranging from 6 percent to 11 percent. High demand for African exports, relatively easy access to finance and microeconomic reforms as well as improvements in the business environment are important drivers of this growth. The concern, however, is that the number of jobs available to the expanding working-age population – projected to be almost 1 billion by 2030 – has not kept pace with this economic growth. Data for 2017 show that unemployment rates (7.5 percent) in African countries are well above the global average (4.3 percent). Only 40 percent of the workforce is engaged in productive employment, with 70 percent of workers in vulnerable employment.

Most employment opportunities (65 percent) arise within the agricultural sector, which represents over 15 percent of the continent's GDP, followed by services, particularly financial services and telecommunications. Close to 80 percent of jobs are found in the informal sector. However, manufacturing – the sector with the greatest scope to add value to raw materials – accounts for just 6.5 percent of jobs. This is not surprising given the low levels of industrialization in African countries compared to the rest of the world.

MANUFACTURING VALUE ADDED IN VARIOUS WORLD REGIONS

Unemployment is a big issue in Africa, especially given the size of its young population, which is disproportionately higher than most developed

economies where the population is aging. Policymakers, therefore, need to find ways to increase industrialization, enhance manufacturing capabilities and productivity, and improve business competitiveness. In so doing, the aim is to reduce the dependence of African countries on the export of primary raw materials. Such dependence leaves them vulnerable to volatile commodity markets and fluctuations in the global economy. Economic diversification is therefore a priority for African countries, especially in sectors with the potential to create employment and produce high-value outputs.

CREATING JOBS AND BUSINESS GROWTH WITH IP AND INNOVATION

History shows us that an environment in which innovation and use of the IP system thrive creates opportunities for employment and socio-economic development. The experiences of countries such as Japan, the Republic of Korea and, more recently, China, attest to this. If African countries are to compete in the global knowledge economy, the development of vibrant innovation ecosystems supported by balanced and effective IP systems is essential. This is a critical step in fulfilling the aspirations of African countries to become producers of high-value, knowledge-based goods and services. Only then will it be possible to succeed in reversing existing trends – where Africa imports most of what it consumes – and for African countries to start adding value to the products they export. Innovation and IP lie at the heart of this process.

Investment in research and development (R&D) and innovation supports the production of new and improved technologies to address local needs, while creating opportunities for business growth and employment. The IP system also facilitates effective transfer, adaptation and assimilation of technologies developed elsewhere to African countries. Countries that have robust innovation ecosystems underpinned by a balanced and effective IP system have benefitted in terms of increased economic growth, employment, tax revenues and foreign direct investment, as well as access to high-end technologies through technology transfer agreements.

An effective IP system is an integral part of a thriving innovation ecosystem. It provides incentives to invest in R&D and other innovation and enables firms to commercialize and monetize their innovations, and to justify and sustain R&D investments.

POTENTIAL BENEFITS OF IP

Companies use IP rights strategically to develop, trade in, and secure income from their innovative products and services. These rights help companies gain and maintain a competitive advantage in markets at home and beyond. Firms with an effective IP strategy generally enjoy a stronger negotiating position, achieve greater success and have a higher market value than those that do not. This is particularly so in a highly competitive global market

Manufacturing Value Added per capita, 2017

6513.0

*North America

4902.0

European Union

2605.2

East Asia & Pacific

1197.2

Latin America & Caribbean

790.9

*Middle East & North Africa

273.7

South Asia

136.5

Africa excluding North Africa

*Data from 2016.
Source: World Development Indicators, World Bank, 2019.

where cross licensing is increasingly prevalent, especially within the pharmaceutical, automotive, and information and communications technology sectors.

IP awareness is particularly important among small and medium-sized enterprises (SMEs) as these companies generally drive economic growth and job creation. Those that embrace IP rights tend to fare better in terms of growth, income and employment than those that are unaware of how IP can support their business.

Consumers and society as a whole also stand to gain. IP rights support the process of bringing a product to market, thereby providing consumers with access to an expanding range of innovative products and services. Of course, IP rights also safeguard consumers from counterfeit and pirated goods. Such illegal activity undermines legitimate businesses and their ability to invest in product development. It also puts consumer health and safety at risk.

Broader understanding of the benefits that can flow from innovation and access to an effective IP system will help ensure that Africa's inventors, creators and entrepreneurs can readily and effectively protect and harness the value of their IP assets and thereby create opportunities for employment, wealth creation and economic growth.

BUILDING BRIDGES BETWEEN ACADEMIA AND BUSINESS

Universities and research institutions, as well as knowledge-based SMEs, are the backbone of economic activity in most countries. These actors have a critical role to play in transforming African economies and in making them more competitive globally. Their ability to innovate and to develop frontier technologies and knowledge are central to boosting Africa's ability to fulfill more of its needs and to produce and export high-value products and services and thereby establish itself as a global economic player.

More and more, policymakers in Africa are recognizing the critical role of universities, research organizations and SMEs as producers of new knowledge to address local needs. They also acknowledge the need to strengthen links between academia and business to ensure research programs generate outputs that are relevant and useful to society. Policies that encourage active use of IP rights to protect and leverage the economic value of the new technologies, products and processes that these important actors generate – for example, through licensing and startup schemes – will enable them to secure sustained research funding and promote business growth.

By linking IP and innovation, policymakers have an opportunity to create favorable settings for African businesses to compete in global markets. The emergence of companies like Sasol in South Africa and MPESA in Kenya attest to this. The experiences of certain Asian countries also offer interesting insights about how to achieve sustained economic growth by encouraging the generation, acquisition and use of IP. For example, 60 years ago, the Republic of Korea was poorer than Mozambique. However, its commitment to innovation and the strategic use of IP has enabled it to emerge as a leading economy. The Republic of Korea's experience highlights what can be achieved when governments adopt a long-term and deliberate focus on innovation, and strategic use of IP to build on a country's strengths.



Photo: SciStock / E+ / Getty Images

By 2050 Africa's population will double, rising from 1.2 billion today to 2.4 billion, with over 60 percent of people under the age of 25. Amid low levels of industrialization and associated high unemployment, African policymakers are grappling with ways to promote innovation and greater use of the IP system to foster business growth, jobs and economic sustainability.

MARRYING UPSTREAM RESEARCH WITH DOWNSTREAM COMMERCIALIZATION

As traditional generators and disseminators of knowledge, in general, the research activities of universities and research institutions are concentrated upstream in innovation value chains. In contrast, SMEs tend to focus downstream, adapting and applying new knowledge to produce goods and services that the market can consume.

To create optimal conditions for knowledge generation and its subsequent commercialization, policymakers need to address many challenging questions. For example, to what extent should universities and research institutions operate downstream on commercialization issues to ensure the relevance of their work? What support mechanisms (policy incentives and structures) are required to increase both upstream and downstream activities to serve society? How can universities support efforts to upgrade technological and manufacturing capabilities of African countries? What type of support should SMEs receive to encourage them to embrace innovation? How can countries strengthen academia and industry linkages and encourage them to use the IP system?



More and more, policymakers are recognizing the critical role of universities, research organizations and SMEs as producers of new knowledge to address local needs.

COLLABORATION IS CENTRAL TO DEVELOPING THRIVING INNOVATION ECOSYSTEMS

Consideration also needs to be given to ways to encourage academia, industry and governments to work together to improve awareness of the economic benefits that can flow from strategic use of IP. Such collaboration is central to justifying and securing research funding, and is particularly important in the context of the Fourth Industrial Revolution, in ensuring that research programs are relevant to local and future needs. Such collaboration also promises to deepen understanding of the implications for innovation and IP of the on-going digital transformation. This will enable African countries to take advantage of potential opportunities and to anticipate and mitigate the challenges arising from the rapid deployment and uptake of advanced digital technologies. Only by working together will it be possible to encourage broader use of IP to boost business development and competitiveness.

The goal, of course, is to ensure that academic and research institutions in Africa become part of a fully integrated national innovation ecosystem, where all players, including businesses, are embracing innovation to create the technologies required to address societal needs and challenges. The creation of opportunities for decent employment and heightened global competitiveness are critically important by-products of this process. How successful we are in achieving this goal will determine how far Africa will be able to increase its share of global IP production in a rapidly evolving technological and economic landscape.

Today, there is a pressing need for dialogue to support the development of an African roadmap for IP and innovation. Such a roadmap will give added impetus to efforts across the continent to improve employment prospects and living standards by leveraging Africa's wealth of talent in an era of rapid technological transformation.

Preparing Africa for the Fourth Industrial Revolution

Management
Legal Services
Logistics
Accounting
Finance
Marketing
Strategy
Production
Research
Human Resources
Development
Engineering
Manufacturing
Planning





Photo: Getty Images / © metamorworks

By **Tshilidzi Marwala***, Professor of Artificial Intelligence and Vice-Chancellor of the University of Johannesburg, South Africa.

Dystopian novels have always been littered with stark warnings about the downfall of humanity that will inevitably accompany technological change. As Aldous Huxley once put it, “technological progress has merely provided us with more efficient means for going backward.” Huxley, who is most famous for his novel *Brave New World*, sketched an eerie picture of the future in the 1930s. Set in a world populated by genetically modified inhabitants and an intelligence-based social hierarchy, Huxley weaves a terrifying tale that prophesizes scientific advancements in sleep-learning, psychological manipulation, and classical conditioning – that ultimately alter the way human beings think and act. The flawed hero eschews it all at the end. Huxley feared that embracing scientific advancements would reduce human beings to passivity and egotism. What Huxley probably had not anticipated is that human beings would adapt and remain active participants in those advancements.

A NEW PARADIGM

As Stephen Hawking once said, “intelligence is the ability to adapt to change.” A decade ago, the advent of machines smarter than human beings still seemed like a far-fetched Huxley concept. We have seen automation in the previous three revolutions, but these were on a mechanical level for the first industrial revolution, on an electrical level for the second industrial revolution, and on an electronic level for the third industrial revolution. These developments took over labor-intensive tasks from humans, but humans found other more cognitive jobs. The Fourth Industrial Revolution, however, is an entire paradigm shift. The Fourth Industrial Revolution is premised on many technologies but chief among them is artificial intelligence (AI). AI technology makes machines intelligent. A machine is intelligent if it can analyze information and extract insights beyond the obvious. In other words, machines become superhuman and begin to alter entire industries.

Through AI, companies are predicting equipment glitches, managing workers, and increasing output. At the University of Johannesburg, we have developed an AI-based system that can predict the failure of transformers before they break down. Transformers are essential and expensive systems in the electricity grid – for example, they enable us to draw electricity from the grid to power our household devices. This ability to predict reduces inventories, improves efficiency and saves costs. These advances are not the horror show Huxley would have made them out to be. Rather, AI has great potential to increase efficiency and accuracy, which ultimately make employees’ lives easier.

At the University of Johannesburg, we have created an AI system that can restore lost voices. The MIT Technology Review featured this research, for which the university has acquired a patent via the Patent Cooperation Treaty. We have also used AI to diagnose leukemia and to detect epilepsy. The increased speed and accuracy of cancer diagnostics through analytics, which can characterize tumors and predict

*Professor Marwala deputizes for President Cyril Ramaphosa on the South African Presidential Commission on the Fourth Industrial Revolution.

therapies, have not replaced doctors but have quickened their efforts and given them the time to attend to more patients.

THE FUTURE OF JOBS

While the fear is that millions of jobs will disappear as a result of more automated and machine-intelligent processes, these technologies are an opportunity to transform professions and make human beings much more productive. South Africa's economy is growing at less than 1 percent per year and unemployment is climbing – fears around mass job losses resulting from another industrial revolution are difficult to curb.

It is not just unskilled workers who worry about being replaced by machines; workers in skilled professions such as medicine and finance fear the change too. At the University of Johannesburg, we have built AI machines that can price options and derivatives, perform credit scoring, manage portfolios, predict stock prices, estimate and price risks and predict interstate conflict. The work on interstate conflict is published as a book and has also been translated into Mandarin by the Chinese Defense Press. Establishing pricing risks is work that traditionally is performed by white-collar workers. However, the Fourth Industrial Revolution is expected to disrupt white-collar workers as compared to blue-collar workers. Think about it – how much easier is it to automate the work of a credit scorer in a bank than that of a tree feller!

Economist Kenneth Rogoff explains that, “since the dawn of the industrial age, a recurrent fear has been that technological change will spawn mass unemployment. Neoclassical economists predicted that this would not happen because people would find other jobs, albeit possibly after a long period of painful adjustment. By and large, that prediction has proven to be correct.” For example, in the 18th century, fears over the impact of machinery on jobs intensified with the growth of mass unemployment. Nevertheless, in the second half of the 19th century, it became increasingly clear that technological advancement was benefiting all segments of society, including the working class.

While the Fourth Industrial Revolution is displacing specific jobs through automation, new occupations are also being created. The World Economic Forum's

Future of Jobs Report 2018 noted that the future of jobs, high-speed Internet, AI, big data analytics, and cloud technology are the biggest disruptors in the workforce. The characteristics of the workforce are indeed changing and shifting. By 2022, the average task hours performed by human beings is projected to be 58 percent compared to 42 percent by machines.

It is envisaged that demand in the labor market will be for professionals who have a blend of science and technology with human and social sciences. This can be achieved through multi-disciplinary education. In response to the need to nurture these skills and to fill this gap in the labor market, the University of Johannesburg has introduced a Bachelor's degree in Politics, Economics, and Technology.

RE-SKILLING THE WORKFORCE: A ROLE FOR UNIVERSITIES

The best strategy to stay ahead of the changing needs of the labor market is to retrain, upskill, and transform the workforce. Career paths are changing fundamentally. The labor market is shifting towards hybrid jobs that combine skill sets such as marketing and data analysis, or design and programming. So how do businesses succeed in a 4.0 business climate? That is the burning question we face.

Universities play a fundamental role in developing the skills of future generations as they navigate new technological directions. As we now see, this requires the reskilling and upskilling of our workforce. It also requires that universities partner with the private sector to ensure their research programs are aligned to real-world needs, that they develop effective intellectual property (IP) strategies and that they establish dedicated technology transfer offices (TTOs). These offices play a pivotal role in enabling the transfer of the knowledge that comes from university research to the market. The commercialization of this knowledge, using the IP system, can support business growth and economic development. The University of Johannesburg has positioned itself at the forefront of the fundamental and rapid changes that are occurring in industry. That has involved revisiting the way in which we teach and package knowledge into modules and qualifications to ensure that students are equipped for further study or employment.

“The time to prepare ourselves for the Fourth Industrial Revolution is now!”

Many universities, including the University of Johannesburg, have started working together with businesses and are incorporating the new skills they require into the curriculum. Many employers are also partnering with universities to develop tailored learning programs for their employees to prepare them for emerging job opportunities. How best do we tailor our curriculum to suit the needs of companies? How do we help companies adapt to this changing work environment? These are some of the big challenges universities face. Part of the solution involves rethinking the way degree programs are set up. Students want the freedom to choose courses beyond a limited program in order to acquire a broader range of skills. They want to define the pace of learning and to have access to content remotely. Universities need to respond to this.

Many are already adopting a model that allows students to enroll in stackable degrees by giving them multiple entries and exit options and by using technology, such as data analytics, to develop customized learning paths.

To remain competitive, it has become critically important for companies to leverage and invest in relevant innovation and disruptive technologies. Universities can support this process by offering flexible multi-disciplinary programs that respond to these real-world needs and that enable young people to acquire the skills needed for the jobs of the future.

BEHAVIORS FOR DIGITAL TRANSFORMATION

A report by Tata Consultancy Services (TCS) on the behaviors of digital transformations, calls for businesses to adopt four key behaviors. The first involves driving mass personalization, which allows companies to offer personalized products and services at scale. The second relates to creating exponential value, which enables businesses to gain more value from a single transaction by using technology, such as data analytics and AI, to forecast future customer needs and points of engagement to target a broader range of potential customers. The third behavior requires leveraging ecosystems to foster collaboration among multiple partners beyond supply chain networks, so that they are no longer forced into silos. And all these behaviors

“Universities play a fundamental role in developing the skills of future generations as they navigate new technological directions,” says Professor Marwala.



Photo: Jan Potgieter/University of Johannesburg

Photos: Jan Potgieter/University of Johannesburg



“Many universities, including the University of Johannesburg, have started working together with businesses and are incorporating the new skills they require into the curriculum,” notes Professor Marwala.





The shift that is required in the Fourth Industrial Revolution is in the workplace and is predicated on greater efficiency, as human beings and machines learn to work together, enhancing supply chains and ultimately boosting economic growth.

require that companies embrace risk to stay ahead of the competition and are able to provide better value to customers. The report found that only around one in 10 organizations surveyed have adopted all four behaviors suggesting there is still a great deal of progress to be made.

The shift that is required in the Fourth Industrial Revolution is in the workplace and is predicated on greater efficiency as human beings and machines learn to work together, enhancing supply chains and ultimately boosting economic growth. This is particularly important in South Africa as we try to kick-start our economy. In a country that has barely managed to achieve growth rates of 5 percent – a level required to make a dent in the increasing unemployment rate – it is essential that we tap into the opportunities that the Fourth Industrial Revolution brings. South Africa is an open economy that is connected to the global economy. Weaker global growth bodes ill for South Africa – we saw the hit South Africa took with the global financial crisis. Although global growth remains tepid, there is untold potential to tap into the emerging opportunities garnered by the Fourth Industrial Revolution. The World Economic Forum estimates that it will create up to USD 3.7 trillion in value by 2025.

THE PROMISE OF AI

The McKinsey Global Institute's report on the impact of AI on the world economy suggests that AI has the potential to incrementally add 16 percent or around USD 13 trillion to current global economic output by 2030 – that is, an annual average contribution to productivity growth of about 1.2 percent over the next decade. When we break this down, automation of labor could add up to 11 percent or around USD 9 trillion to global GDP by 2030, while innovations in products and services could increase GDP by about 7 percent or around USD 6 trillion.

Nobel Laureate Robert J. Shiller said, “you cannot wait until a house burns down to buy fire insurance on it. We cannot wait until there are massive dislocations in our society to prepare for the Fourth Industrial Revolution.” The time to prepare ourselves for the Fourth Industrial Revolution is now!

WIPO's TISC program: helping inventors unlock their potential

By **Andrew Czajkowski** and **Elangi Botoy**,
Technology and Innovation Support Division,
WIPO

WIPO's Technology and Innovation Support Center (TISC) program facilitates access to technical and scientific knowledge and thereby reduces the knowledge gap in developing and least developed countries. By providing access to specialized scientific and technical databases and the training required to enable users to extract value from their use, the program aims to promote innovation and its commercialization through more effective use of the intellectual property (IP) system. The program was first conceptualized under the WIPO Development Agenda (Recommendation 8), adopted by WIPO member states in 2007, and has been operating since April 2009.

Since then, 80 countries, of which 26 are least developed countries, have signed up to the TISC program and have established national TISC networks. More than 900 TISCs are now in operation.

The program helps inventors, researchers and entrepreneurs unlock their innovative potential by providing access to on-the-ground information and support services relating to innovation and IP. The services offered by TISCs vary, ranging from basic support services, such as access to and assistance in using patent, scientific and technical databases, to more sophisticated value-added innovation support services, such as assistance and advice on IP management or patent analytics. Through these centers, inventors can build on the wealth of technological information found in millions of patent documents and thousands of scientific and technical publications.

TISCs are financially and technically self-supporting institutions to which WIPO provides advice on demand. They may be located in a variety of host institutions, including patent offices, universities, research centers, and science and technology parks. By the end of 2018, 34 of the 80 countries participating in the program had reached some degree of sustainability, defined in terms of institutionalization, operationalization and the provision of a broad portfolio of innovation support services, including value-added services such as the drafting of patent landscape reports.

TISCs play a key role in promoting innovation and business growth, with the potential to support the creation of jobs and the social and economic development in countries in all regions of the world. The resources they provide are relevant to a wide range of actors – researchers, entrepreneurs, universities, technical and vocational schools, research centers, SMEs and their associations, laboratories and inventors.

SCIENTIFIC AND TECHNICAL RESOURCES

Over the past decade, WIPO has developed a range of publications, platforms, training materials and tools to build the services provided by TISCs, broaden access by TISC users to valuable scientific and technical information and enable them to use these resources more effectively.

Patent databases are a major source of technological information and knowledge. Some of them comprise more than 100 million patent documents. WIPO trains TISC staff to navigate, search and analyze the prior art (all the technologies contained in the patent documents) contained in patent databases, such as WIPO's PATENTSCOPE, which is free of charge. A first step for a TISC in advising a user is to identify the databases that are most relevant to the technology in question. TISC staff then support users by showing them how to use key words and patent classification systems to perform searches to generate relevant results.

Beyond access to PATENTSCOPE, TISCs also benefit from two public-private programs provided by WIPO. These programs – the Access to Research for Development and Innovation (ARDI) program and the Access to Specialized Patent Information (ASPI) program – allow users to broaden their search by accessing subscription-based scientific and technical journals and commercial patent databases.

The ASPI program includes a range of sophisticated tools for searching, retrieving and assessing technologies and is available thanks to a partnership with nine of the world's leading commercial patent database providers.

The ARDI program is part of the Research4Life partnership, which includes a number of specialized programs: HINARI from the World Health Organization; AGORA from the Food and Agriculture Organization of the United Nations; OARE from the United Nations Environment Programme; and GOALI from the International Labor Organization. These programs provide online access to nearly 100,000 international peer-reviewed scientific and

legal journals, books, and databases to more than 9,000 institutions in developing and least developed countries.

Over the last decade, WIPO has created a wide range of publications and other resources to boost the capacity of TISCs around the globe. The publications are key references and cover a range of subjects, including patent documentation and databases, patent search, patent analysis and TISC management. They also include WIPO Patent Landscape Reports, which offer useful insights on patent filing trends and technical and business information in areas such as public health, food and agriculture, environment, energy and disabilities.

Earlier this year, WIPO launched its new *Technology Trends* series, which tracks the development of technologies through the analysis of data on innovation activities. The first report, launched in January 2019, examines global patenting trends in the area of artificial intelligence (AI). It compares patenting activity with scientific publications; identifies top players from industry and academia across different technologies and application fields; highlights the geographical distribution of AI patent protection; and examines existing AI policies and future prospects. The analysis, which is based on patent and scientific data, is complemented by business information as well as contributions from leading AI experts.

PROMOTING BEST PRACTICE

Sharing experiences and best practices is widely encouraged, whether between national TISC networks or regional networks such as those comprising member states of ARIPO, or through the eTISC virtual network.

The eTISC online platform connects the TISC community and other interested parties. The platform allows members to share knowledge and experiences across national and regional boundaries and offers access to a growing number of specialized platforms, portals and tools, to support TISC staff and users in accessing the knowledge required to commercialize and bring their innovative outputs to market.

Photos: WIPO / Natalia Rodriguez



Banana growers in Uganda face significant wastage problems due to rapid over ripening of the fruit and poor post-harvest handling. George Bazirake, a food scientist at Kyambogo University in Kampala, has developed an enzymatic inactivation process, which when followed by vacuum sealing can extend the shelf life of peeled bananas by up to six months when refrigerated.



Dr. Bazirake recently set up an incubation program at Kyambogo University "to guide participants to develop projects from conceptualization to implementation, to scale up technologies, and to create competitive agribusiness enterprises."

Photo: Getty Images / © Wavebreakmedia

TISCs at work: Uganda's banana business

Uganda is the world's second largest producer of bananas after India. Bananas are a food staple in Uganda and much of East Africa. They are a key ingredient of *matooke*, a traditional Ugandan dish.

More than 75 percent of Uganda's farmers cultivate bananas, but are often unable to optimize the return on their harvest because their crop ripens too quickly or because poor post-harvest handling means the fruit does not meet the quality standards required for export. These factors result in significant wastage.

Recognizing the need to find a solution to the problem, George Bazirake, a food scientist at Kyambogo University in Kampala, has found a way to extend the shelf life of the country's banana harvest. He has also developed alternative ways to use the peel of over-ripe bananas to make vinegar or biodegradable bags and mats, for example.

"Around 7 million people consume *matooke* in Uganda every day. We have one of the highest consumptions per capita of bananas but there's a lot of waste coming from the banana that is not used. I realized that I wanted to solve the problem," says Dr. Bazirake.

In 2009, he began developing an enzymatic inactivation process followed by vacuum sealing to extend the shelf life of bananas. Using this method, peeled bananas can last up to six months when refrigerated. The process also generates significant freight savings as a peeled, vacuum-sealed banana weighs about 40 percent of its original weight.

Dr. Bazirake was granted a patent for his method and has since registered his technology with the United States Food and Drug Administration, which means that Ugandan bananas processed in this way can now be exported to the United States. Innovations developed by Dr. Bazirake relating to the production and processing of bananas are providing employment for 12 farmers through AfriBanana

Products Limited (ABP), an agribusiness consortium, which he founded with a team of researchers.

Dr. Bazirake is a keen advocate of better education and is committed to promoting and supporting innovation in Kyambogo University, where he is Dean of the Faculty of Sciences. Dr. Bazirake is an active participant in training events organized by the University's TISC, one of eight TISCs currently operating in Uganda. At these events, he shares his experiences with young students and researchers to encourage them to take advantage of the resources offered by the TISC.

"I want young people to appreciate science and technology. I like to be a mentor for students and promote a problem-solving mindset," says Dr. Bazirake.

Dr. Bazirake recently set up an incubation program at the University "to guide participants to develop projects from conceptualization to implementation, to scale up technologies, and to create competitive agribusiness enterprises."

The program is led by Kyambogo University in collaboration with other TISC members including the Mbarara University of Science and Technology and the Uganda Industrial Research Institute, among others. "We select around 60 students every summer. They apply to our program and we provide them with the training and mentoring they need to develop entrepreneurship skills. It is important to create an innovation environment, especially among young people," explains Dr. Bazirake. His goal now is to convince government policymakers of the need to promote research and innovation within Uganda's educational curriculum.

"My goal is to engage the political arena to support more and more education projects around science and technology. We need the government to allocate a higher percentage of the GDP to research. I'm working hard for that."

TISCs at work: establishing successful innovation structures in Morocco

Founded in 2010, the International University of Rabat (IUR), located in the heart of Technopolis Rabat-Salé, is a semi-public university with a strong focus on engineering and business management. Although a relatively young institution, IUR has become a national innovation leader. It is the first university in Morocco to embrace technology transfer-focused research projects and the publication of high-quality articles in the international arena.

In 2012, the University won the first National Innovation Prize for its efforts in promoting training, research, innovation and technology transfer with the private sector.

Thanks to a series of successful partnerships with industry, IUR now holds 311 national patents and 58 patents in other countries, making it one of the country's leading patent filers. How has such a young university managed to create such a successful innovation culture?

Mr. Mohsine Bouya, Director of Valorization and Transfers at IUR believes the answer lies in the establishment of its technology transfer office (TTO), which also serves as a TISC, and its close relationship with industry. IUR is the first academic institution in Morocco to have a TTO and a TISC.

“We are the first university in Morocco to set up a TTO. This has allowed us to establish a structure that works transversally supporting all the research needs of the university and to establish successful partnerships with the private sector,” explains Mr. Bouya.

The presence of a dedicated TTO within a university campus supports the transfer of the wealth of knowledge generated by university researchers to industry, so that society as a whole can benefit from it. A dedicated TTO allows universities and research institutions to protect their outputs with intellectual property (IP) rights and to license these to industry. IUR's TTO is supported by a multidisciplinary team of professionals. Its role as a TISC has enabled IUR to reduce the costs associated with assessing its inventions and developing patenting strategies around them.

The office focuses on three main areas: IP protection, incubation (including the acceleration of startups) and negotiation (e.g. licenses, spinoffs and commercialization). “Our team works to develop



Founded in 2010, the International University of Rabat (IUR) has become a national innovation leader and is the first university in Morocco to set up a technology transfer office, which also serves as a TISC. In 2012, the University won the first National Innovation Prize for its efforts in promoting training, research, innovation and technology transfer with the private sector.



Mohsine Bouya, Director of Valorization and Transfers IUR (second from the left) with the university's TTO team.

activities on how to transfer technologies, but also on how to create, manage and build tech transfer offices,” notes Mr. Bouya.

Technology transfer partnerships can generate multiple benefits. Universities and research institutions, for example, benefit from the identification of new and commercially valuable research topics, and new income streams to support research funding. And companies benefit from new business opportunities arising from the expertise of researchers in developing new products or in solving specific problems facing a particular industry.

Technology transfer has allowed the university to expand its patent portfolio. In recent years, IUR has been working with the private sector on research projects focused on transport, safety and renewable energy.

In some cases, projects result in the creation of spin-offs. In these circumstances, the university and its private sector partner each has a stake in the business and the commercialization of the products. This was the case when IUR researchers co-developed a new air-conditioning system with a private company. IUR researchers are currently working on artificial intelligence (AI) innovations, such as autonomous drones, with Atlas Space.

The success of IUR’s TTO is also attributable to its commitment to training and mentoring its staff, researchers and students on IP issues, which is an important factor in any innovation strategy. Each year, TTO staff meet with the Moroccan Office of Industrial and Commercial Property to develop a schedule of TISC-supported IP training activities.

EXAMPLES OF TISC SERVICES

Demand for TISC services across the globe continues to grow, and in Africa, the TISC network is expanding every year. For example, in Benin, four new member joined the network in 2018 and others are in the pipeline. Sixteen new institutions also joined the TISC network in Madagascar, making it one of the largest in the region with 73 centers. Also in 2018, ARIPO established a regional TISC network to promote the sharing of experiences and best practices to catalyze innovation and development across the region. Such expansion is making it possible to direct more services to local needs.

Every year, TISCs reach out to innovators, researchers and entrepreneurs to encourage and support them in using the global IP system to leverage the economic value of their work and to foster local innovation. In Madagascar, for example, more than 200 people from universities, research centers, SMEs and industry received dedicated training on IP through the national TISC network. Members of that network also took part in industry, science and research events across the country to raise awareness about patent information and offer training on the practical aspects of searching patent databases.

A DIRECT IMPACT ON INNOVATION AND VALUE CREATION

The support that TISCs are providing local innovators is having a direct impact on the local innovation landscape. The growing number of patent applications in participating countries is evidence of this. In Benin, for example, five patent applications have been filed through the TISC network with OAPI. In Madagascar, TISCs supported the filing of 35 patent applications with OAPI and five other international patent applications under the Patent Cooperation Treaty (PCT). Similarly, in Morocco, TISCs had a hand in the filing of 121 national patent applications with the Moroccan Office of Industrial and Commercial Property (OMPIC) and 15 international patent applications filed under the PCT. Sixty-six percent of all patent applications filed with OMPIC by Moroccan applicants in 2018 were filed by members of the national TISC network.

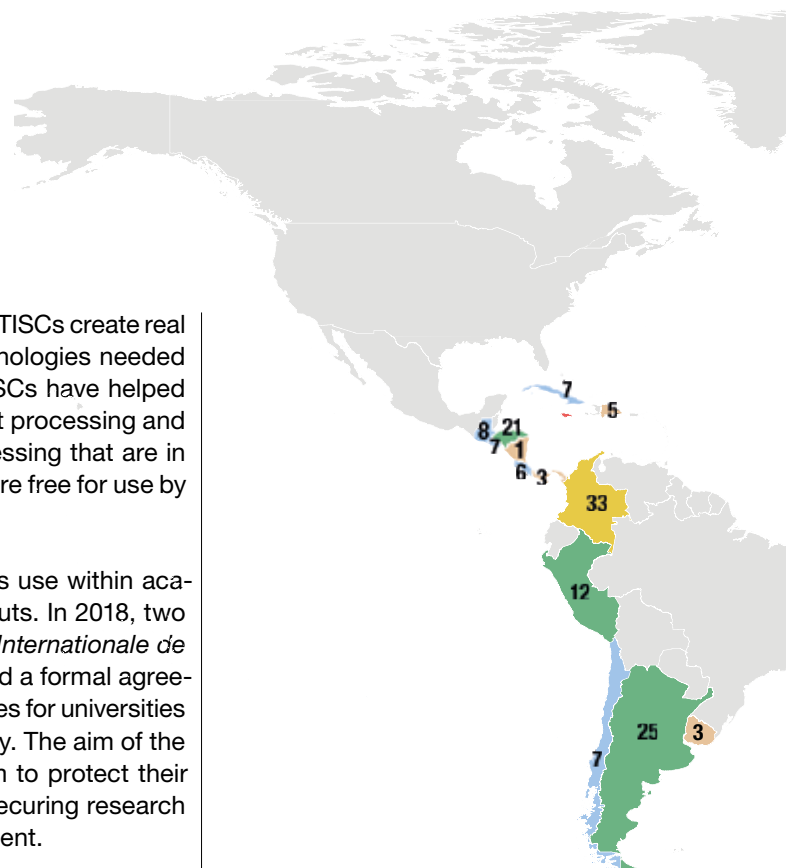
The technology and innovation support services offered by TISCs create real value, in particular, by facilitating the transfer of the technologies needed to address local needs. For example, in Madagascar, TISCs have helped to reveal 41 patents covering technologies relating to meat processing and 31 patents covering technologies relating to vanilla processing that are in the public domain, meaning the associated technologies are free for use by entrepreneurs in the country.

TISCs are also creating real value by promoting IP and its use within academia to support the commercialization of research outputs. In 2018, two members of the Morocco's TISC network, the *Université Internationale de Rabat* (IUR) and the *Université Hassan 1^{er} de Settat*, signed a formal agreement with OMPIC to provide value-added innovation services for universities and research and development centers across the country. The aim of the initiative is to support researchers in using the IP system to protect their outputs with a view to leveraging their economic value, securing research funding, boosting business growth and creating employment.

NEW OPPORTUNITIES FOR INNOVATION

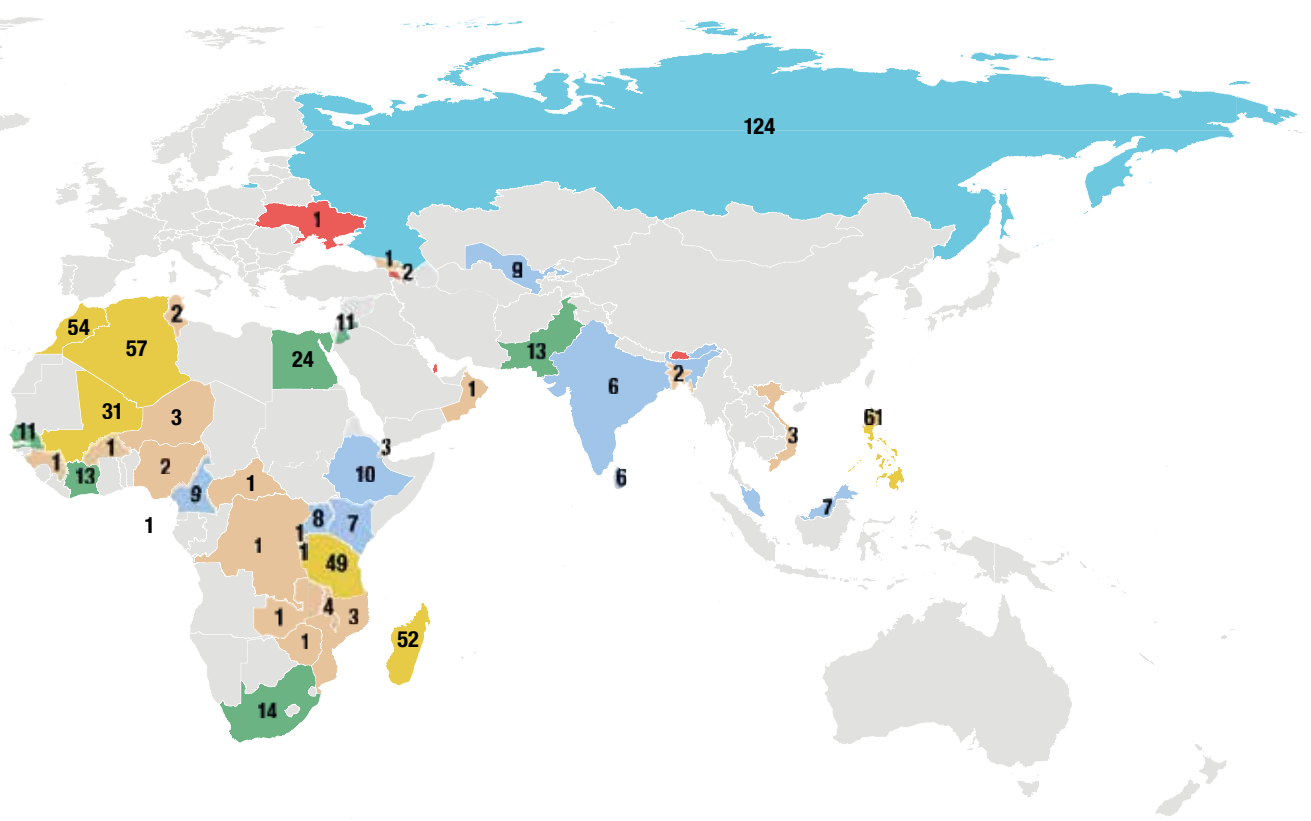
The expansion of the TISC network is also creating opportunities for greater cooperation between countries. This, in turn, is strengthening the network, increasing its reach and improving its sustainability. Within Africa, for example, in 2018, Djibouti and Madagascar initiated a partnership to exchange experiences and best practices on managing national TISC networks. Similarly, Morocco and OAPI have joined forces to prepare a patent landscape report on green technologies, including in the areas of water treatment, biodegradable plastics and food packaging.

Insofar as the TISC program provides access to more than 100 million patented technologies and to more than 100,000 scientific publications, it has been instrumental in putting developing and least developed countries on a more equal footing with industrialized nations. The TISC program means that developing countries, and least developed countries, in particular, can more easily identify, use and adapt existing technical solutions to address local problems, and avoid reinventing the wheel. Continued expansion of the TISC program will enable developing countries in Africa and beyond to foster innovation and the advancement of science and technology, improve business competitiveness and growth, create jobs and promote sustainable social and economic development. TISCs have achieved a lot over the past 10 years; it will be interesting to see how they continue to shape the global innovation landscape in the next decade.



TISCS WORLDWIDE

Source: TISC Annual Report 2018 (updated)



- 1-5
- 6-10
- 11-30
- 31-70
- more than 71
- New TISC Networks (Armenia, Bhutan, The Gambia, Jamaica, Palestine, Qatar, Ukraine)

Recalibrating innovation: science at the center of Africa's development

By **Nathalie Munyampenda**, Managing Director,
The Next Einstein Forum,* Kigali, Rwanda

*The Next Einstein Forum is an initiative of the African Institute for Mathematical Sciences (AIMS) that seeks to propel Africa onto the global scientific stage and make science relevant and cool for all ages. AIMS believes that the next Einstein will come from Africa.

“Like the rest of the world, we need to improve the way we learn so that we empower African children and give them opportunities to acquire the multidisciplinary skills that will allow them to be both great employees and employers,” says Nathalie Munyampenda, Managing Director of the Next Einstein Forum.



Photo: Courtesy of The Next Einstein Forum

If you stop a young girl or boy in any African city and ask them to name a famous African, the answer will vary from Sadio Mané or Mo Salah to Wizkid. The eyes of some may glaze over as they dream of starring in the next Black Panther movie or of creating a real Wakanda, (Black Panther's fictional homeland). If you ask the same girl or boy what they want to be when they grow up, they will likely enthuse about becoming a singer, an athlete, or following in the footsteps of Aliko Dangote, Africa's wealthiest entrepreneur, or Mark Zuckerberg. We want to be what we value. Most will not mention scientists or inventors. Why? Because science or "sciencepreneurship" is not cool. It is not a first choice career. This is what the Next Einstein Forum (NEF) is working to change.

So why is it important that we change this narrative? Every year, around 11 million young people enter the labor market in Africa. We are graduating more people than we are creating jobs. New jobs require new industries. Africa is quickly becoming the startup continent and that is a good thing, but it is not enough. Africa needs unicorns, companies that create industries and jobs and that have a transformative impact on African economies. How does this happen?

For the last 18 months, we have been working on a Pan-African vision and roadmap for the digital economy. We believe the digital economy is the single largest driver of innovation in Africa. What we have discovered in our roundtables with public and private sector actors is that Africa lacks a collaborative innovation framework to accelerate the digital economy and the gains that can flow from it. We need to redefine what innovation is and how innovation can transform our economies and societies.

Our message is simple. If we want to benefit from the digital economy, we need to view education as a value chain that requires different interventions at each level. At NEF, we have defined five pillars to accelerate the transformative impact of the digital economy or, in other words, to speed up the process of taking ideas from the lab and scaling them for the market.

“For years, African scientists and researchers have been involved in leading labs and research institutions all over the world, conducting breakthrough research in many strategic fields ... We need to create an environment for such innovation to happen in Africa.”

The first and second pillars (see page 41) relate to the need for basic and digital infrastructure. For many, it may seem that digital infrastructure (including last mile efforts) somehow removes the need to improve basic infrastructure. This is a shortsighted assumption. Africa needs to accelerate efforts to build and improve infrastructure. The ability to buy raw product online from farmers 500 kilometers away in another country may seem like the perfect solution, but a good road network and efficient custom services are still required to take possession of that product in an affordable way and to accelerate business growth.

FUNDING INNOVATION

The third pillar focuses on factors that support an enabling environment or ecosystem. Without a sound policy and regulatory environment that actively brings the public and private sectors and civil society together at an early stage, we will continue to advance at a snail's pace. How then can we speed up the process?

First, we need to explore what types of new financing instruments and partnerships are required to support the lab to market process at a Pan-African level. Until now – although this is likely to change soon – no mechanisms have been in place to finance pilot and demonstration projects in Africa in a systematic way. No comprehensive research and innovation fund exists in Africa.

Second, we need to improve awareness about the way in which intellectual property (IP) rights can add value to innovation and creativity and foster business growth. A recent study by WIPO covering the 19 African countries that make up the African Regional Intellectual Property Organization (ARIPO) shows that IP awareness on the continent is very low. We need to turn this around.

And third, we need to establish an open innovation framework and within that, develop strong technology transfer mechanisms in our universities and colleges, to help ensure that the new knowledge they create translates into the products and services required to address local challenges. If we are to harness the full benefit of IP, we need to tackle the barriers to greater IP awareness, and we need to address the need to establish and adequately fund effective technology transfer offices in a systematic way.

The Next Einstein Forum is developing a continent-wide state of science and innovation index to explore what it takes to be successful in innovation and to use that knowledge to recalibrate how we define innovation and how we ensure it is transformative. The role that IP plays in leveraging the value of innovation is one important aspect that will be reviewed in this exercise. We will be launching the first edition of the index in March 2020 at the NEF Global Gathering in Nairobi, Kenya.

CHANGING THE WAY WE LEARN

The last two pillars of our innovation framework focus on technology and talent. Like the rest of the world, we need to improve the way we learn so that we empower African children and give them opportunities to acquire the multidisciplinary skills that will allow them to be both great employees and employers. And of course, we need to make a deliberate effort to ensure girls remain in the science and technology pipeline. This doesn't just mean that going to university is an end goal. We need to anticipate our future needs – bearing in mind the impact that greater automation will have on our lives – and we need to invest in making sure we have the talent to create new value chains and industries.

At the tertiary level, we need to prepare students for the world of work and ensure they are employable, but we also need to make sure we keep some of our best minds in research. Without good researchers and engineers, we will always be subject to technology created for others and by others. There must be a deliberate effort and cultural shift across Africa to commit to scientific research and technology. Research must become the "it" profession.

At the post-graduate level, we need to partner with the private sector or find other innovative ways to fund research in priority areas. Developing new funding instruments is one of the continent's most urgent needs. This is even more critical in the commercialization phase, where millions of dollars are often needed to prove a concept, roll out a product and scale up production.

So what should be our priority areas? At NEF, we encourage governments to look at their competitive advantage, particularly now that the African Continental Free Trade Area is taking shape. We need to get better

“The digital economy is the single largest driver of innovation in Africa.”

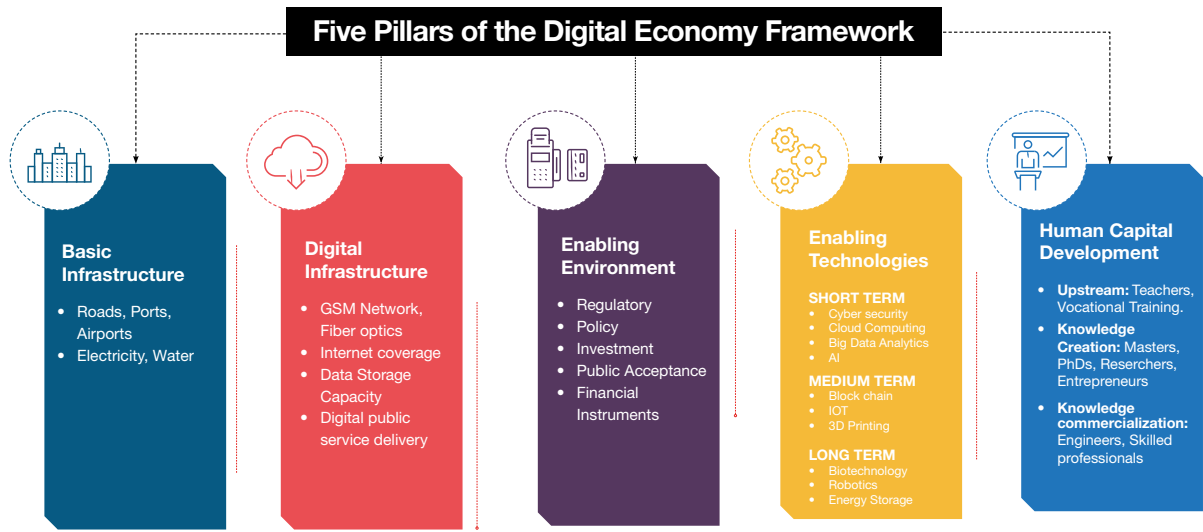
at pooling resources and focusing on key enabling technologies, particularly the immediate needs of cybersecurity, Big Data, artificial intelligence and machine learning, cloud computing and 5G. This should not be done in a vacuum. Again, national priorities and those involved in strengthening value chains must look at all aspects of the innovation framework and how it is to be funded. All the actors involved must be on the same page and need to ensure their respective contributions are geared to harnessing the social and economic benefits of these technologies.

MAKING SCIENCE COOL

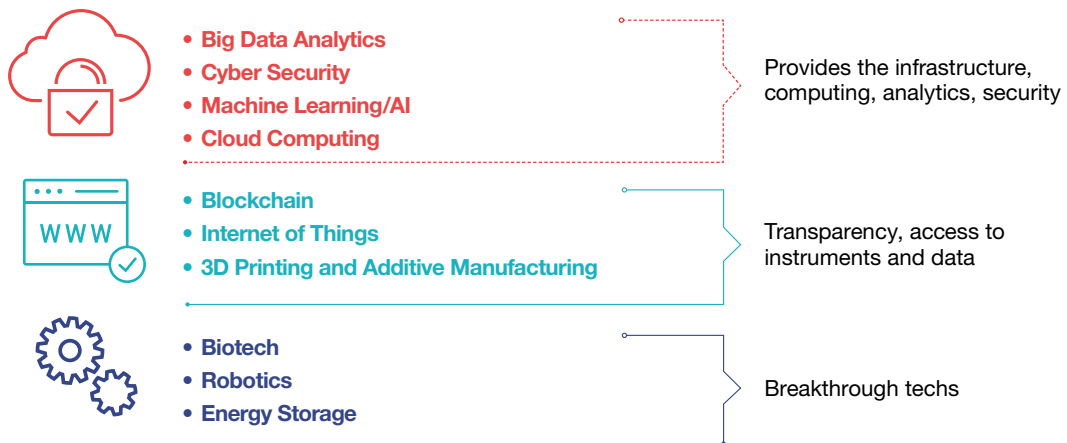
Where does NEF fit in? An initiative of the African Institute for Mathematical Sciences (AIMS), NEF has a bold ambition – that the next Einstein will be from Africa. As our President and CEO Thierry Zomahoun likes to say, “this isn’t a motivational speech, it is our blueprint.”

AIMS is training Africa’s top scientific talent, graduating Africans from 43 countries with master’s degrees in mathematical sciences or machine intelligence. We also recruit brilliant young researchers from across the world, bringing them back to Africa to work on real world problems using mathematics. And we train secondary school teachers to enable them to teach mathematics in a more interesting and compelling way so we keep girls and boys in the science, technology, engineering, mathematics (STEM) pipeline.

With more than 1,900 AIMS alumni applying mathematics to agriculture, health, trade and logistics, fintech, the circular economy, energy and power, and more, we have high hopes that Africa will soon move from a startup continent to the home of transformative innovation. The question of leveraging IP remains a critical challenge, one for which we must develop a clear plan that has strong public support.



Key Enabling Technologies for the Digital Economy



An initiative of the African Institute for Mathematical Sciences (AIMS), the Next Einstein Forum (NEF) has a bold ambition – that the next Einstein will be from Africa.

Courtesy of The Next Einstein Forum



“We need to improve awareness about the way in which IP rights can add value to innovation and creativity and foster business growth.”

At NEF, we are already seeing the fruits of our public engagement activities to make science cool. Our programs, particularly our NEF Fellows Programme, which recognizes top scientists in their field and who serve as invaluable role models, and our hands-on Africa Science Week, organized in over 30 African countries, are shifting the tide by demonstrating the impact that scientists can have on the development of Africa and the rest of the world. Young people are often surprised that an industrial chemist like Professor Peter Ngene, a Nigerian based in the Netherlands, can come up with a hydrogen-based eye sensor to detect lactose intolerance, or that a geneticist like Dr. Vinet Coetzee from South Africa, could create a non-invasive, low-cost way to detect malaria. We need to change the stories we tell around scientists, and these stories need to be grounded in fact and impact.

Africa Science Week will be held in over 35 countries this year. We will use interactive science activities as well as industry-scientist meetups, to put a human face on scientists and the important work they do in our countries. This program is led by our local STEM champions, NEF Ambassadors, young scientists, technologists and entrepreneurs, making every science week unique and contextually grounded.

Finally, to make important scientific work accessible, we run an online magazine, *Scientific African Magazine*, which makes research published in our journal, *Scientific African*, understandable for policymakers and the public. The articles are written by science journalists who are gifted in simplifying the very complex.

WORKING TOGETHER AND BETTER

Our work in developing the innovation framework has shown us a number of things. First, it has underlined how critically important it is for actors across value chains to work together to identify barriers and opportunities and to find ways to address these in a collaborative way. Second, we learned the importance of looking at innovative financing mechanisms to address funding needs. Third, it is clear that Africa will not catch up if we do not create our own technology. We need researchers, engineers and other technical talent. Our talent requirements for today and tomorrow's industries need to be mapped out and resources need to be secured in a systematic way to reach talent targets. For years, African scientists and researchers have been involved in leading labs and research institutions all over the world, conducting breakthrough research in many strategic fields including aerospace, cybersecurity, semiconductors, health and more. We need to create an environment for such innovation to happen in Africa. Fourth, we need a clear plan to leverage IP and promote greater use of the IP system. And fifth, we need to win over African citizens to the importance of science for development. This is critically important. We need to promote broader understanding of why large investments are needed in these areas and how each and every African can be part of the continent's scientific and technological renaissance. This, and strong political commitment, will take Africa to new heights.



Photo: Courtesy of The Next Einstein Forum

NEF undertakes a range of public engagement activities to make science cool among young people. These include Africa Science Week, which will be organized in more than 35 countries in 2020.

Gender equality in African agriculture: an innovation imperative

By **Wanjiru Kamau-Rutenberg**, Director,
African Women in Agricultural Research (AWARD),
Nairobi, Kenya

President Barack Obama once highlighted the importance of leveraging the talents of Africa's women using the analogy of a football match. He pointed out that any team that decides to only put half its players on the field is destined to lose the match.

Africa is playing a life-and-death match when it comes to food security, especially in the context of climate change and population growth. The need for the talents of a full team is more urgent than ever.

WOMEN IN AFRICAN AGRICULTURE

Women play a central and critical role in African agriculture. Around 62 percent of them are involved in farming. Women do the bulk of the work to produce, process and market food. They are on the frontline of agriculture. Yet when it comes to shaping research agendas, setting priorities, decision-making and leadership in agricultural research and development, women are heavily underrepresented. They account for just 22 percent of agricultural scientists, with just one in seven women occupying leadership positions in agricultural research.

This means we are playing with only half a team. We need to broaden our focus so that we leverage the talents of women and men. We can no longer afford to willfully leave women on the sidelines. We can no longer ignore their innovation potential. We need to embrace their amazing talents, their ability to solve problems and to innovate.

Women have so much to bring to the table. Their insights and perspectives can help researchers come up with effective solutions to address the unique challenges facing Africa's farmers, many of which are compounded by climate change.

UNLOCKING AFRICA'S AGRICULTURAL POTENTIAL

Africa needs to build a robust and efficient agricultural research and innovation ecosystem. Our ability to make African agriculture more productive, profitable and sustainable depends on it.

In a context of climate change, rapid urbanization and rampant malnutrition, we need to ensure that African "agripreneurs," especially farmers, have access to the type of

This article was first published in Issue 2/2018 of the *WIPO Magazine*



Photo: Courtesy of AWARD

Christine Onyango (second from left), Senior Lecturer at the Faculty of Agriculture at Kenyatta University, teaches her students milk processing. “Innovation has a critical role to play in every step of the agricultural value chain,” says Wanjiru Kamau-Rutenberg.

innovations they need to overcome the unique challenges they face. If we are to feed ourselves and build thriving economies, it is imperative that we increase the pace of agricultural innovation. We can no longer afford to outsource our agricultural research needs. We need to leverage the talents of all innovators, including those of women. Only then will we deliver workable solutions that are relevant to the needs of Africa’s farmers. We cannot afford to play with half a team!

Innovation has a critical role to play at every step of the agriculture value chain. Take indigenous vegetables, of which there are many in Africa. Many of them are being overharvested in the wild. There is a serious role for agricultural research to expand our knowledge in this area. How do we ensure they are farmed sustainably? How can we help farmers develop thriving businesses around indigenous plants and vegetables? And how can we help consumers understand the nutritional value of these crops? There is a role for innovation at every step.

TOWARD INCLUSIVE AGRICULTURE-DRIVEN PROSPERITY

Recognizing the need to draw on 100 percent of available talent, over the past decade African Women in Agricultural Research Development (AWARD) has been working to promote inclusive agriculture-driven prosperity

for Africa. Our aim is to build an agricultural sector that responds to the needs and priorities of women and men across agriculture value chains. Our training programs are helping to build a critical mass of capable, confident and influential women scientists to lead critical advances in agricultural research and innovation.

Through our flagship AWARD Fellowship initiative, for example, we have strengthened the science, leadership and mentoring skills of 1,158 scientists from more than 300 research institutions in 16 African countries. The women who take part in these programs are tackling some of the most intractable problems facing farmers.

They include Filomena Dos Anjos, a 2008 AWARD Fellow and a leading animal health scientist from Mozambique. Ms. Dos Anjos is breaking new ground in the health and husbandry of indigenous chicken, which are an important source of protein and income in her country. She works with women and young farmers to promote the use of a thermo-tolerant vaccine against the deadly Newcastle Disease, and on brooding and feeding technologies to improve productivity. Her work is helping to strengthen the food security and incomes of these chicken farmers.

In her doctoral research, Phyllis Muturi, a 2013 AWARD Fellow from Kenya, is focusing on high-yielding drought-tolerant varieties of sorghum, a prized crop

The research
done by
women in
Africa is not
finding its
way into the
hands of
those who
most need it –
the farmers,
the majority
of whom are
women.

and food source in Kenya's drylands. "I see significant improvement and conservation of sorghum in Kenya, with research yielding new sorghum varieties that perform far better than their predecessors in terms of grain yield and stem borer attack resistance," she says.

And Yenesew Mengiste Yihun, a 2015 AWARD Fellow and agricultural engineer from Ethiopia, is working with smallholders to improve water management practices. "Research is important to alleviate problems for rural farmers," says Dr. Yihun. "If we produce more, the country will be self-sustained and food secure." Dr. Yihun provides smallholder farmers with practical solutions to manage their resources more efficiently. "I respect their indigenous knowledge and show them how they can use irrigation to make their efforts more successful," she says.

As a recent review of the gender gap in African agricultural research capacity in the *Journal of Gender, Agriculture and Food Security* (April 27, 2017) confirms, training female scientists in the areas of mentoring, leadership and scientific research has a transformative effect not just on each scientist's own career, but on the performance of their institution.

INTELLECTUAL PROPERTY AS A DRIVER OF AGRICULTURAL INNOVATION

At AWARD we recognize that intellectual property (IP) has a key role to play in ensuring that agricultural research translates into practical solutions that get into the hands of farmers and other actors along agriculture value chains. IP unlocks the transformative potential of agricultural research by making it available to and attractive for private sector players to develop and commercialize technological innovations for widespread distribution and uptake by farmers and others.

The potential of IP to drive the transformation of African agriculture has been recognized at the highest levels of government. In 2016, the African Union Heads of State and Government endorsed the Dakar Declaration on Intellectual Property for Africa. The Declaration recognizes "the importance and relevance of intellectual property for innovation and creativity in the knowledge-based economy." It further emphasizes "the role of IP in advancing

2008 AWARD Fellow Filomena Dos Anjos from Mozambique. Ms. Dos Anjos' work centers on improving the quality and health of indigenous poultry.



Photo: Courtesy of AWAFRD

Photo: Courtesy of AWARD



Women play a critical role in African agriculture. Around 62 percent of them are involved in farming yet they are heavily underrepresented when it comes to shaping agricultural research and development agendas.

innovation for sustainable agricultural technologies, for the use and transfer of environmentally sound technologies, and to help guarantee food security... and combat the negative effect of climate change..." And it calls upon the World Intellectual Property Organization (WIPO), as the global forum for IP services, policy, information and cooperation, "to lead the development of a balanced and effective international IP system that enables innovation and creativity for the benefit of all."

In this context, we need to redouble efforts to ensure that Africa's female scientists have a place at the table and play an active role in shaping the continent's agricultural landscape.

A GENDER GAP IN INNOVATION

Research by WIPO indicates that while globally the number of women using the international patent system has increased over time, it will be decades before we see women patenting their innovations at the same rate as their male counterparts. These data show that in 2015, just one-third of international patent applications filed featured the name of a woman inventor. We already know that women are less likely to be named as authors in scientific publications. Now, there is evidence of a yawning gender gap in the use of WIPO's Patent Cooperation Treaty (PCT), which facilitates the process of obtaining patent protection in more than 150 countries.

While more research is needed to establish the extent of the IP gender gap in Africa, the low proportion of women in science and technology across the continent, and generally low levels of patenting activity, suggest that the

research done by women in Africa is not finding its way into the hands of those who most need it – the farmers, the majority of whom are women.

Existing gender gaps in agricultural research and the use of IP have potentially dire consequences for Africa's agriculture and food security. The continent is facing intense challenges. We need to support innovation to find effective solutions. Yet we are saddled with a system that fails to make efficient use of the talents of at least half the population. We have a system that impedes the participation of women in scientific research and fails to support female scientists in the practical application of their research at the farm gate and across agriculture value chains. Much of their research simply gathers dust on a shelf when it could actively support agricultural and agribusiness development across the continent.

WE NEED TO ACT NOW

Gender is attracting a great deal of attention, and that is a good thing. But we still need to find ways to ensure that more women are able to have an equal voice in developing innovative technologies and creative solutions to address the daunting challenges we face. WIPO data suggest that at current rates, we will not see gender parity in the use of the international patent system until 2070. We cannot wait that long!

Our problems are far too pressing. Our survival and future prosperity hinges on making the best use of all the talent we have and leveraging it to produce the technologies we need to boost efficiency, productivity and profitability across agriculture value chains.



Photo: Alamy Stock Photo / Peter Alexander

“Women do the bulk of the work to produce, process and market food. They are on the frontline of agriculture in Africa, notes Wanjiru Kamau-Rutenberg.

That is why in 2017, in a further attempt to move the dial on gender in African agriculture, AWARD partnered with WIPO in holding a regional conference on *Innovation and Intellectual Property as Engines for Competitive Agribusiness: Empowering Women Researchers and Entrepreneurs in Africa*. The conference brought together more than 200 African women agricultural scientists and agribusiness owners. It was an invaluable opportunity for them to learn more about the IP system: how IP information can support their research and how IP rights can be used to ensure that their high-quality research translates into marketable solutions that are widely available at the farm gate. Our participation in this important event, which was organized with the support of the governments of France, Morocco and Japan, is part of our ongoing commitment to ensuring that the full potential of Africa’s talent base is realized.

By utilizing women’s talents to the fullest extent, we will be better placed to leverage science, technology and innovation to solve the chronic and pressing problems facing the continent, particularly with respect to food security and climate change.

Intellectual property policies for universities

Universities and public research institutions (PRIs) play an important role in advancing the frontiers of science and technology. They are the birthplace of pioneering discoveries and inventions that have enhanced the lives of millions. Knowledge and technology generated in universities and public research institutions can have immense economic and societal benefit.

In order to bring research results to the next stage of development, universities and public research institutions need a policy for effective intellectual property (IP) management and knowledge transfer. An IP policy provides structure, predictability, and a beneficial environment in which enterprises and researchers can access and share knowledge, technology and IP.

THE ROLE OF IP IN RESEARCH AND TEACHING

Intellectual property plays an essential role in the teaching and research functions of universities and public research institutions. Whether it is basic “blue-sky” or applied research, through their research and development (R&D) activities, universities and public research institutions produce results in the form of inventions. Many of these inventions are patentable, but are often no more than a proof of concept of a laboratory-scale prototype, which require further R&D prior to possible commercialization. By granting universities and public research institutions the rights to their own IP derived from publicly funded research, and allowing them to commercialize their results, governments around the world are trying to accelerate the transformation of research-based inventions into industrial processes and products by strengthening collaborative ties among universities and industry.

In addition, the teaching activities of a university or public research institute will generate IP in the form of teaching materials, theses, software and designs. While the Internet and other modern technologies have fostered greater access to scholarly materials, these advanced technologies have also given rise to a growing number of disputes over the ownership and use of these materials.

“Knowledge and technology generated in universities and public research institutions can have immense economic and societal benefit.”

The *WIPO IP Policy Toolkit for Universities and Research Institutions* (IP Policy Toolkit) provides all the relevant elements to develop an institutional IP policy.



What an IP policy seeks to achieve

The main goals of an IP policy are to:

- Provide legal certainty;
- Promote scientific research and technological development;
- Encourage researchers to consider the possible opportunities for exploiting an invention in order to increase the flow of benefits to society;
- Provide an environment that supports and encourages innovation and development;
- Balance the various competing interests of universities, industry and society;
- Ensure compliance with applicable national laws and regulations.

Further information is available at: www.wipo.int/about-ip/en/universities_research/ip_policies/#database.

WHY DO UNIVERSITIES AND PUBLIC RESEARCH INSTITUTIONS NEED AN IP POLICY?

Traditionally, universities serve the public interest by providing graduates to meet the needs of industry and business. With that focus, universities have published the results of research activities and have made them freely available. Today, this is often viewed as incompatible with industry's need to keep information confidential and to protect it with IP rights, such as patents. This, coupled with the process of globalization, is requiring universities and public research institutes to collaborate more closely with business partners at home and abroad, which, in turn, means taking steps to adequately protect and manage research results through effective use of the IP system.

In an era where universities and public research institutions are expected to more actively participate in economic development, innovation and IP takes on growing importance. This evolving context is driving universities and public research institutions to explore strategies that will leverage their IP assets, while also preserving their essential character as educational and research institutions. Institutional IP policies are a first step in doing so.

ADVANTAGES OF AN INSTITUTIONAL IP POLICY

An institutional IP policy clarifies the ownership of and right to use the IP resulting from the institution's own or collaborative R&D activities. It sets out the institution's strategy when it comes to identifying, evaluating, protecting and managing IP for its further development, usually through some form of commercialization. Such a policy also provides a transparent framework for cooperation with third parties and provides guidelines on the sharing of economic benefits arising from the commercialization of IP.

Without a formal policy to regulate the ownership and use of IP rights, the different stakeholders in a partnership involving academia (e.g. professors, researchers, students) and commercialization partners (e.g. industrial sponsors, consultants, non-profit organizations, small and medium-sized enterprises and governments) would have no guidance on how to make

decisions concerning IP. This could inhibit the process of commercializing research results.

WIPO IP POLICY TOOLKIT FOR UNIVERSITIES AND RESEARCH INSTITUTIONS

Since 2015, WIPO has been developing a toolkit to support its member states and their universities and public research institutions in developing customized IP policies. The *WIPO IP Policy Toolkit for Universities and Research Institutions* (IP Policy Toolkit) provides all the relevant elements to develop an institutional IP policy. It consists of six components:

Volume 1:

- An IP Policy Template for Universities and Research Institutions
- Guidelines for Implementation of the IP Policy Template
- Policy Writer's Checklist

Volume 2:

- A Roadmap for the Utilization of Academic Assets
- Model Agreements
- Hypothetical Cases

The IP Policy Template and its Guidelines provide universities with a range of options with regard to specific provisions on IP-related matters. The aim is to promote reflection and critical thinking, to encourage responsible IP commercialization of academic research results.

In general terms, the IP Policy Toolkit is designed to help policy makers make informed decisions when developing their institutional IP policy, and to give researchers and faculty an insight into IP issues relevant to a university setting. The Toolkit also seeks to promote the modernization and harmonization of IP management practices within higher education with a view to enhancing university-industry collaborations and contributing to economic and social development.



34, chemin des Colombettes
P.O. Box 18
CH-1211 Geneva 20
Switzerland

Tel: +41 22 338 91 11
Fax: +41 22 733 54 28

For contact details of WIPO's External Offices
visit: www.wipo.int/about-wipo/en/offices

WIPO Magazine is published bimonthly and distributed free of charge by the World Intellectual Property Organization (WIPO), Geneva, Switzerland. It is intended to help broaden public understanding of intellectual property and of WIPO's work, and is not an official document of WIPO.

The designations employed and the presentation of material throughout this publication do not imply the expression of any opinion whatsoever on the part of WIPO concerning the legal status of any country, territory or area or of its authorities, or concerning the delimitation of its frontiers or boundaries.

This publication is not intended to reflect the views of the Member States or the WIPO Secretariat.

The mention of specific companies or products of manufacturers does not imply that they are endorsed or recommended by WIPO in preference to others of a similar nature that are not mentioned.

For comments or questions, contact The Editor at WipoMagazine@wipo.int.

To order a print version of the WIPO Magazine, contact publications.mail@wipo.int.

WIPO Publication No. 121(E)
ISSN 1020-7074 (print)
ISSN 1564-7854 (online)