

**The Keys to the Kingdom:
Innovation, Intellectual Property and the Wealth of Nations**

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Innovation is the central issue in economic prosperity.

– Professor Michael Porter, Harvard University

Why Innovation Matters for Africa's Future

As Africa, frequently referred to as “the last frontier” in the global economy faces its future, it is confronted by what I call the globalization paradox. Globalization is the inevitable context in which the continent seeks to prosper in a globalized world. It is a controversial concept with deep implications for the control of national and continental destinies, including that of this emerging market of one billion people. How can African countries and their economies advance in this new and unusual universe? Has globalization led to increased poverty or prosperity in the continent, and can it be an opportunity for Africa?

Globalization is the process of increased interconnectedness of the economies of previously well demarcated nation states; the phenomenon of the instant transmission of ideas, events and culture over long distances through the instrumentality of technology, and the impact of these processes on local environments. It narrows the gaps and distances between nations and peoples.

Two dimensions of the concept of globalization are relevant here. First, technology is its chief instrument. The internet has made the world a small, interconnected place; Africa has come to have 700 million mobile phone users, more than the United States and Europe. Second, beyond, this, globalization is driven by ambition, or what is called global intent. This is the intent to dominate, technologically and hence economically. Globalization is thus not benign in its intention nor is it agnostic in its belief. This global intent is part of a worldview, and those who have it and know how to turn it into concrete reality end up dominating the global economy through their technological prowess, as well as military superiority.

This technological ability is reflected in the manufacturing base of industrial economies. Most of world trade (55 per cent) is trade in manufactured goods, which are the products of technological innovation. This is the link between globalization, innovation, technology, and economics.

It is in the uncritical embrace of globalization without engaging its critical enabler of innovation and technology that African countries have missed the point.

Nevertheless, one of the paradoxes of globalization is that the phenomenon has so

opened up the world and its inhabitants to each other that the prospects and opportunities for economic advancement are now almost universal.

The Knowledge Society

The 21st century global economy is a knowledge economy. To secure the future, African countries must lay the foundation for the continent's economic transformation by designing and creating knowledge societies. It is knowledge as a factor of production that makes possible a paradigm shift away from natural factor endowments such as land and labor and natural resources towards the production of complex products.

What exactly, then, is this knowledge economy? According to the American management guru Peter Drucker, who popularized the term "knowledge society", the knowledge economy is one in which intellectual property – knowledge and information systems that drive an ever-increasing pace of scientific and technological advances that are quickly overtaken by new knowledge – is the basis of production and services. Knowledge, not characteristics such as physical attributes or social class, traditional groups such as farmers and craftsmen, or individual production, is the driving force of economic activity or social transformation. In the knowledge economy, older measures of competitiveness such as labor, costs, resource endowments, and infrastructure have fallen behind such things as patents, research and development (R&D) and the availability of knowledge workers.

Knowledge economies are built on two things, both of which are directly linked to knowledge work, and are also interconnected. The first is innovation, and the second is education. Both dimensions are also linked to the worldview approach to development, which I have argued in my book *Emerging Africa*. Through the inventions or improvements it spawns, innovation gives expression to worldviews because it is an expression of rational futurology. Innovation is based on a view of what the human future should or will look like. Education is the tool, and the foundation, for constructing group worldviews. It is what inculcates value systems, gives expression to systems of knowledge, and helps us construct the building blocks of our worldviews.

Patents and other kinds of intellectual property are the engine drivers of the knowledge economy. Patents provide incentives for innovation, which is why companies in the knowledge economy spend huge sums of money on research and development (R & D).

The absence of a link between science, *commercialized* indigenous innovation, and economic and business activity is a fundamental obstacle between Africa and a quantum leap to prosperity. This gap is all the more tragic because science and technology is one area in which African countries can quickly develop global competitive advantage over the Western world and even Asia, if African nations were to take the critical policy implementation actions.

Science, Technology and Wealth

Having sketched a broad outline of the knowledge society, we should now consider why African countries must invest in science and technology, how science creates wealth, and what Africa must do to achieve this “new liberation” – using its untapped natural wealth, human resources, and effective policy execution to create explosive wealth that by-passes Western-led globalization and creates national and continental technology hubs. This is what will reposition Africa with advantage in the phenomenon of globalization. Without it, we are merely a market for the products of globalization.

The secret that lies behind science and the prosperity of nations is simple but profound: Ideas matter. Making use of natural phenomena and properties and adopting these properties to practical use is essential to improving the quality of human existence. When this happens, and when the inventions and innovations that stem from the process of scientific inquiry and research are popularized for commercial value, efficiencies and utilities are created. We can do things faster and better. What previously seemed impossible becomes possible. Productivity increases. Wealth = whether that of nations or individuals, including the owner of the idea that created the innovation - is the result.

Africa has fallen behind because its people, despite their historical abilities in science, have not done this in an organized manner. The more the Western world was able to invent and innovate in the past 300 years, the more “civilized” it became. And as Africa in comparison remained closer to nature and was dominated by natural phenomena, the more “primitive” and backward the continent seemed.

It is not always apparent that the provenance of most of the world's wealth is less than two centuries old. Thus, before the inventions of the 18th, 19th and 20th centuries, mankind's economic progress was extremely slow, and poverty was a dominant state even in today's industrialized world. This is because for as long as human muscle and animal power performed most of mankind's agricultural, industrial, engineering and military tasks, there were severe limits to what could be achieved.

The dam burst with the invention of the steam engine by James Watt in 1775 and its subsequent application to shipping, which replaced the crude sail used for centuries earlier, and to railroad travel, as well as with the invention of the Morse Code telegraph by New York University professor Samuel Morse in 1835. The Morse Code demonstrated that messages could be transmitted by wire using electric impulses in a world in which it previously took days, weeks and months to relay messages across large distances. These two inventions practically shrank the globe and began an era of increased globalization.

The adaptation of electric power to industrial and residential use by engineers in the 19th century, such as Michael Faraday who invented the electric motor in 1821, and

Thomas Edison who invented a light bulb that produced incandescent electric light in 1879, completed the foundations of modern industrial society as electricity spread around the world. Edison, who held a record 1093 invention patents in his lifetime, founded the Edison General Electric Company, which merged with a competitor firm in 1892 to form the U.S. conglomerate General Electric, now one of the world's largest companies. Today, GE is expanding its business in Africa, with presence in Angola, Ghana, Kenya, Nigeria and South Africa, 1,500 employees and \$3.6 billion in revenues in Africa in 2010, and sees the continent as a key market for the global corporation's future growth.

There are a number of factors that determine whether or not technology and innovation can thrive in any society, and African countries will not succeed in creating technology-generated wealth if they do not pay attention to these prerequisites.

A Priori

First, African countries need to make technology and innovation a strategic priority from the standpoint of a worldview that Africa *can* invent and innovate, and must do so in order to liberate itself from the oppressive dominance of globalization.

Kenya is moving faster to establish itself as a technology hub on the continent. The East African country launched a \$14.5 billion "silicon city" in Konza, a 2,000 hectare city 60 kilometers from Nairobi and designed to turn Kenya into an attractive location for technology businesses and incubators.

The "silicon savannah" project is ambitious, and is set to challenge South Africa's continental dominance of the technology industry. Scheduled for completion in 2020, the Konza Technology City seeks to capitalize on the country's track record and reputation: 9 out of 10 Kenyans have mobile phones, and the country has pioneered the use of mobile phone banking system, the M-Pesa, that is widely admired and now imitated around the world for efficient payment systems and to increase access by the poor to financial services. Nairobi, the capital, hosts an Innovation Hub, and Kenya's Information and Communication Technology Board already offers grants from \$10,000 for individuals and teams and \$50,000 for companies to build local web and mobile applications. Technology-focused venture capital firms are already emerging in the Kenya's landscape. This is the sort of practical role African country governments need to play to begin to move the technology-for-development agenda forward. As far back as the 19th century, the US Congress in 1843 provided \$30,000 to Samuel Morse to construct the experimental telegraph line between Washington D.C and Baltimore.

Second, although African governments need to create enabling environments for innovation, they must avoid seeking to control the innovation process. This requires a clear line between government support and allowing private innovation initiatives room to thrive. Private research laboratories should be encouraged with funding from the

private sector and government policy support, to enable them or other innovation centers take their results to the market. But governments should never seek to control scientific inquiry or innovation for political or other reasons.

Third, institutions and markets must exist in order to enable technology and innovation to thrive. Institutions include those that protect and regulate private property. Markets mean environments that offer commercial applications for innovation, with the private sector, not governments playing the most important role except in the case of industries such as defense. The two most important institutions for an innovation-driven economy are government offices or institutions which are specifically tasked with authority to grant intellectual property rights, the right to exclusive rights to creation of the mind – inventions (patents), literary and artistic works (copyright), and symbols, names, images and designs used in business (trademarks) – and to promote the creation of intellectual property. Also essential are judicial institutions that protect such property, making its ownership secure, worthwhile, and ensuring that intellectual property owners have fair opportunities to obtain the commercial rewards for their creations that markets can confer.

The institutions of intellectual property are national and international. At the national levels many countries have institutions such as the UK Intellectual Property Office, the Nigerian Copyright Commission, and Nigeria's National Office for Technology Acquisition and Promotion (NOTAP). These institutions in developed countries have developed intellectual property into a mature, sophisticated instrument of wealth creation from shaky foundations. In the United States, an intellectual property clause that provides for patent and copyright systems was enshrined in the very first article of the Constitution, directing the U.S. Congress to “promote the progress of science and useful arts by securing the authors and inventors the rights to their respective writings and discoveries”.

At a global level, the World Intellectual Property Organization (WIPO), a United Nations agency, promotes innovation through an intellectual property system. That system includes the global registration and protection of patents, copyrights, trademarks and designs, and the resolution of intellectual property disputes. The WIPO helps develop the international legal framework for intellectual property, builds networks for collaboration amongst countries, and helps developing countries build capacity to use intellectual property to make economic progress.

But African nations have not translated into their mainstream national life the issues discussed and agreed at WIPO's Geneva headquarters. Thus, the WIPO regime, while necessary for global harmonization of intellectual property rules, provides an opportunity for international harmonization for the industrialized countries where intellectual property has developed through *national* policies and systems. African countries must build these institutions and systems in their own jurisdictions.

In Africa these institutions are weak, and so innovation-driven economies do not exist.

Because the structure of African economies is import and consumer driven, building and strengthening intellectual property institutions is not seen as a strategic national priority. But that is precisely why it should be, for it is only innovation that can break this structural dependency. South Africa is an exception. It has moved to link intellectual property with a global competition business strategy by creating a new Companies and Intellectual Property Commission designed to give effect to the goals of the South Africa's New Companies Act of 2008, which aims to promote innovation and growth by assisting South African companies become more competitive in the global context.

This forward-looking initiative leads us straight into the matter of markets for innovation. Without business, either individual companies or the organized private sector, an innovation economy will not be created. Inventions and innovations require funding by venture capital firms and by large corporations through R&D. The early inventors and innovators in the Western world were always backed by wealthy businessmen – financiers whose sole purpose in these partnerships was to ensure financial support for the inventive process and take the resulting products to the market for commercial use through mass production, and split the monetary rewards with the inventor.

There are two types of economic growth – “extensive” and “intensive” growth. The first results from adding greater numbers or quantities of factor endowments such as land, labor, capital and resources. But this kind of growth ultimately leads to diminishing returns. The second sort of growth comes from discovering better ways of production using the same or even less inputs such as workers or resources, and allowing constant increases of income and welfare. Intensive growth allows a country's economy to grow even as its population decreases, and is based on innovation.

African companies therefore need to invest in R&D aimed at yielding new products or improving existing products and procedures and gaining competitive advantage. Although African economies may be seen as still at basic levels relative to the West and Asia, there are an increasing number of companies that can profitably engage in R&D – although such activities tend to have a longer term perspective.

The fourth requirement that African countries must meet in order to develop innovation-powered economies is that of creating a social consensus on innovation. This sort of consensus scarcely exists. But it means that innovation and its practical applications in society must be popularized, and a specific, conscious awareness of it built.

To be sure, there is an increasing social consensus about internet technology, computers and the technological wonders of mobile telephony in Africa, but mostly as *consumers*. There are 120 million mobile phone subscribers in Nigeria alone. African countries need to build social consensus around innovation that will lead to the continent's true development – including innovation in agriculture that will increase crop yields with less acreage, as Israel has done by turning deserts into farmland, and in healthcare to combat deadly diseases such as malaria.

African Science

Africa has advantages that the continent's countries can deploy, through a worldview prism, to turn its destiny around by improving the quality of life of its one billion inhabitants, creating wealth for its national economies, and developing genuine competitive advantage in the context of the global economy. Three or four of such distinct advantages easily come to mind.

First is Africa's scientific heritage – the rich history of science in Africa that goes back thousands of years. This rich history of Africa's contributions to early science and technology that predated the European Renaissance and the modern Western scientific inventions of the past three centuries have been buried in the womb of history, out of sight to much of the world including today's Africans, by a Eurocentric accounting and interpretation of world history. Thus, Africans today often associate science and technology almost instinctively with the Western mind, buying into a worldview deliberately constructed and established as part of a quest for global domination.

But the historical facts are clear. Scientific and mathematical knowledge, as well as medical knowledge, existed in advanced forms in ancient African societies. Manuscripts discovered in Timbuktu in today's Mali showed that Africans there were versed in astronomy. The manuscripts contained complex mathematical diagrams of planets and orbits and recorded astronomical events that included a meteoric shower in 1583. The Egyptian pyramids were technological feats unrivalled for thousands of years, and the Great Pyramid of Giza remained the world's tallest man-made structure for 3,800 years, long before the Empire State Building in New York, the Petronas Towers in Kuala Lumpur, and the Burj Khalifa in Dubai. And European explorers in the 19th century African Great Lakes region observed caesarean section surgical operations performed by indigenous healers in Kahura, Uganda in 1879.

Against this backdrop, it should be obvious that "African science" is not just the popular perception about the manipulation of supernatural phenomena that pervades African societies, but in fact was underpinned by natural, empirical scientific knowledge more advanced than what obtained in what is today the Western World, thousands of years ago, and certainly rivaled it as the gap narrowed in the last few hundred years and Africa went into a period of reversal as a result of colonialism. With the confidence that this knowledge of recorded history should imbibe, Africans have a basis to develop a worldview that approaches technology and innovation from the standpoint, not of an alien wonder, but of reclaiming a lost heritage.

Second, Africa has natural habitats that offer bountiful raw materials for scientific advance and innovation. This is famously so in the case of pharmaceuticals and medicine. The abundance of natural herbs with healing properties in African

ecosystems – some of which have been exploited by individual Western countries to develop medicines – offers a wide scope of opportunities for the development of evidence-based pharmacy and medicine. Nigerian researchers, for example, have done much work in these areas, but the problem of a lack of social consensus on innovation remains, and research findings often remain at the level of basic science as opposed to applied science.

Third, African countries have amazing local talent pools of innovations. Their output in Kenya is gradually receiving global attention as “apps” are manufactured for global use. In Nigeria, thousands of young men and women have accomplished prototypes of innovations which would improve agriculture, manufacturing, and telecommunication if they were to be developed and commercialized in a systematic manner.

The young inventors, most of them fresh university graduates or students in high schools and universities, often lack the confidence to take their innovations forward because they have no knowledge of how patent systems work in the country and live in mortal fear of the theft of their innovations. They have no funding of their own and there exists no organized framework for matching them to private sector or government funding.

Finally, Africa has thousands of scientists in Diaspora contributing their skills and know-how to building knowledge economies in Europe, United States and Asia. This is Africa's greatest tragedy. It is estimated that 40 per cent of African-born scientists live and work in OECD countries, and this is apart from those in North America and Asia. It is believed that there are more African scientists and engineers working in the United States than in all of Africa. Unless these brilliant minds return to their countries and are positioned through effective strategy formulation and execution, Africa's hope for a true renaissance will not be fulfilled. Why is this so, despite the abundance of local technological talent? It is because these emigrés have the experience of the organization, teamwork and management of research and innovation essential to the creation of knowledge economies. It is the combination of the experience and exposure to global standards of these scientists and the local innovators' knowledge of the local African environments that will form the bulwark of a technological revolution in Africa.

This outcome requires a level of strategy execution not common in African countries, but which has been successfully adopted by nations such as Israel, China and India – countries that have made careful and effective use of their nationals with foreign technological experience. The debate about how the “scientific diaspora” can help Africa is important, but contrary to conventional wisdom, the chances of their making impact by remaining abroad but collaborating with scientists back home is limited. Large enough numbers of these brains in export must return to the continent. The challenge that faces public policy and business is to create a truly enabling and empowering environment that will offer them adequate incentives to do so.

This will require money, lots of it. Science and technology is not cheap. Funding

research, technology and innovation is expensive, as we have seen. The scientific diaspora will not return to work pro bono or for a pittance in remuneration or research funding. So where will the money come from? First, African countries should not work on the assumption that they do not have the requisite financial resources for such a big-ticket item as STI financing. A reallocation of resources can certainly achieve the required levels of funding for an organized return and deployment of the scientific diaspora. In addition, however, it could help to have large global foundations such as the Bill and Melinda Gates Foundation, the Rockefeller Foundation and others to devote targeted funds that will cover both the remuneration of such scientists and actual research funding, although in doing so an African country must take steps to ensure that it owns the outcome of such a strategy.

The Innovation- Human Capital Link as the Secret of Transformation

There is a crisis of education in African, and this has implications for innovation.

Education in many African countries is in disrepair and, consequently, in despair. Although primary education enrolment increased by 18 per cent between 1999 and 2009, from 58 per cent to 76 per cent, these numbers mask many fundamental problems. Thirty million primary school age children are out of school, with 10 million of them in Nigeria alone. And the continent has the lowest rates of secondary school enrolment rates in the world. Only 28 per cent of Africa's youths are enrolled in secondary school, and while a child entering the education systems of an OECD country has an 80 per cent likelihood of going on to university or some other form of tertiary education, only 6 per cent in sub-Saharan Africa have similar chances. And according to the Learning Barometer, a study conducted by the Centre for Universal Education at the Brookings Institution in Washington DC, 61 million African children will grow to adolescence with no basic literacy or numeracy skills. With these education statistics, the future of the continent is no cause for optimism, except such a future is re-imagined and redesigned.

Education is the key to Africa's future because it is critical to the development of the worldview of transformation that Africa needs. Knowledge obtained through education systems shapes interpretations of the world from the early ages of citizens.

Second, education actualizes worldviews and visions of economic transformation. This happens in so many ways. Education, especially science and technology, directly creates a strong basis for inventions and innovations. Thus, the education systems of the emerging economic powers of Asia, for instance, have been designed to prioritize obtaining and applying science and technology to improve the quality of life of their citizens and to support economic growth by producing the human capital with skills that make real economic transformations possible. An illiterate society cannot replicate this kind of progress.

Solutions

One real role African governments can play to good effect is to invest heavily in targeted, high quality teacher training at all levels. Teacher training in pedagogy and educational administration through a train-the-trainers approach that immediately begins to cascade skills and knowledge in education planning, management and classroom teaching, as well as subject matter competence with emphasis on science and technology, should be emphasized. This of course includes computer literacy as a basic component.

An overhaul of the curriculum is needed. Civic subjects such as history, values such as ethics, patriotism and leadership need to become compulsory in primary and secondary schools to ensure that schools actually educate to the needs of the society and begin the long process of turning around the ethos of African societies and shaping the worldviews of the continent's youth. Science and technology, as well as entrepreneurial training, must become the strategic direction of education in Nigeria.

Third, business corporations need to become more involved in the funding of education in Africa in a strategic and systematic manner beyond symbolic corporate citizenship.

Fourth, a strategic approach to attract foreign direct investment in education and human capital development in African countries must become a government priority. Attracting such "education investors" will serve Africa's strategic interests. It will build human capital skilled enough to serve the country's domestic STI needs and also provide the sort of technical skills foreign investors seek as a location factor. This strategy will increase the chances of foreign investments that will actually create jobs in light and middle-level manufacturing, as investors look to diversify away from countries such as China with its increasingly high labor wages.

Finally, African governments must agree on a fundamental revamp of their education sectors as an essential policy direction, and the re-invigoration of the country's productive capacity within the worldview context. This will have to be backed up by effective communication that galvanizes public support for such a strategy.

China is already ahead, with a game plan that it is painstakingly executing. The Asian giant's strategy is to take another "great leap forward" in human capital by making a \$250 billion-a-year investment in the education of tens of millions of young Chinese people and overhauling its current system in which a small educated elite supervises large numbers of semi-trained factory workers and rural workers that make up much of the country's workforce, and achieve a more broadly educated public that will rival European and American societies in human talent, moving up the totem pole of

development.

African countries need to be making a similar effort. It requires a long range perspective, a clear strategy anchored on a worldview, which as we can see is what drives China. It is doubly important for Africa to begin to make massive investments in human capital. Otherwise, claims of Africa Rising could be laid low in the coming years by a reality different from dreams. But, if successful, the rewards of such a vital undertaking will clearly reflect in the wealth of its people.