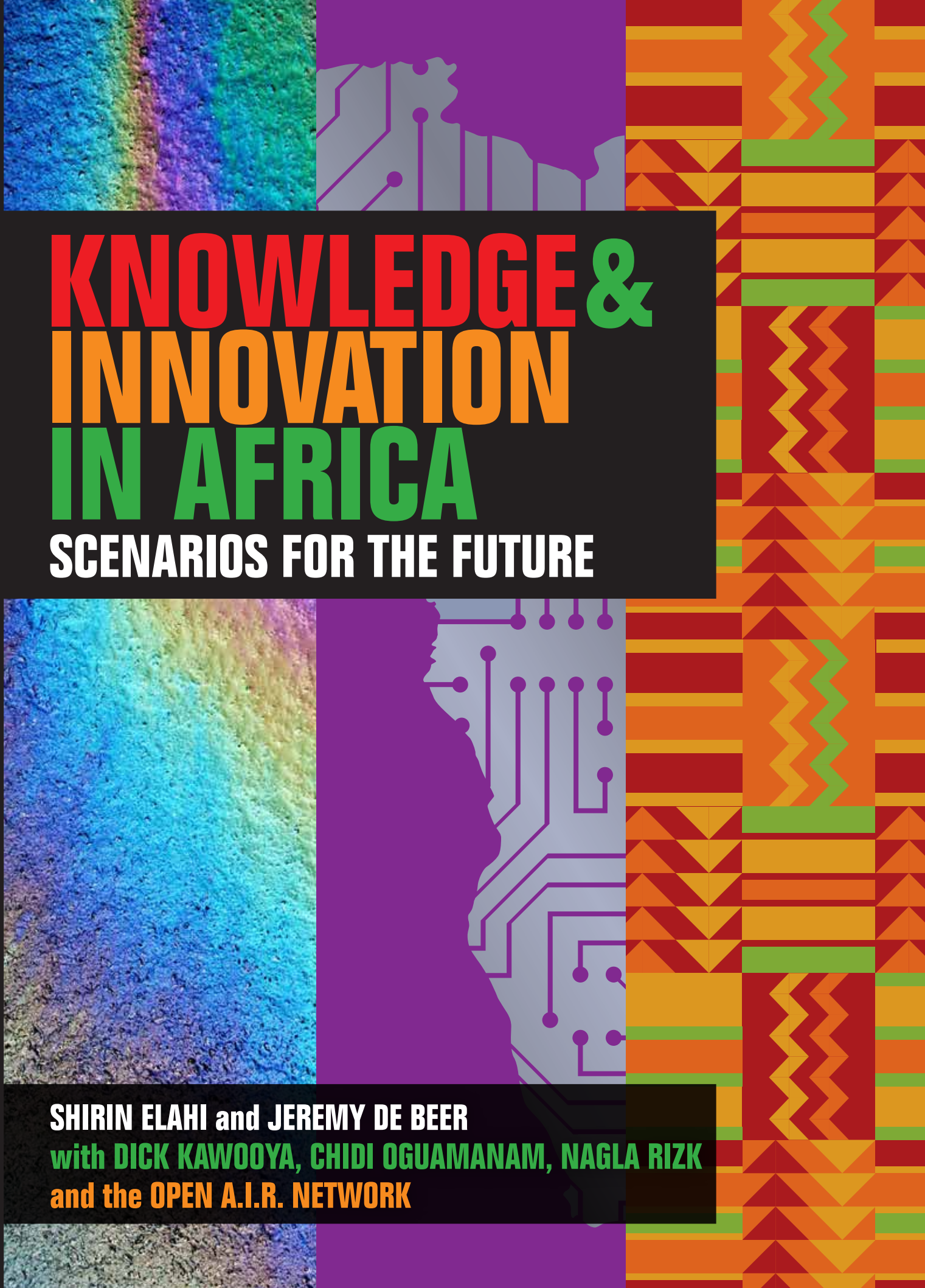
KNOWLEDGE & INNOVATION IN AFRICA
SCENARIOS FOR THE FUTURE
SHIRIN ELAHI and JEREMY DE BEER
with DICK KAWOOYA, CHIDI OGUAMANAM, NAGLA RIZK
and the OPEN A.I.R. NETWORK

Foreword

Fernando dos Santos

Hardly a day goes by when we are not confronted by the word 'innovation'. Innovation and creativity provide the alchemy that drives human development and welfare, that empowers individual and national economic growth – perhaps even contributes to democratic self-governance and longer healthier lives. However, it is very seldom that the adjective 'African' is associated with innovation – and it is this omission that the Open A.I.R. (Open African Innovation Research and Training) project seeks to address.

The aim of Open A.I.R. is to understand whether and why informal innovation and creativity are not adequately and fully accounted for through the traditional Western-oriented prism of patents, copyrights and other IP metrics. It also explores the dynamics between innovation and creativity, and intellectual property (IP) in order to build capacity and generate practical lessons concerning the influence of intellectual property environments on innovation and creative activity in Africa.

These Open A.I.R. scenarios are only part of this three-year, multidisciplinary, pan-African project, built by thinkers and experts from various parts of Africa and beyond. These contributors have also collected research, set out in a sister volume, *Innovation and Intellectual Property: Collaborative Dynamics in Africa*, which has been reflected in the scenario-building exercise. Collectively they have determined the relevant driving forces of change and identified three plausible, challenging, and relevant scenarios for the future. These scenarios – wireless engagement, informal the new normal, and Sincerely Africa – each present unique threats and opportunities, and take a broad continent-wide perspective.

Why use scenarios? Simply because they are a useful tool – a tool that enables us to take a fresh look at the world and opens our eyes to other possibilities. All too often we assume that tomorrow will look like today, yet all too seldom it does. Scenarios provide us with a framework that enables us to examine any possible blind-spots we might have, to compare our individual assumptions about the future with others and to explore how the forces of change, both inside and outside Africa, might impact upon its future.

These scenarios will be useful to anyone interested in how the future of innovation and creativity might unfold in Africa. Armed with foresight, it is easier to detect faint signals of change. They are particularly useful for strategic planning or policymaking. Both encompass the art of the long view – no easy task when dealing with turbulent environments or times of possible disruptive change. For both policies and strategies, there are grave risks of unintended consequences and maladaptive practices. Therefore, a thought exercise of '*What if?*' is a useful economical way to avoid expensive '*If only*' regrets. The scenarios set out in this document take an Africa-wide focus, and it is possible and probably useful to use them as the starting point for more focused scenarios dealing with the specific region, industry or subject matter – and outlines of how to do so are set out in the Appendix.

The Open A.I.R. project has been a fascinating and informative journey for everyone involved. The hope is that we have simply arrived at a new starting point: that these scenarios, together with the research underpinning them, stimulate wider thinking about African innovation and creativity and that they enable readers everywhere to undertake further work toward realizing a collective vision of innovation and creativity in Africa that is sustainably vibrant, properly valued, democratically participatory, collaboratively shared, widely accessible, and justly distributed throughout society.

Fernando dos Santos, Director-General,
African Regional Intellectual Property Office

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International Development Research Centre
Centre de recherches pour le développement international

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On behalf of
Federal Ministry for Economic Cooperation and Development

This work was carried out with the aid of a grant from the International Development Research Centre (IDRC), Ottawa, Canada, and with financial support from the German Federal Ministry for Economic Cooperation and Development (BMZ), in cooperation with Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ).

Contents

Locating Open A.I.R.

Conceived in 2009, established in 2010 and launched in 2011, Open A.I.R. is a pan-African network of nearly 60 experts from multiple academic disciplines, national and international government organisations, civil society advocates and private sector leaders.

Our aims are to conduct research that supports evidence-based policymaking, build capacity to empower an epistemic community of African intellectual property (IP) experts, and generate practical insights and recommendations regarding IP, innovation and creativity, openness and development on the continent of Africa. Members of the Open A.I.R. network share a vision of innovation in African communities that harnesses IP systems to facilitate innovation through collaboration – to make processes more participatory, knowledge more accessible and benefits more widely shared. This publication is a tool to help us and others realise that vision.

Following three years of research, 10 workshops involving dozens of participants, hundreds of interviews, and thousands of survey responses and pages of literature reviewed, we have constructed three scenarios for the future of African innovation. As important, we have placed these scenarios in the context of Africa's broader historical trajectories, and the multiple driving forces exerting pressure in various complex ways.

These scenarios complement our project's sister publication, *Innovation and Intellectual Property: Collaborative Dynamics in Africa*. That book (to be published by the University of Cape Town Press), contains conceptual analyses and on-the-ground case studies conducted in nine countries from the four main regions of Africa. Its description of the "current reality" reports empirical evidence, based on qualitative and quantitative data. Already we see signals that the scenarios envisioned in this book could soon become reality.

The Open A.I.R. network was launched in May 2011.

Open A.I.R. gratefully acknowledges the generous support it has received, both financially and strategically, from Canada's IDRC and Germany's BMZ, as well as from numerous individuals and organisations recognised in the acknowledgements section of this book.

IDRC International Development Research Centre
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Above left: Open A.I. R. hubs: UCT IP Unit in Cape Town, uOttawa in Ottawa, A2K4D centre in Cairo, NIALS in Lagos and CIPIT in Nairobi.

Above right: Monthly virtual interaction – a glimpse into the dynamics of the network's physical and virtual interactions.

Among the spin-off benefits of scenario-building exercises is the creation of "social capital", the human resources and relationships embedded within networks of interconnected actors. Foundations for the Open A.I.R. community were laid during a previous project exploring the role of copyright in access to educational materials. That four-year comparative study of laws and practices in eight countries led to the 2010 publication, also by the University of Cape Town Press, of *Access to Knowledge in Africa: The Role of Copyright*.

Connections established during the course of that and related projects supported by Open A.I.R.'s core funders – Canada's International Development Research Centre (IDRC) and Germany's Federal Ministry for Economic Co-operation and Development (BMZ) – grew into the African and global community that worked on the scenarios in this publication. There are four African regional hubs – in Cape Town, Nairobi, Lagos and Cairo – linked to Ottawa, Rio de Janeiro, Bangalore, Geneva and elsewhere. This network has, directly and indirectly, served as a credible reference point for articulating, projecting, sustaining and amplifying African perspectives and voices regarding the role of IP in innovation and creativity.

Because of the immense geographic size of the African continent, and the unique logistical challenges of African intra-continental travel, information and communication technologies (ICTs) were instrumental in empowering the research network. Online, the network includes hundreds of individuals and institutions throughout Africa and from all corners of the globe.

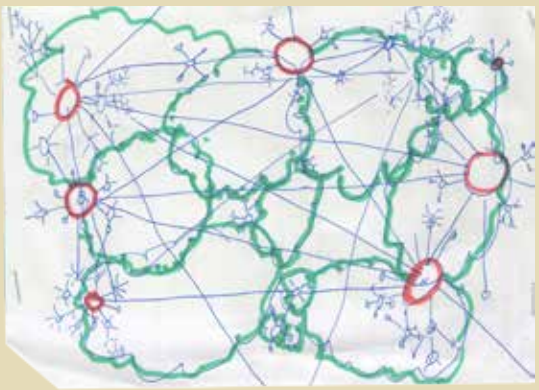
Of course, even this network could not, acting alone, undertake an exercise of this magnitude without relying on extensive consultation through formal and informal research methods with experts across different domains. We therefore engaged with external stakeholders and resource persons from many parts of Africa, as well as other parts of the world.

In constructing these scenarios, we also interacted with stakeholders from various sectors:

- innovators, creators and entrepreneurs, including individuals and companies
- business groups such as chambers of commerce and industry associations
- national, regional, and international policy- and lawmakers
- issue leaders, such as politicians, judges, professors and practitioners
- scientific and cultural research and development funding bodies
- university researchers, administrators and technology transfer officials
- rights holders, including collective rights management organisations
- representatives of indigenous communities.

The result of this broadly consultative approach appears in this publication. We hope it marks the beginning of your engagement with this crucial topic, and with our network of experts. To join our community of practice as we continue on our journey into the future, please visit our website at www.openair.org.za.

Below: Visually imagining a potential Open A.I.R. network, created in an early workshop.

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2K
MALACHITE


1508 A.D.
ETHIOPIA


LESOTHO
25s
Traditional Pottery
Pot Shapes


REPUBLIQUE CENTRAFRICAINE
15F
BARTHELEMY BOGANDA


EGYPT
5P


KENYA·TANZANIA·UGANDA
40c
10th. Anniversary of Kenya's Independence 12th. December, 1973


40F


MAURITANIE
1c
1c
AFRIQUE OCCIDENTALE FRANCAISE


EGYPT
5P


10n
THATCHING
POSTAGE


journée de l'Afrique
045
ALGERIE


TEXTILE INDUSTRY
TANZANIA
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1/-
REPUBLIQUE DU BURUNDI


WILHELM C. RONTGEN. PRIX NOBEL DE PHYSIQUE 190
60F
EMPIRE CENTRAFRICAIN


UGANDA
TANGANYIKA
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KENYA
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Zimbabwe
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MINE WORKERS
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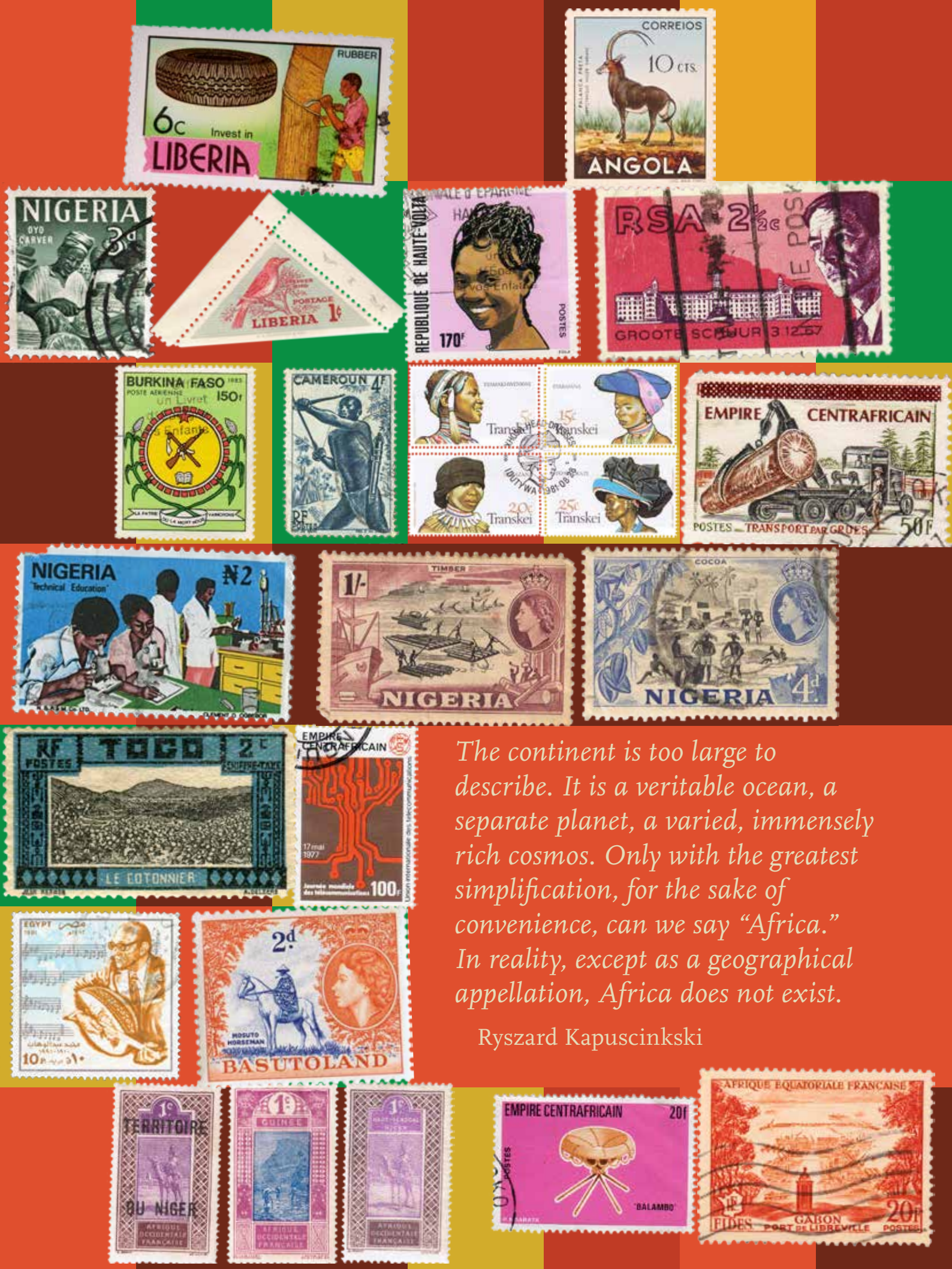


The continent is too large to describe. It is a veritable ocean, a separate planet, a varied, immensely rich cosmos. Only with the greatest simplification, for the sake of convenience, can we say "Africa." In reality, except as a geographical appellation, Africa does not exist.

Ryszard Kapuscinkski

Photos taken during various
Open A.I.R workshops and events.

A kaleidoscope of Africa

In exploring scenarios for Africa's future, it is necessary to proceed with great caution when making generalisations about the continent.

Africa sits astride the Greenwich Meridian, and stretches from above the Tropic of Cancer, through the Equator and past the Tropic of Capricorn, from 38° N to 34° S. It covers about 20% of the global land mass, with about 15% of the world's human population. Over 1 billion inhabitants living in 55 countries (give or take disputed territories) – and half of this population is under the age of 20.[1]

It has 6 of the 10 fastest-growing economies in the world and 14 out of 20 of the least competitive ones. The indicators below attempt to reflect the wide spectrum of conditions for any given issue.

Photos taken during launch of Open A.I.R. scenarios at the *Open A.I.R. Conference on Innovation and IP in Africa* (9-11 December 2014) *(See page 143 for more photos)*

ENVIRONMENTAL CHARACTERISTICS							
Biomes	desert	semi-desert	grassland	savannah	rainforest	woodland	scrub
Average rainfall (mm)	29 (Egypt)	1,120 (Mali)	831 (Zimbabwe)	509 (South Africa)			
Average temperature (°C)	28 (Egypt)	35 (Mali)	25 (Zimbabwe)	21 (South Africa)			
Land area (1,000s of km^2)	29,375 (total Africa)	23,636 (SSA*)	5,738 (North Africa)	2,382 (Algeria)	0.5 (Seychelles)		

HISTORICAL LEGACY								
Language families[2]	Niger-Congo	Afro-Asiatic	Nilo-Saharan	Khoi-San	Indo-European	Austro-nesian	Creole	
Religions	Islam	Christianity	Traditional	Hinduism	Judaism			
Colonial power	Ottoman	Britain	France	Germany	Portugal	Belgium	Italy	Spain
Legal system	customary law	Islamic law	common law		bi-juridical mixed	civil law		

POPULATION AND LABOUR CHARACTERISTICS						
Population[3] (millions)	1,008 (total Africa)	841 (SSA)	167 (North Africa)	155 (Nigeria)	2 (Botswana)	
Population density[4] (people/km^2)	34 (total Africa)	36 (SSA)	29 (North Africa)	628 (Mauritius)	3 (Namibia)	
Life expectancy[5] (years)	56 (total Africa)	53 (SSA)	72 (North Africa)	75 (Libya, Tunisia)	45 (Lesotho, Zimbabwe)	
Labour force participation[6] (% of population)		71 (SSA)	52 (North Africa)	48 (Tunisia)	88 (Tanzania)	55 (South Africa)
Adult literacy (% of men)		75 (SSA)		45 (Chad)	95 (Zimbabwe)	
Adult literacy (% of women)		56 (SSA)		23 (Chad)	89 (Zimbabwe)	
Migrants[7] (% of population)		2 (SSA)	1 (North Africa)	0.3 (Egypt, Somalia, Eritrea, Tunisia)	12 (Cote d'Ivoire)	18 (Gabon)

ECONOMY					
GDP *per capita* ($)	879 (total Africa)	618 (SSA)	2,191 (North Africa)	8,011 (Equatorial Guinea)	97 (DRC)
Classification of economy[8] (by $ GNI *per capita*)	High income: $12,196 or more (1 country)	Upper-middle income: $3,946–$12,195 (6)	Lower-middle income: $996–$3,945 (13)	Low income: $995 or less (33)	Least Developed Countries (34)[9]
Concentration of economy (top export as % of total)	7 (Morocco: phosphate)	50 (Ghana: cocoa)	86 (Nigeria: oil)	96 (Angola: oil)	9 (South Africa: precious metals)

TRADE AND FINANCIAL FLOWS							
International trade[10] (% of GDP)		63 (SSA)	69 (North Africa)	39 (Ethiopia)	247 (Seychelles)	31 (DRC)	163 (Lesotho)
Foreign direct investment[11] ($ billion) [% of GDP]	45 [3] (total Africa)	30 [3] (SSA)	15 [3] (North Africa)				
Migrant remittances[12] ($ billion) [% of GDP	38 [3] (total Africa)	21 [2] (SSA)	18 [3] (North Africa)				
Private debt and portfolio equity flows[13] ($ billion) [% of GDP]	12 [0.8] (total Africa)	12 [1] (SSA)	–0.5 [–0.1] (North Africa)				
Official aid[14] ($ billion) [% of GDP]	40 [3] (total Africa)	36 [4] (SSA)	4 [0.6] (North Africa)				

GOVERNANCE							
Perceived corruption of public sector[15] (best score is 100) [global ranking]	65 [ranked 30th] (Botswana)	53 [50th] (Rwanda)	48 [58th] (Namibia)	45 [64th] (Ghana)	43 [69th] (South Africa)	20 [163rd] (Zimbabwe)	8 [174th] (Somalia)
Environmental performance[16] (best score is 100)	58 (Gabon)	56 (Zambia)	55 (Egypt)	54 (Botswana)	49 (Algeria)	40 (Nigeria)	35 (South Africa)

INFRASTRUCTURE SERVICES					
Electricity consumption (kWh)	531 (SSA)	1,282 (North Africa)	42 (Ethiopia)	127 (Nigeria)	4,760 (South Africa)
Use of solid fuels (% population)	82 (SSA)	5 (North Africa)	95 (Congo, Ethiopia, Mali, Malawi, Rwanda, Uganda)	5 (Algeria, Egypt, Libya, Mauritius, Seychelles, Tunisia)	
Access to water[17] (% of total rural [urban] population)	60 [83] (SSA)	92 [95] (North Africa)	99 [100] (Egypt)	38 [98] (Ethiopia)	30 [67] (Somalia)
Access to sanitation (% of total rural [urban] population)	31 [44] (SSA)	89 [94] (North Africa)	94 [97] (Egypt)	9 [34] (Niger)	23 [52] (Somalia)

CONNECTIVITY					
Access to sea	15 landlocked countries		38 countries with access to sea	Lesotho surrounded by South Africa	
Mobile phone subscriptions[18] (per 100 people)	37 (SSA)	77 (North Africa)	3 (Eritrea)	105 (Seychelles)	94 (South Africa)
Landline phone subscriptions[19] (per 100 people)	2 (SSA)	11 (North Africa)	17 (Libya)	0.1 (Congo)	30 (Mauritius)
Internet users[20] (per 100 people)	9 (SSA)	21 (North Africa)	28 (Nigeria)	0.6 (Congo)	39 (Seychelles)

All amounts rounded to nearest whole number, except those less than 1; SSA = Sub-Saharan Africa; $ = United States $ (throughout the publication)

What are the questions?

How do we understand progress?

What role does innovation play?

How is knowledge governed?

How are answers to these questions shaped by the political, economic, legal, social, cultural, technological and environmental contexts of time?

How do we understand progress?

For centuries, philosophers and economists have tried to define what is meant by progress and development.[1] We know that progress requires change, but change does not always mean progress. Real progress can only be evaluated by a given society at a particular point in time, within a particular context, because people attach different values to different goods and services, and do so under different circumstances.

Progress requires structural change: it requires changes to the economic, social and political structures within a given society to the benefit of all people. Change – the basis of progress and development –takes time, and like any system, there is a time lag between policies and their realisation. Progress and development require foresight, as there are no hard and fast rules about how to achieve either. The difficulty they pose is that the outcomes of these changes can usually only be measured in hindsight.

> *"Development is a comprehensive, economic, social, cultural and political process, which aims at the constant improvement of the well-being of the entire population and all individuals on the basis of their active, free and meaningful participation in development and in the fair distribution of benefits resulting therefrom.[2]*
>
> United Nations Declaration on the Right to Development

Probably the most critical measure of this comprehensive process is fair distribution, where the beneficiaries are society as a whole without the exclusion of anyone. All too often, benefits are not equitably spread, yet due to the inherent time lag, it is usually not possible for the benefits to be evident to all members of society at the same moment.[3] Africa has some of the greatest levels of inequality and poverty in the world – in 1981 there were 200 million people living on US$1.25 per day, but by 2010 it had doubled to 400 million. Despite all the aid, the poverty headcount ratio has hovered around 48% of the population of Sub-Saharan Africa.[4] The figures are different in North Africa, but progress and development have clearly not been taking place across Africa as a whole.

Over the past decades, the concepts of progress and development have shifted to a holistic perspective of welfare, one which reduces income, production, distribution, personal procurement and social costs to a purely quantifiable economic set of measures: economic metrics of efficiency, rationality, financial risks, property rights and market mechanisms. The result has been competing paradigms, each with their own proponents: between the orthodox economic rationale, with its focus on reduction of poverty at the national level, and other rationales that focus on the capabilities and freedom of the individual, or on sustainable policies, based on the argument that development has to include future generations.

In addition, there is a further dimension that is changing the face of development and progress: global interconnectivity. This digital environment has led many to question whether the "open" model offers new opportunities. Structures and institutions have increasingly become organised around electronically processed networks of information.[5] As a result, they are enabling people to mobilise and organise resources in different, innovative ways, thereby offering the potential for transformative change.

In the past five decades, there have been both successes and failures in Africa's development. There are countless well-meaning development programmes in Africa that have become white elephants: often inappropriate, ill-conceived or even misappropriated. These programmes have left a lasting legacy of crippling debt for Africa,

which – despite many initiatives to reduce the burden – takes a sizeable proportion of government revenues to service. These mistakes have probably sabotaged many of Africa's development and progress prospects for the future. Development and progress raise many questions, including: What works, and in what circumstances? Does progress mean growth? Who decides? Who benefits? Who pays? What about dependency? Short term or long term? There are no easy answers.

It is useful to recognise that one cannot solve problems with the same thinking that created them. Africa will have to find new solutions that match its uniquely African context and harness the skills, capabilities and endowments of its people to improve their wellbeing. What role does innovation play?

The economic model

The need for property rights, and law and order

"The major stumbling block that keeps the rest of the world from benefiting from capitalism is its inability to produce capital. Capital is the force that raises the productivity of labour and creates the wealth of nations. It is the lifeblood of the capitalist system, the foundation of progress […] The value of savings among the poor is immense: forty times all the foreign aid received throughout the world since 1945 […] Because the rights to these possessions are not adequately documented, these assets cannot readily be turned into capital.[6]

Hernando de Soto, economist

The capabilities model

Conditions necessary for a life with dignity

"The capabilities approach aims to give people the necessary conditions of a life with human dignity. It would be a self-defeating theory indeed if the injunction to promote human capabilities devoured people's lives, removing personal projects and space to such an extent that nobody at all had the chance to lead a dignified life.[7]

Martha Nussbaum, ethics philosopher

The human model

Development as freedom

"Very many people across the world suffer from varieties of unfreedom […] Unfreedom can arise either through inadequate processes (such as the violation of voting privileges or other political and civil rights) or through inadequate opportunities that some people have for achieving what they would like to achieve (including the absence of such elementary opportunities as the capability to escape premature mortality or preventable morbidity or involuntary starvation).[9]

Amartya Sen, economics Nobel laureate

The sustainable model

Equality for the next generations

"The word "development" has also been narrowed by some into a very limited focus, along the lines of "what poor nations should do to become richer", and thus again is automatically dismissed by many in the international arena as being a concern of specialists, of those involved in questions of "development assistance". But the "environment" is where we all live; and "development" is what we all do in attempting to improve our lot within that abode. The two are inseparable […] Many of the development paths of the industrialized nations are clearly unsustainable. And the development decisions of these countries, because of their great economic and political power, will have a profound effect upon the ability of all peoples to sustain human progress for generations to come.[8]

World Commission on Environment and Development

The open model

Networked access

"Open development refers to an emerging set of possibilities to catalyze positive change through "open" information-networked activities in international development [where] "open" is shorthand for information-networked activities that have, relatively speaking, more information that is freely accessible and/or modifiable and more people who can actively participate and/or collaborate.[10]

Matthew Smith, Laurent Elder and Heloise Emdon, researchers

Yaoundé, Cameroon
Photo: Joona Pettersson

What role does innovation play?

From time immemorial, people have innovated – it is this tinkering, adjusting and adapting that has been the driver of progress and development. All economic and social progress ultimately depends on new ideas that challenge the inertia of the status quo with possibilities for change and improvement. Innovation is what happens when this new thinking is introduced and bears fruit.

Today, "innovation" is the word on everyone's lips, because in a knowledge-based economy it is knowledge – the intangible asset – that has the potential to create substantive value. Its great value lies in the fact that it can be reproduced without loss of the original, i.e. it is replicable. It is also scalable, in that once the knowledge has been discovered or created it is cheap to share – potentially, it can be used on an infinite scale at virtually zero cost.[11] We are no longer interested in bigger factories or more stuff, such that the drive for greater industrialisation and, increasingly, physical and tangible properties have made way for a push up the value stack. Investing in intangibles, particularly knowledge, is the way of the future.

For those investing in knowledge and innovation, *caveat emptor*, buyer beware: innovation drives jobs, productivity, technological progress and social change, but it is also inherently unpredictable. Innovation means the destruction of the old tried and tested systems, institutions, processes and products, displacement of the incumbents, and the introduction of new and uncertain alternatives.[12] Many policymakers and business leaders who talk enthusiastically about innovation appear to forget this. As Schumpeter described, the real rewards from innovation come with "gales of disruptive innovation" initiated by countless competing, risk-taking entrepreneurs.[13] But, while there might be a few who benefit, the squalls hurt many who are currently thriving. Innovation does not always bring positive outcomes.

What is innovation? The widely used *Oslo Manual* defines innovation as "the implementation of a new or significantly improved product (good or service), or process, a new marketing method, or a new organisational method in business practices, work place organisation or external relations".[14]

There are different kinds of innovation: **incremental innovation**, which involves small improvements to existing products, processes or services, and **disruptive** or **breakthrough innovations**, which are discontinuous revolutions in technologies and markets.[15] The direction of change is also important. **Continuous innovations** follow in sequence from the *status quo*; **discontinuous innovations** break patterns to move in significantly new directions. Disruptive, discontinuous innovations usher in new social, technological, economic and/or political systems in their wake.

OTHER TERMS REGARDING INNOVATION	
Open innovation	An emergent model of innovation in which firms draw on research and development that may lie outside their own boundaries.[16]
Closed innovation	Controlling all aspects of the creation and management of ideas, from conception to commercial application. This means that innovation takes place in a self-sufficient environment with internal R&D, controlled by IP.
User innovation	Innovation by user firms, user communities and end-users, rather than by suppliers or manufacturers.[17]
"Bottom-of-the-pyramid" and **"grassroots" innovation**	Innovation by the poor – those billions living on less than $2 per day[18] – or grassroots innovators and holders of traditional knowledge from the informal sector of society.[19]
Social innovation	Innovation linked to the "social business" concept, where a self-sustaining company sells goods or services and repays its owners' investments, with the primary purpose to serve society and improve the lot of the poor.[20]
Inclusive innovation	Innovation with a focus on inclusive growth and reduction of inequality,[21] i.e. the "inclusion" of the "excluded" where exclusion could be due to disability, poverty, distance, migration or other factors.[22]

How is knowledge governed?

Access to knowledge as IP policy
We now understand that innovation depends on knowledge flows throughout systems, and that IP can facilitate or frustrate the exchange of knowledge. We also understand that development means more than industrialisation and economic growth; development depends on human freedoms and capabilities. So it should not be surprising that our objectives of IP policy are also evolving to become more holistic, under the auspices of a movement toward "access to knowledge".

The Open A.I.R. scenarios shed light on what kinds of knowledge might become most relevant in different contexts, and how various forms of IP rights might be used to govern knowledge in different futures. To help you understand these insights, which are presented later, we introduce the basics of how innovation and knowledge systems are now governed by IP. In part this depends on what kind of knowledge we are talking about.

Today, our world is awash with data and information. Data is factual information that has been collected together for reference or analysis, or numerical information represented in a form suitable for computer processing. Information is facts that have been provided or learned about something or someone, or what is conveyed or represented by a particular pattern or sequence of things. Information and data are easily transferable from one person to another.

However, not all information is knowledge. While data is raw information without context, and information is organised and contextualised data, knowledge assimilates information and puts it to use.[23]

There is a problem with innovative knowledge of potential value. Knowledge cannot be possessed, like land or goods. So someone who discovers or applies new knowledge will not necessarily reap the benefits of innovations they have enabled. Some say this is unfair: people have an innate right

Types of knowledge
There are several different types of knowledge, each with different properties:

Codified knowledge is disclosed in writing and able to be stored in databases, documents, etc.

Non-codified knowledge is not fixed in writing, often remaining undisclosed, and passed on in oral traditions from generation to generation.

Tacit knowledge is difficult to transfer to another person by means of writing or description. Tacit knowledge can involve intuitive insights, or may require expertise, such as the ability to speak a language, make complex mathematical calculations, etc.

Contextual knowledge has particular meaning because of the surrounding conditions connected to its application, and will not be understood or used in the same way by everyone.

Acontextual knowledge is represented as rational, scientifically "objective", impartial observations of stable social realities.

What, how, who and why
Knowledge can be categorised in other ways as well:[24]

Know-what: Facts; complex answers to questions that can be divided into discrete pieces of information. Lawyers, doctors, engineers and others rely on this type of knowledge.

Know-how: Skills; the judgement or capability to do something, like hiring staff or evaluating markets. This type of knowledge is typically shared between individuals, or within organisations or across networks of trust.

Know-who: Relationships; the creation and maintenance of special social networks and human capital. These relationships enable actors to identify and access other actors with complementary skills and knowledge.

Know-why: Theories; scientific knowledge regarding human behaviour or laws of nature. This underpins technological development and industrial innovations, and is often concentrated in research laboratories and universities.

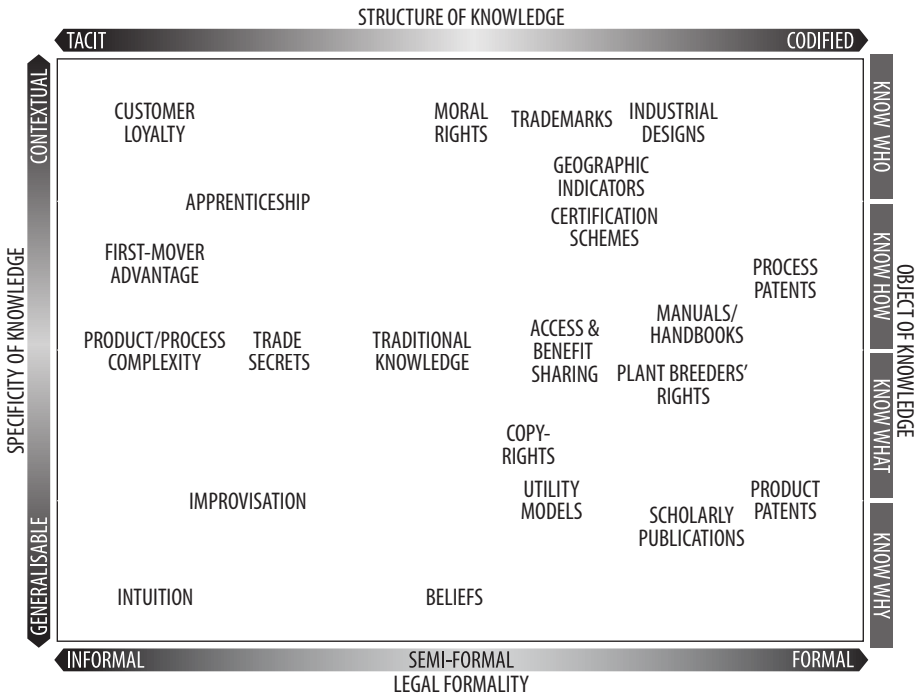
Riding a bicycle is tacit and acontextual knowledge – people can usually do it without reading books, and do it in roughly the same way everywhere. In contrast, reading the Bible is codified and highly contextual knowledge – interpretations of the same written text can vary widely based on beliefs, space and time.

to control their inventions and creations. Some say this is unwise: without a way to capture economic returns, fewer people will invent or create things of social value. Others disagree, saying that knowledge is most useful when it is networked and widely accessible. They also say that access to knowledge ("A2K" for short) is a prerequisite for fundamental rights, like health care, food security, basic education or cultural participation.

Resolving such tensions is the role of knowledge governance systems. There are many ways of governing knowledge. Secrecy is the oldest, most well-known way that knowledge is shared among small, trusted groups of people. Reputation, in the form of word-of-mouth referrals or recognisable brands, is also among the most well-established means of managing valuable knowledge. Other informal modes of appropriation, like first-mover advantage and technological complexity, also play crucial roles in innovation systems.

In very general terms – more details are provided in Appendix 1 – patents protect scientific and technological inventions, copyrights protect works of creative expression, and trademarks protect brands and associated goodwill. One must apply to obtain a patent, showing that the invented product or process is new, applicable and inventive. In exchange for written disclosure of the technical specifications, a patentee receives the exclusive right to make, use and sell the patented invention for a period of 20 years. Registration is not always necessary, but is usually advisable, to secure a trademark in a distinctive word or image – or, in some countries, a sound, smell or other mark – used in association with wares or services. Trademark owners do not have complete monopoly over a mark, but may stop competitors from causing confusion in the marketplace for as long as the trademark remains distinctive. Copyright protection arises automatically upon the creation of an original literary, artistic, musical or dramatic work, and lasts for the life of the work's author plus an additional period of 50 to 100 years, depending on the country.

Knowledge Appropriation Matrix



The relationships between IP and innovation are complex, variable and dynamic. But, in general, IP can sometimes be (i) an indicator of innovation, (ii) an incentive for innovation, and/or (iii) an impediment to innovation.

Researchers use many different metrics to measure innovation, including IP statistics. In this context, patent statistics dominate, partly because they are among the most readily available data, and partly because of the orthodox (but incorrect) view that they are the form of protection most relevant or important for innovation. Intellectual property indicators are not only a tool for econometric analyses, but are also influential in various organisations' rankings of innovation performance, by country and by firm. Intellectual property outputs are weighted with other indicators, such as scientific publications, as well as inputs, like R&D expenditures, to create a consolidated measure of countries' innovative activity.

As a matter of public policy, the exclusive rights protected by IP are predominantly justified as an incentive to invest in innovation through research, development and commercialisation of new products and processes. Empirical evidence proving this theory in practice, however, is scarce. Everything depends on context. The general consensus among economists is that while IP can and does stimulate activity in advanced markets, especially by multinational firms, patent law reforms have little, if any, impact on domestic innovation in poor countries. Evidence also suggests that patents, for example, are more important to large firms in industries such as pharmaceuticals and semiconductors. Small and medium-sized enterprises rely more on other kinds of protection, such as secrecy or trademark branding.

The value of knowledge often increases through network effects: the more people that share an idea, the more valuable it becomes. This fact leads to the insight that exclusive IP rights can sometimes frustrate rather than facilitate innovation. Too much IP protection can be a problem, especially for sequential innovations that build upon earlier technologies and especially if rights are fragmented among multiple owners.

Perspective

Before setting off to explore the future, we first establish our whereabouts – the current reality. This sets a baseline for what we know, what we believe, and what the rest of the world believes about Africa. Moving through snapshots of African history, we pull out features of development and progress, knowledge that was particularly valued, innovation systems and technologies, and relations of power and ownership of knowledge.

Until the lions have their own historians, the history of the hunt will always glorify the hunter.[1]

Chinua Achebe, author

Origins of humanity

Australopithecus boisei skull
Photo: Shutterstock

> *"Africa is the "cradle of mankind", possibly the cradle of modern man as well as the place where man's expansion began, and the birthplace of the very first stone tools, the first symmetric stone tools, and the nest of so many discoveries, inventions, creations and cultures. … [T]he first 8 million years of [mankind's] history (from 10 to 2 million years BC) are only African. It is then prestigious for Africa to be the unique origin of the 100 billion human beings who have existed since the very first one.*[2]
>
> Yves Coppens, UNESCO keynote speech, Addis Ababa 2011

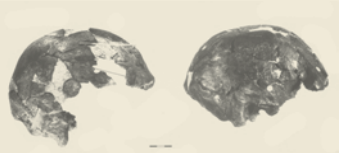
In 1871, Darwin published *The Descent of Man*, demonstrating that humanity had evolved from primate ancestry and arguing that the origins lay in Africa. Both ideas were anathema to Victorian England of the time, and it took many decades, mountains of research and incontrovertible evidence to prove his theses.

There have been two competing theories about the origins of humankind: "out of Africa", which contends that humans originated entirely from Africa, and "multi-region", which contended that humans developed separately in many places at the same time.[3] Today, scientific research concludes that our human ancestors, the hominids, came from the African plains and migrated to populate the earth tens of thousands of years ago.[4]

The oldest known human remains from our own species, the fossilised *Homo sapiens* skulls "Omo" I and II, have been dated at about 195,000 years old, and originate in Ethiopia.[5] Their adaptations result from climatic drought conditions between 2.7 and 2.8 million years ago in East Africa.[6]

Humans started to leave Africa between 60,000 and 70,000 years ago, probably due to major climatic shifts and the onset of the Ice Age, which resulted in a major drop in human population and almost led to our extinction.[7] The Genographic Project by National Geographic used advanced DNA analysis and worked with indigenous communities to conclude that human migrations from Africa became isolated from one another about 150,000 years ago. Remains from such split populations, for example in Asia, led to the multi-region theory. Jared Diamond indicates how different populations encountered different regional geophysical and climatic conditions, with species which were more or less difficult (or impossible) to domesticate in the shift from hunter-gathering to pastoralism.[8] Different modern human populations re-encountered each other some 40,000 years ago.[9]

The oldest known human remains



Omo I and Omo II

The discovery of the specimen OH 5 ("Zinj") in 1959, by Mary Leakey, was a watershed in the history of palaeoanthropology. The find added an important stage in a relatively sparse hominid lineage at the time, and was also important in focusing attention on multidisciplinary research.

The fairly complete cranium (sans mandible) eventually became known as *Australopithecus boisei*. Specimens attributed to *Australopithecus boisei* have been found mostly in Ethiopia, Tanzania and Kenya in East Africa.

The oldest *Australopithecus boisei* specimens were found at Omo, Ethiopia, dating to approximately 2.3 million years, and the youngest was found at Olduvai Gorge, dating to approximately 1.2 million years.

Source: http://archaeologyinfo.com/australopithecus-boisei/

The Omo River in Ethiopia.
Photo: Frank Brown, University of Utah

Inset picture left: The Kibish formation on the banks of the Omo where fossils have been found.

Inset picture right: Archaeological dig on the Kibish formation.
Photo: John Fleagle, via Wikimedia Commons

Founding civilizations

> *As Egypt slowly emerged, the thing that made it different from Babylonia and the Indus River Valley of the same time was an African organisational idea. This concept was that of divine kingship – an idea so familiar to us from Western history that we scarcely think of it as first emerging in Africa. While the city-states were rich, well-fed, keeping written records and able to communicate among themselves, the Egyptian towns and cities were unified under one ruler, a god-king and because of this unity their civilisation was leaping forward while the Babylonians and Indians were squabbling among themselves, jockeying for power.*[10]
>
> Lester Brooks, in *Great Civilizations of Ancient Africa*

DYNASTIES OVER CENTURIES

Egyptian civilization stretched from the Upper Nile with its origins in Lake Victoria to the Lower Nile, which flows into the Mediterranean Sea. Fertile sediments deposited by the annual flooding of the Nile left a sustaining strip of arable land thousands of kilometres long, farmed since at least 3000 BC. The upper and lower entities were united circa 3100 BC, by the first Pharaoh, called "Menes", founding the first of over 30 dynasties that stretched for centuries. For centuries, these dynasties interacted with the many other cultures of the Middle East, Africa and beyond, and at times even ruled them. Egypt absorbed some of the best minds of the day.

Egypt had a calendar of 365 days 5,000 years ago; they developed writing and invented papyrus to write on. Imhotep was a notable scribe, the father of medicine in Egypt, and the designer of the original "house of eternity" step pyramid for his king Zoser in 2700 BC, which created the blueprint for the pyramids as we know them.

Punt is generally held to have been southeast of Egypt. It traded gold and copper with the rest of the civilized world of the time. By 2500 BC it was building ships of 60 oars – 2,500 years before the Romans did.[11] In 1470 BC, Queen Hatshepsut, the fifth pharaoh queen of the Egyptian 18th Dynasty, undertook a large expedition to Punt, with five 21-metre sailing ships each with over 200 men on board. Reliefs at her temple show the ships returning with live myrrh trees.

Kush (also known as Nubia) was another complex and flourishing kingdom, which remained stable from 1070 BC to 350 AD, situated around today's Sudan. Its economy produced ebony, ivory, gold and silver, gems, metals and wood, and also slaves and soldiers. Between 730 and 656 BC, Egypt was ruled by Nubia, the 25th Dynasty of the "black pharaohs".

After Egypt's power waned, Kush's strategic position with trading outlets on the Red Sea and its strong manufacturing base made it a major centre for trade and commerce. There is evidence of pottery, jewellery and woven cloth, and also a sophisticated ironworking economy, making both military and agricultural goods. For the next millennium the rulers of Kush called themselves the "Kings of Upper and Lower Egypt". Kush's power waned as its manufacturing dependency on charcoal led to widespread deforestation and soil erosion.

The **Nok** culture evolved in West Africa, at the confluence of the Niger and Benue rivers, today in Nigeria. It appeared around 1000

Scholarship

For seven centuries, from the time of Alexander the Great who founded the city in 332 BC, well into the 4th Century AD, Alexandria was the intellectual capital of the Western world. It invented modern scholarship, attracting the greatest scholars of the time and producing the definitive texts upon which our history is based. The Great Library of Alexandria was one of the wonders of the Ancient World, amassing most of the scholarship of the day and the past, with some 490,000 books written on papyrus, and later 42,000 contained in the "daughter library" housed in the Serapeum. The texts were destroyed over time in a series of disasters, with only a few copies or fragments surviving.

Above left:
Old Egyptian calendar in the Karnak temple.
Source: www.timecenter.com/articles/the-history-of-the-western-calendar/

Above right:
Carthage Electrum coin dating from 250 BCE
Current location: British Museum

Left:
Fragment of a limestone tomb-painting found in the tomb of Nebamun in Thebes, Egypt (1350 BC), representing the assessment of crops, for the purposes of tax, on Nebamun's estate. Five vertical registers of hieroglyphs survive; the rest of the fragment is divided into two registers, with a horse-drawn chariot above and cart drawn by onagars beneath.

BC and remained active until about 300 AD. Iron smelting took place there from 280 BC, the earliest dates for iron smelting in Sub-Saharan Africa. The culture included art, organised worship, horses and sufficient population to support these activities.[12]

Assyria became the centre of the greatest empire the world had yet seen. From 911 BC to 608 BC much of the Middle East and Mediterranean was under its control. Assyrians defeated the Nubians and drove them from Egypt. They were able to achieve such victories due to their military technological and organisational advantages. Assyrians had developed iron weapons and armour, which were stronger than the bronze of Egyptians. Their innovations included siege units, ordnance supply units, and separate transport units for light and heavy bows, spears, cavalry, infantry and heavy chariots.

Carthage was founded by the Phoenicians on the North African Mediterranean coast in 814 BC. It became a major power with extensive links with tropical Sub-Saharan Africa and the Greek and Roman empires. Carthage was a rival to Rome, and they fought three wars: in 264 to 241 BC over Sicily, in 218 to 201 BC when Hannibal invaded Europe, and in 149 to 146 BC when it was destroyed. Carthage became a Roman province, supplying wheat, olives and olive oil to imperial Rome.

Berbers had occupied northwestern Africa for thousands of years, before the beginning of human records in Ancient Egypt. They were coastal agriculturalists and desert nomads, who were often in conflict with one another. Berber middlemen crossed the Sahara with packs of camels, trading salt, metal goods, gold, beads, slaves, and ivory between northern and inland Africa.[13] By the 2nd Century BC, they had established several large, loosely administered kingdoms, which were to be divided and reunited several times over the next millennia. Berber kingdoms, in modern-day Algeria and Morocco, included Numidia (202 BC to 46 AD) and Mauretania (3rd Century BC to 40 AD), before each was annexed by the Roman Empire.

By the 10th Century, climate changes had led to desertification

The Pharos of Alexandria, a lighthouse in Alexandria, Egypt, was considered one of the Seven Wonders of the Ancient World. This mosaic from Olbia, Libya, shows the form of the lighthouse after the quake of 796 when it lost its upper tier.

Source: Qasr Libya Museum, via Wikimedia Commons

of North Africa, and the balance between sedentary cultivators and nomadic pastoralists had shifted. The nomadic Berbers expanded northwards into Morocco, the Arabs westward along the North African coast. Successive Muslim Berber empires, the Almoravids and Almohads, gathered power and swept down through Africa and into Spain, converting local populations, often by the sword. From 1000 to 1500 AD, Islam spread southwards, up into the Nile kingdoms of Nubia and across the Sahara.

Axum, the Axumite Empire, (about 100 to 940 AD) was based in the area that is now Eritrea and northern Ethiopia.[14] Alongside Persia, Rome and China, it was one of the four great powers of the time and its power stretched well into the Arabian Peninsula. Axum had extensive trade links with the Roman Empire and ancient India, and minted its own currency. It had a high literacy rate and valued written documents. It was the first major empire to convert to Christianity, in about 350 AD.

The first recorded steam engine

In the 1st Century AD, the world's first basic steam engine was invented by Hero of Alexandria. It was a rocket-like reaction engine which was used to open the temple doors. It was called an *aeolipile*, which translates to "the ball of Aeolus", who was the Greek god of the wind. The implications of this design were only realised 17 centuries later in Europe, with the advent of the Industrial Revolution.

Source: Knight's American Mechanical Dictionary, 1876.

A proto-Suez canal

There are indications that a canal linking the Red Sea and the Nile existed as far back as the 13th Century BC during the time of Rameses II. A granite monument known as the Chalouf stele was discovered at Kabret, 130 kilometres from Suez. It is inscribed:

> *Saith King Darius [king of ancient Persia from 550 to 486 BC]: I am a Persian; setting out from Persia, I conquered Egypt. I ordered to dig this canal from the river that is called Nile and flows in Egypt, to the sea that begins in Persia. Therefore, when this canal had been dug as I had ordered, ships went from Egypt through this canal to Persia, as I had intended.*

The canal later silted up and it was only centuries later, after Napoleon's invasion of Egypt in 1799, that archaeological excavations proved its existence. It then took 70 years before the Suez Canal, as we know it today, was opened in 1869. It enabled ships to avoid going around the southern tip of Africa, or via the northern sea route during summer when the Arctic ice shrank.

Features of development

Development was mostly dependent on the ability to adapt to the uncertainties of rainfall and disease, and to warfare. Some groups and regions had natural advantages, but this could change over time, as it did for Kush. In many parts of Africa, cattle provided a resource to mitigate this uncertainty, and thus became a source of wealth. The origins of modern settlements can be recognised when cattle enclosures were first built and people made the transition from hunter-gatherers to ethnic, tribal and later national concepts of civilization.[15]

Innovation systems and technology

Agriculture: Arable farming techniques (3000 BC); access to new animals and crops such as wheat, sorghum and bananas from Asia.

Transport: Invention of the wheel (Mesopotamia 3500 BC); sail (Egypt 3000 BC); the horse and chariot (Hyksos Asia from 1783 to 1570 BC); introduction of the camel into Sahara (100 AD).

Irrigation: The development of canals, basins, dams and dykes to control the annual flooding of the Nile and use the fertile silt for farming.

Writing and printing: Egyptian writing or hieroglyphics and the use of papyrus paper (from 3200 to 2755 BC). This allowed the Egyptians to record daily events throughout the kingdom. The Chinese invented paper in 105 AD.

Military technologies: Organisational innovations such as special military units, and technological innovations, such as the Assyrians' use of iron weapons, which were much stronger than the bronze already in use and led to their overthrow of the Egyptians.

Permanent structures: The pyramids (2590 BC) created awe by the sheer size and complexity of construction (by slave labour) and the grasp of astronomy, mathematics and geometry involved in their construction.

What held particular value?

Different religions, each with its own belief systems, value systems and cultures, and its own form of valued knowledge: divine kingship and the "Osiris" myth, based on the tribal chieftain's role (BC); traditional African spiritual systems; Judaism with the Jewish exodus from Egypt (1200 BC); Christianity (AD); Islam (622 AD).

Wealth-in-people rather than wealth-in-things: "The goal was not to accumulate a labour force or material things, but rather the ability to mobilise various knowledge and skills in order to be successful in a challenging environment."[16]

Power and knowledge governance

Within Africa, there were two main forms of ownership which dictated the structure of society, power relations and economic relations within the society:

Divine and absolute rule, with an emphasis on magical powers and ceremony. The strict hierarchy had the pharaoh at the top and, below her or him, the priests of the temple, an army of officials, scribes and civil servants and finally, the populace. The priesthood guarded knowledge and literacy, and the pharaoh controlled the dissemination of knowledge through scribes.

Collective governance by a council of male chiefs or elders, or by several neighbouring people bound by loyalty or common ancestry.

Later empires

There are in Timbuktu numerous judges, teachers and priests, all properly appointed by the king. He greatly honours learning. Many handwritten books imported from Barbary are also sold. There is more profit made from this commerce than from all other merchandise.[17]

Andalusian diplomat Leo Africanus in 1510

AFRICAN EMPIRES TO 1500 AD

In East Africa, the kingdom of Axum retained a key position trading from its port on the Red Sea until the 11th Century. Ancient Ghana flourished from the 8th to 11th Centuries in West Africa, followed by Mali between the 12th and 14th Centuries, and then Songhay, from the 14th to the 16th Centuries. East of Mali were the Hausa city states that survived until the 19th Century.

In Southern Africa, the kingdom of Zimbabwe flourished between the 13th and 16th Centuries as an important trading hub, with networks extending across the Indian Ocean.[18] The empires were maintained through a mixture of military force and diplomatic alliances.

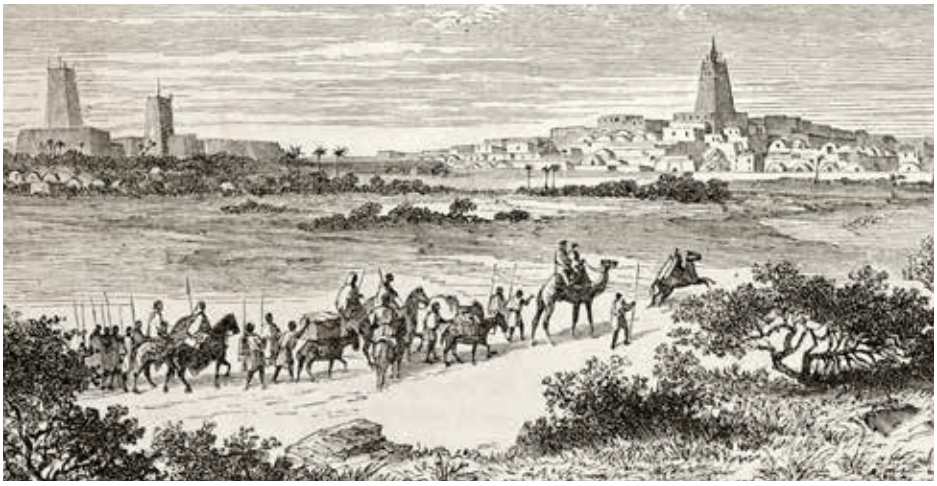
Kings such as Mansa Musa and Sonni Ali were famous throughout the Western and Muslim worlds for the scientific, medical and artistic achievements of their subjects, and for the wealth of their kingdoms. Their capitals were immense walled cities with universities that attracted traders, scholars and poets from all over the world.

AT THE CROSSROADS

African empires established extensive trading links across the world. Royal bureaucracies administered taxes and controlled trade. The strength of kingdoms in West, Central and East Africa lay in their geographic position between the Berber and Arab traders of

This 14th Century map shows Mansa Musa offering a gold nugget to an approaching Muslim merchant on a camel.

The Catalan Atlas of 1375 is attributed to Abraham Cresques, and the original is in the Bibliotheque Nationale de France.[19]



Above:
Arrival in Timbuktu, old illustration. Created by Lancelot after Barth, published on Le Tour du Monde, Paris, 1860
Source: Antonio Abrignani/Shutterstock

> *"The land is situated in the sea of the south east. … It is there that the big bird p'eng lives [now extinct], in its flight it momentarily obscures the sun. If the big p'eng meets a wild camel it eats it. If you happen to find a feather of the bird, you can use its quills to fashion a waterjar. In this country also are found the camel-crane [ostriches] whose necks are six or seven feet long. They can fly but not to any height. They eat all kinds of things, even burning fire. Sometimes [people] give them red-hot copper or iron to eat. The products of the land are elephant tusks and rhino horns.*
>
> Chou Ch'u-fei in 1178 AD

the North, and the gold and ivory producers of the South. Africa has few natural harbours; its great empires therefore developed inland at the crossroads of trade routes. Their success rested on the ability of their rulers to exert control over the flow of goods across the Sahara Desert and tropical jungle to ocean ports.[20]

In 1067 AD, Andalusian scholar al-Bakri described the Ghanaian king Tunka Manin from eyewitness accounts, as well as the economic system that enabled the Ghanaian kings to live so magnificently. The economy was based on import and export taxes on all goods passing through Ghana, as well as monopoly ownership of the most precious resource of all, gold. "The king of Ghana places a tax of one dinar of gold on each donkey-load of salt that comes into his country," and he "also places a tax of two dinars of gold on each load of salt that goes out."[21] This lucrative taxation enabled the king to regulate and control distribution and production – until new gold fields and trade routes opened up beyond the control of the Ghanaians.

GLOBAL OUTREACH

Contact between the East African coast, and Arabia, Persia and China goes back to the 8th Century. Chinese explorer Tuan Ch'eng-Shih described the East African coast in his *Compendium of Knowledge* in 863 AD, and about 300 years later another Chinese explorer described Kouen-Louen ts'eng-k'I, the "land of the blacks".[22]

Perhaps one of the most famous African voyages of discovery – though we are ignorant as to the eventual outcome – was that of Mali's ruler, Mansa Abubakar II. When he first sent an exploratory expedition across the Atlantic, only one boat returned. So Abubakar abdicated and set sail with his fleet across the Atlantic Ocean, never to be seen again. Mansa Musa, his successor, described the events to a contemporary Syrian scholar, Al-Umari, in 1310:

> *Abubakar equipped 200 ships filled with men and the same number equipped with gold, water and provisions, enough to last them for years … they departed and a long time passed before anyone came back. Then one ship returned and we asked the captain what news they brought. He said, "Yes, O Sultan [Abubakar], we travelled for a long time until there appeared in the open sea a river with a powerful current … the other ships went on ahead, but when they reached that place, they did not return and no more was seen of them … As for me, I went about at once and did not enter the river." The Sultan got ready 2,000 ships, 1,000 for himself and the men whom he took with him, and 1,000 for water and provisions. He left me to deputise for him and embarked on the Atlantic Ocean with his men. That was the last we saw of him and all those who were with him. And so, I became king in my own right.*[23]
>
> Mansa Musa, ruler of Mali, circa 1310

SCHOLARSHIP

The oldest existing and continually operating university in the world is the University of Al-Qarawiyyin in Fes, which was established alongside its associated mosque in 859 AD.[24] Fes was not the only historical seat of knowledge in Africa, but many others no longer exist. Of these, the most notable were the 16th Century University of Timbuktu, a medieval complex comprising three schools with an average attendance of more than 25,000 students studying science, mathematics, logic, history, astronomy and medicine.[25] Jenne was another famous centre of learning, a "humble town on a tributary of the great River Niger … that grew and prospered across ten centuries" as "the vital market centre for the trade in gold and kola and other goods from the southern forest lands".[26]

Above left:
The earliest obtainable map of the whole continent of Africa by Sebastian Münster, 1554.
Photo: Princeton University

Above right:
Courtyard of the Al-Qarawiyyin University in Fes, Morocco.
Photo: Khonsali

Features of development

The ability of a kingdom to provide a significant food surplus allowed for divisions of labour and specialisation, with concomitant features of development.

> *"With iron tools there could be more and better farming. With more farming there began to be enough food to maintain specialists who worked at making tools, weapons and other hand-made things. This division of labour encouraged trade, at first local and then long-distance, by producing a wide range of goods. All this, together with the growing size of population, required more complex forms of political organisation. However, as the fates of Ghana, Mali, Kanem, Songhay and other kingdoms showed over time, all too often this progress and development was undermined by environmental change – resulting in widespread drought and disease.*[27]
>
> Basil Davidson in *West Africa before the Colonial Era: A History to 1850*

Innovation systems and technology

Transport: The widespread introduction of camels in trans-Saharan trade routes increased the quantity of goods that could be transported.

Financial administration: Innovations such as book-keeping enabled rulers and officials to monitor large groups of people and their trade, and ensure that taxes reached the central government.

What held particular value?

Islam: Islam became a unifying force, a shared set of ideas about religion, law and order, trading and customs. The religion formed a basis for "integrating immigrants into the political community, which was undergoing increasing differentiation with the expansion of permanent agriculture, manufacture, and commerce".[28] For many leaders, conquest took on a religious dimension and became jihads, or holy wars. Traditional religion persisted alongside the rise of Islam.

Trade: Before the 15th Century, there were two trading networks. The Kongo traded up and down the West coast, and started trading with the Portuguese in 1482, but there was no westbound transatlantic trade. In contrast, Great Zimbabwe managed gold production and was situated at the centre of a complex trade network that spanned East across the Indian Ocean, through the Persian Gulf to India and China.

Power and knowledge governance

Governing power was held by religious elites, with small groups of ruling families benefitting from an increasing concentration of privilege and wealth.

Oral knowledge: A strong oral tradition exists across Africa, where valued knowledge is passed on by custodians and relies on the sharpness of their memories. Few others in the community are able to challenge the knowledge content, although all may have access to it through the custodians. As reported by oral historian Mamadou Kouyate, "Mali guards its secrets jealously. There are things which the uninitiated will never know, for the *griots*, their depositories, will never betray them".[29]

A treasure trove

Right:
Elmina Castle in Ghana was one of the slave embarkation points from Africa to the Americas.
Photo: Jeremy de Beer

Far right:
Slaves in chains, probably somewhere in East-Africa.
Source: Odhiambo Atieno, E.S., Ouso, T.I. and Williams, J.F.M., 1977. *A History of East Africa.* London: Longman Group Ltd.

AFRICA'S WEALTH

Until the 16th Century, most in the Western world knew little about the African continent. In 1656, the Geographer Royal of France described Africa as part of Europe, a "peninsula so large that it comprises the third part, and this the most southerly of our continent".[30] For most Europeans, the continent was perceived to be vacant, legally *terra nullius*, a no-man's land.[31]

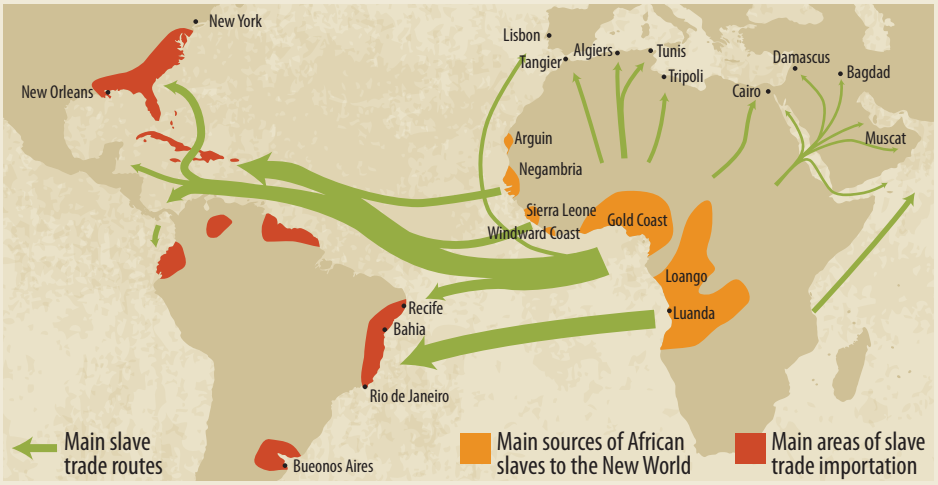
Africa's wealth was legendary. Most of the Muslim Middle East and Christian Europe had economies based on gold – and the majority of this gold was supplied by West Africa. King of Mali Mansa Musa's pilgrimage to Mecca in 1324 became legendary: "It is said that he brought with him 14,000 slave girls for his personal service. The members of his entourage proceeded to buy Turkish and Ethiopian slave girls, singing girls and garments, so that the rate of the gold dinar fell by six dirhams."[32] But the very success and visibility of the Malian empire, characterised by its large population with a strong central government and kingship, led to its decline. By 1400, its capital Niani had been pillaged.

THE PLUNDERING OF AFRICA

Before the 18th Century, African economies were characterised by some persisting hunter-gathering, herding, farming, production such as metal tools and goods, and trade within the continent and outside, the latter including items such as ivory, gold, beeswax, cloth and beads. But two forces reshaped global dynamics. The first was the expansion of the Ottoman Empire into Africa, which led to growing Mediterranean rivalry between the southern European Christians and the Muslim Turks. The second was trade, which circled the world – the Portuguese discovery of the route to the East via the Cape of Good Hope, and Spain's discovery of the Americas.

These developments ushered in a dark chapter in Africa's history. Africa's wealth, both natural and human, became valuable possessions elsewhere in the world.

Portugal's involvement in Africa serves as an example of the dynamics of European engagement. In 1482, the Portuguese established a foothold in Africa, with a fort – São Jorge da Mina – on the Gold Coast to take advantage of the gold trade that formerly passed across the Sahara Desert. A little while later, the explorer Diogo Cão ventured southwards into the Kongo kingdom. When the Portuguese arrived, the Kongolese ruler Nzinga Nkuwu (1481–1495) considered himself a sovereign equal in rank to the king of Portugal, and was initially treated as such.



Above:
Slavery Memorial in Zanzibar, Tanzania.
Photo: redfrisbee/ Shutterstock

He converted to Christianity and his successor's son, Henrique, was educated in Portugal and returned to become Africa's first Roman Catholic bishop. As noted below, what began as a convenient form of mutual trade became the destructive Atlantic slave trade by the time the Portuguese retreated from their African interests.

THE SLAVE TRADE

With the arrival of Europeans, slaves displaced gold as the main commodity for trade. Within 400 years, millions of Africans were forced into slavery. Most went to the Americas, although many were taken to the Middle East and North Africa.

The Portuguese established contact with the African island of Sao Tome, and developed a sugar cane plantation there in 1473.[33] Its prosperity relied on a continuous supply of imported slaves from the African mainland. The settlers' rights to this labour were established by edicts of 1486 and 1493. The financial success of the enterprises of slave trading and of sugar cane farming, given the expanding market for sugar in Europe, caused conflict among competing African tribes, stirred by the Portuguese. Such divide-and-rule tactics characterised colonialism. These processes eventually resulted in the colonisation of Angola, as a hub for the export of slaves to the Portuguese possessions in the New World.

Slavery was not a new phenomenon, but never before had so many people been displaced against their will. Europeans were not the first to treat people as property, but Europe's commodification and commercialisation of human beings was of an unprecedented scale.

Most historians agree that at least 12 million slaves left the continent between the 15th and the 19th Centuries, and up to 20% died on board ship. More would have died at the point of capture. One Portuguese merchant in the late 18th Century observed that nearly half of those captured inland were dead by the time they reached the coast.

In 1807, Britain declared all slave trading illegal, and in 1865, after the civil war, the 13th Amendment abolished slavery in America. In 1873, the last slave market in Africa, in Zanzibar, was closed and slavery gradually petered out.

IMPACT ON AFRICA

Men, particularly those at the prime of their life, were the most commercially attractive to the slave traders. The impact of the slave trade on both the size and structure of the population is incalculable.[34]

The slave trade involved African middlemen. As European demands grew, enslaving enemies became less a consequence of war, and more a reason to go to war. The result was a vicious spiral of escalating conflict, pitting neighbours against each other and fomenting growing chaos. When commerce and trade took on this new dimension, human and mineral resources and firearms became highly valued as the means to maintain superior wealth and power.[35]

Slavery changed the dynamics of nearly all African trading relations:

> *"The impact of slavery was devastating. Inter-regional trade and commerce declined. Traditional systems of alliance and networks of exchange were irreversibly destroyed. Trust amongst former trading partners and neighbours eroded.*[36]
>
> Chapurukha Kusimba, archaeology scholar

COMMODIFICATION THROUGH PROPERTY

During this period, European empires began to assume powerful global positions. The acquisition and exchange of property rights played a major role in their rise.

The *terra nullius* concept was useful in order to justify the exploitation of Africa's wealth through "discovery" instead of "conquest". A conception of Africans as inferior underpinned the treatment of slaves as things.

While Africans could *be* property, legal principles lasting well into the 20th Century restricted Africans from *own*ing property themselves.

While using property laws to

Africa was a lottery and a winning ticket might earn glittering prizes. There were dreams of El Dorado, of diamond mines and goldfields criss-crossing the Sahara. In Europe these were the drab years of the Great Depression ... There might be new markets out there in this African Garden of Eden, and tropical groves where gold fruit could be plucked by willing brown hands.[37]

Historian Thomas Pakenham, in *The Scramble for Africa*

This sword ornament of a lion dating back to 1874 originated from the Akan people of west Africa.

Photo: Gold of Africa Barbier-Mueller Museum

plunder Africa of human capital, Europeans were also creating ways to control knowledge through property rights. The first patents granting exclusive rights in knowledge were granted in Italy in the late 15th Century.

While not analogous by any means, the simultaneous trends to commodify both people and ideas through property rights – and the economic and philosophical justifications for these actions – laid the foundations for the period of colonialism to come.

> *The estimation of the rights of aboriginal tribes is always inherently difficult. Some tribes are so low in the scale of social organization that their usages and conceptions of rights and duties are not to be reconciled with the institutions or the legal ideas of civilized society. Such a gulf cannot be bridged. It would be idle to impute to such people some shadow of the rights known to our law and then to transmute it into the substance of transferable rights of property as we know them.*
>
> Lord Sumner, writing in 1919 in the case of Re: Southern Rhodesia

Features of development

According to the Decree of King Louis XIV of France on 26 August 1670[38]: "There is nothing which contributes more to the development of the colonies and the cultivation of their soil than the laborious toil of the negroes."[39]

Africans' perceptions of progress and development – and the role of slavery – were polarised:

> *There are many traders in all parts of the country. They bring ruin. … Every day people are kidnapped and enslaved, even members of the King's family.*[40]
>
> King of Congo, Alfonso I in 1526, in a complaint letter to the King of Portugal João III

The slave trade is the ruling principle of my people. It is the source and the glory of their wealth. … the mother lulls the child to sleep with notes of triumph over an enemy reduced to slavery.[41]

King Gezo, ruler of Dahomey from 1818 until 1858 (Dahomey was an African kingdom in the present-day Republic of Benin which lasted from 1600 until 1900.)

Power and knowledge governance

Europe 1421: The first industrial patent was granted to Filippo Brunelleschi for inventing an improved method of transporting goods by boat.

Europe 1474: The French monarchy created the Parta Venizia, a royal letter granting the right to have a monopoly over an invention or artistic work. This is the first appearance of what would be termed "intellectual property rights" in modern terms. This was formalised in French law in 1791 and 1793.[42]

What held particular value?

Commerce and trade took on a new dimension and human and mineral resources (the treasure trove), and firearms (the means to access treasure) became highly valued as the resources to maintain superior wealth and power.[43] The Great Rinderpest epidemic of the 1890s killed 95% of all cattle in many areas of East Africa and led to intensification of alternative sources of revenue, particularly the ivory trade.[44]

Innovation systems and technology

Maritime: Chinese naval and navigational innovations led to the building of large ships that could survive the storms of the oceans. The compass enabled seamen to steer their course.[45] These innovations were adapted by the Arabs and later the Europeans in the 15th Century. This enabled Portuguese and later other European nations to make long ocean-going trading voyages.

Firearms: Gunpowder was invented in China in the 9th Century, firearms by the 14th Century. Firearms first appeared in Africa in the late 15th Century, brought by Portuguese explorers. Their first use was in 1591, when a small Moroccan army under Judar Pasha managed to overthrow the powerful Songhai empire. Soon afterwards, the king of Bornu was the first to acquire a division of musketeers from the Ottomans, and firearms became indispensable weapons. A vast number of slaves were traded for guns.[46]

Sugar: Two-thirds of all slaves captured in the 18th Century went to work on sugar plantations. This reflected the enormous demand for sugar in food and drink at the time.

Cotton: In 1793 Eli Whitney invented the cotton gin, which enabled cotton to be processed on a large scale. Growing numbers of plantations led to a dramatic increase in the number of slaves.

Colonialism

The history books say that Livingstone discovered the Victoria Falls. Stupid idea! When Livingstone came to the falls he was shown by an African. Livingstone didn't discover: he was informed.[47]

Flavio Paradza, school teacher in Chibi, Zimbabwe, in 1981

> *To open to civilization the only part of our globe where it has yet to penetrate, to pierce the darkness which envelops whole populations, it is, I dare to say, a crusade worthy of this century of progress. … in bringing you to Brussels I was in no way motivated by selfish designs. No gentlemen, if Belgium is small, she is happy and satisfied with her lot. My only ambition is to serve her.*
>
> King Leopold of Belgium at the 1876 Brussels Geographic Conference

And a few months later in a letter to the Belgian ambassador in London:

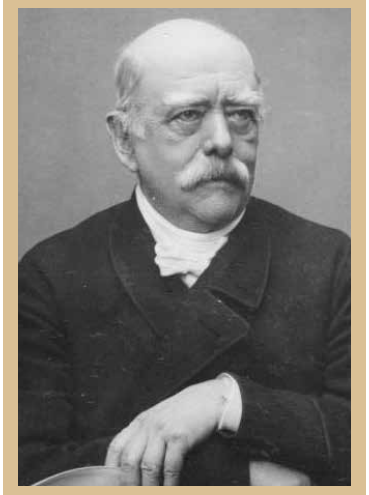
> *I do not want to miss a good chance of getting us a slice of this magnificent African cake.*[48]

19TH CENTURY COLONIALISM

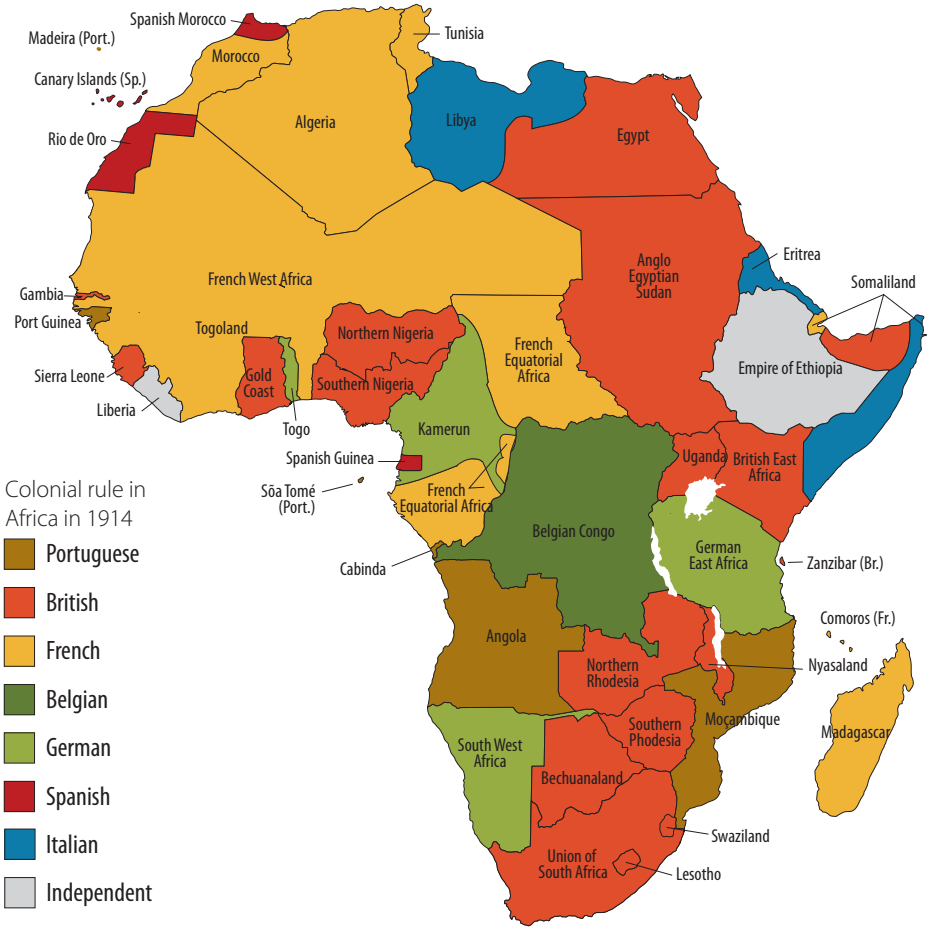
From the time of Napoleon's defeat in 1815 to the outbreak of the First World War in 1914, Europe's technological innovations and political ambitions fuelled a wave of colonialism across the globe. Within a century, most of the world's land was under the control of one or other of Europe's countries – and no continent was so impacted as Africa.

Until the 1850s, relations between Africans and Europeans were conducted at arm's length. This was largely due to mutual hostility and the perceived harshness of the

The Rhodes Colossus, an 1892 caricature of Cecil Rhodes after announcing plans for a telegraph line from Cape Town to Cairo.
Source: For ***Punch*** by Edward Linley Sambourne



In November 1884, following a request from Portugal, German chancellor Otto von Bismark convened the Berlin Conference that carved out Africa. Fourteen countries were present. By 1900 much of Africa had been colonised by seven European powers: Britain, France, Germany, Belgium, Spain, Portugal and Italy..



Colonial rule in Africa in 1914.

Source: Darby and Fullard, ***Modern History Atlas***; Robert Stock, ***Africa South of the Sahara***

African environment by European explorers. African princes were able to present themselves as "lords of the land", while acknowledging that the Europeans were "masters of the water".[49] In 1876, more than 90% of the continent was still ruled by Africans. Three decades later, only Liberia and Ethiopia had retained their independence.

COLONIAL MOTIVES

In 1855, David Livingstone became the first European to report the Mosi-oa-Tunya ("the smoke that thunders") waterfall, which he renamed Victoria Falls after his monarch, Queen Victoria. His motto is inscribed on the base of his memorial statue at Victoria Falls: "Christianity, Commerce and Civilisation." For Africans, the fourth C was Conquest.[50]

> *I beg to direct your attention to Africa; I know that in a few years I shall be cut off in that country, which is now open: Do not let it be shut again! I go back to Africa to try to make an open path for commerce and Christianity; do you carry out the work which I have begun. I leave it with you!*
>
> David Livingstone, Cambridge University address, December 1857

His urging was heard by many in Europe who were motivated by commercial greed, political rivalry and territorial ambition.

When France was defeated in the Napoleonic Wars, it turned to Africa as economic consolation. The coalitions that had formed to attack Napoleon's growing French empire became involved, and soon the major European powers started to claim territory in Africa and play proxy politics.

There were growing territorial ambitions and the desire to find new markets for the growing surplus of European produce. Colonialism offered the opportunity to exploit raw materials and return products from the metropole for consumption by African markets.

There were some who believed that the growing strength and modernisation of indigenous African empires had the potential to challenge the *status quo* outside the continent. Some Muslim empires were supported by the Ottoman Empire and thus there was also a religious motivation.

PARTITIONING OF AFRICA

The result of these dynamics was the "scramble for Africa", a partitioning of Africa at the Berlin Conference in 1884 by Britain, France, Germany and Belgium. Africa became a proxy for political rivalry. This culminated

This scene from an Ethiopian painting depicts the Ethiopian triumph against Italian forces at the Battle of Adwa. The Italo-Ethiopian War of 1895–96 distinguished Ethiopia as the only African state to maintain independence in the 19th Century with a decisive show of force.
Photo: Joshua Sherurcij

in the Fashoda Crisis in 1898, after a series of territorial disputes between France and Britain, which brought the two countries to the brink of war in Sudan.

Colonialism transformed the physical, political, cultural and psychological landscapes of Africa. It undermined and destroyed traditional forms of ownership, fractured societies and fomented distrust. A hallmark of colonial practices, particularly those of the British, was "decentralised despotism" or indirect rule. In this system, local rulers were co-opted or installed to collect taxes and maintain law and order.[52] Other colonial powers demolished or sidelined indigenous ruling systems and created their own governing structures staffed by their own citizens. Either way, this impacted the systems of land control, the form and function of urban areas, the organisation of work practices, and the very means of existence for most African people.[53]

BURYING HISTORY

Distortions of history were occasioned by racist mindsets and served the colonialist narrative. White rule was justified by the belief that blacks were not capable of governing or developing themselves. The most famous cover-up is that of the Zimbabwe Ruins, centre of a thriving medieval state. Cecil John Rhodes, who occupied the country and created the British colony of Rhodesia in 1888, refused to believe that a structure of such sophistication as Great Zimbabwe had been built by Africans. He employed Theodore Bent to excavate at the ruins, and commissioned research from A. Wilmot. The respective resultant *The Ruined Cities of Mashonaland* (1893) and *Monomotapa (Rhodesia)* (1896) argued that the ruins had been built by either Phoenicians or Arabs. Soon after Rhodes' death, archaeologists found evidence disproving these views. In his book *Medieval Rhodesia* (1906), Randall-MacIver made the case that the ruins were of African origin and dated from approximately the 14th Century, research later corroborated by radiocarbon analysis. Nevertheless, the myths of mysterious origins were perpetuated by Rhodesian education until Zimbabwe's liberation.

The colonial scramble petered out after World War I, when colonial powers started to calculate the costs of their colonial empires.

Surviving Herero after the escape through the arid desert of Omaheke in German South West Africa (modern-day Namibia) (circa 1907).
Source: Ullstein Bilderdienst, Berlin

Prince Eleko and council, Southern Nigeria (circa 1911).
Photo: John Hobbis Harris

> *"We wanted to indicate to the average [visitor to] the ruins what the evidence was, to give them the facts of Zimbabwe's origins, and that's where we met opposition [from the Rhodesian government]. With our guidebook, they wanted us to omit any mention of radiocarbon dates, a scientific process that would give the lie to the other stories. Their thinking went like this: "If we accept blacks could do something like that then, we must give them majority rule now."*[54]
>
> Tom Huffman, senior curator of archaeology in 1981 at the Queen Victoria Museum, Salisbury, Zimbabwe

Features of development

In the 19th Century, concepts of progress and development were strongly linked with commerce, utilitarianism and the perception of technology as the key agent of social change. There was a marked change in discourse, with concepts of "polygeny" (that humans evolved from different ancestors) becoming widespread.[55] There was a growing discourse in terms of binary extremes: black/white, civilized/savage,[56] domination/subjugation and citizens/subjects. Superiority was not necessarily expressed explicitly in racial terms but in terms of notions of work, tools, weapons, legal codes and "sophistication".

Innovation and technology

Quinine: Before the discovery of quinine, derived from the bark of a Peruvian plant, Africa was known as the "white man's grave". Later, Europeans were able to travel through Africa using quinine as protection from malaria.

Railways: In 1825, Stevenson designed the first steam engine that could pull carriages. In 1853, the first railway track on the continent was opened in Egypt. Steamboats similarly acted as the key to "civilizing" the interior of West Africa.

Gun design: In the 1830s, Africans and Europeans had equivalent firepower. Early muskets took some time to load, and were unreliable. In 1866, breech-loading rifles were invented, which used cartridges and shot faster, more accurately and further. This led to an arms race from which Africa was largely excluded.[57]

Cars: In 1886, Carl Benz patented the modern automobile, which soon replaced animal-drafted carriages. In 1890 Dunlop invented the tyre, so creating an insatiable market for rubber, which grew in the Congo. This led indirectly to the colonisation of the Congo by Belgium.

Telecommunications: Submarine telegraphy was invented in the 1880s, speeding up communications and improving commercial, political and military control of the colonies.

What held particular value?

Science and technology: With science and technology playing a leading role, structures that protected the inventors, such as formalised intellectual property rights, were introduced.

Geology: The first geological map was drawn in 1815 by William Smith. It explained how geological strata create the conditions for certain minerals. This led indirectly to the scramble for Africa and its resources, for example, in the 1880s when diamonds were discovered in South Africa.[58]

Political strategies: As colonial powers usurped control, traditional rulers either learned new adaptive or subversive strategies or fell from power. This depended on their ability to acquire new technology (primarily modern guns), to communicate efficiently, to mobilise armies swiftly and to accept indirect rule. These qualities became more important than ancient genealogy, ritual, inheritance and isolation.

Power and knowledge governance

Europe 1883: Paris Convention for the Protection of Industrial Property protects patents on industrial design. African signatories include Tunisia.

Europe 1886: Berne Convention for the Protection of Literary and Artistic Works protects copyright.

Post-independence

> *The African state since independence has been subject to two competing pressures – the push towards militarisation and the pull towards privatisation. […] Africa is caught between Shylock and Shaka, between greed and naked power – and the decay of the post-colonial state is one consequence of that dialectic.*[59]
>
> Ali Mazrui, writing in *The Africans: A Triple Heritage*, 1986

GROWING NATIONALISM

By the end of the Second World War, there were just three independent African countries – Liberia, Ethiopia and Egypt. Inspired by the example of Indian independence in 1947 under Gandhi, there was growing resistance and nationalist sentiment across Africa. Both the United States and the Soviet Union were supportive of anti-colonial sentiments: the former to gain free trade access to African markets and the latter to increase its sphere of influence.

State by state, the continent threw off the yoke of the colonials. In 1963, the Organisation of African Unity was established, a forum where newly independent African heads of state could collaborate.

The borders of African countries were those inherited from their colonial past, with scant regard for the organic borders between different ethnic and linguistic groups or regional power bases. Often the groups placed in charge under policies of indirect rule continued to rule following independence.

Many leaders of the struggles for independence also led the transition from colony to independent nation. Personality cults sometimes grew in response to the need to bind conflicting interests and groups. Initial multiparty democracies sometimes gave way to military rule or authoritarian one-party states. This often led to weak governance, poor economic performance, and the continued exploitation of resources by the elite, both domestic and foreign.

Following the rapid decolonisation of African states in the late 1950s and throughout the 1960s, independent states followed two paths – the "African socialist" model of Ethiopia, Zimbabwe and Tanzania, and the "neoliberal" approach of Nigeria and later apartheid South Africa. Cold War politics led to Africa becoming an ideological battleground for the Soviet Union and the United States and its allies – the East versus the West, socialism versus capitalism.

AFRICA PAYS AGAIN

In the immediate post-colonial era, African governments borrowed heavily to industrialise their economies and educate their people. Commodity prices, which African countries relied on, were rising and credit was accessible. However, major oil price shocks (in 1973

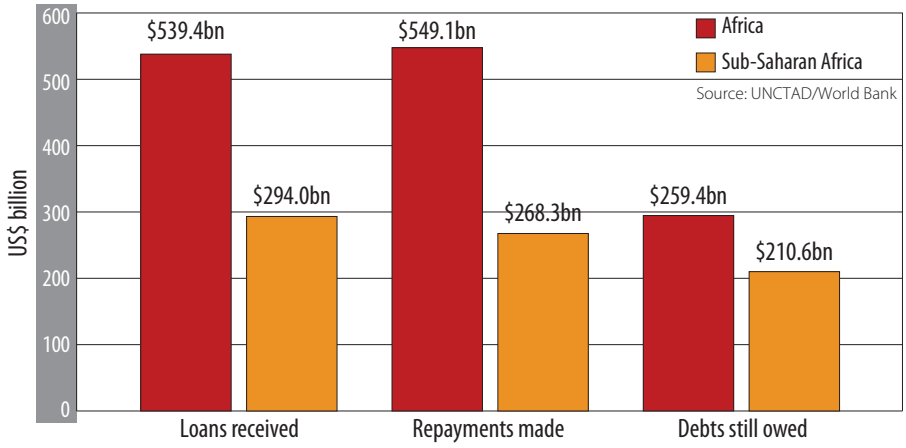
In 1960, the number of independent countries grew from 9 (population 95 million) to 26 (180 million).

- **Cameroon** (formerly Cameroun) – the first day of 1960 (from France)
- **Togo** (formerly French Togoland) – 27 April (from France)
- Mali Federation – 20 June, then split into **Mali** and **Senegal** – 20 August (from France)
- **Madagascar** – 26 June (from France)
- **Somalia**, through the unification of British Somaliland and the Trust Territory of Somalia – 26 June (from United Kingdom)
- **Republic of the Congo** – 30 June (from Belgium)
- **Somali Republic**, five days after unification, Somalia united with the Italian Trust Territory – 1 July (from Italy)
- Dahomey (renamed **Benin** in 1975) – 1 August (from France)
- **Niger** – 3 August (from France)
- Upper Volta (renamed **Burkina Faso** in 1984) – 5 August (from France)
- **Côte d'Ivoire** – 7 August (from France)
- **Chad** – 11 August (from France)
- **Central African Republic** – 13 August (from France)
- **Republic of the Congo** (Brazzaville) – 15 August (from France)
- **Gabon** – 17 August (from France)
- **Nigeria** – 1 October (from United Kingdom)
- **Mauritania** – 28 November (from France)

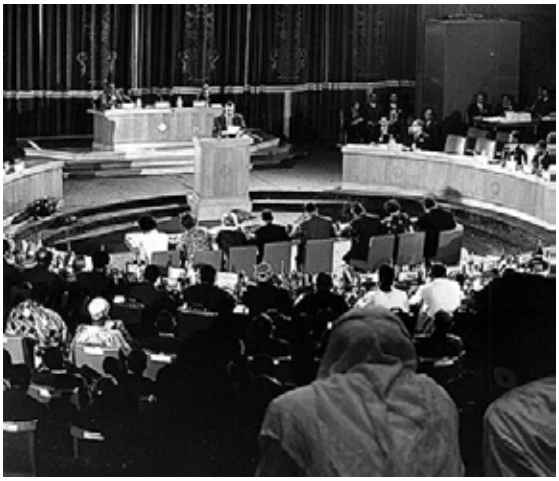
[Africa] has come far – overcoming colonisation, mounting successful liberation struggles which led to the acquisition of independence and … coming to grips with democratic governance.

Ada Ordor, Director of Centre for Comparative Law in Africa, University of Cape Town

Africa's debts 1970–2002



Barricades set up in the streets of Algier during the Algerian War of Independence, January 1960.
Photo: Michel Marcheux/Christophe Marcheux



Egypt´s president, Gamal Abdel Nasser, addresses the 1964 OAU Summit in Cairo, during his term as Secretary General. The OAU was disbanded in 2002 and replaced by the African Union.
Source: Al-Ahram Weekly online

and 1974 when Organization Of Petroleum Exporting Countries (OPEC) raised the oil price, and in 1979 and 1980 when the Shah of Iran was deposed) sent interest rates sky-high and led to the global recession of 1981 to 1982. Commodity prices dropped precipitously, leaving African countries with spiralling debt.

New borrowing was not always productive, and was sometimes used simply to service existing borrowing. "[P]oor public sector management, including, at times, poor project selection by donors, meant the loan funds which were designed to increase productivity and generate exports failed to produce the expected yields and brought no long-term benefit in terms of capacity to earn foreign exchange."[60]

As the debts spiralled, the World Bank and IMF initiated greater controls over African governments, forcing structural adjustment programmes in exchange for loans. The neoliberal agenda was designed to remove "excess" government controls, promote market competition and revive multiparty democracy. Governments had to privatise state-owned industries, including the health sector, and open up their economies to foreign competition. The impact on the social sector has been profound, diverting scarce resources and thereby affecting access to health and education for the poor.

Between 1970 and 2002, African countries received some $540 billion in loans, paid back close to $550 billion in principal and interest, and still held debt of $295 billion at the end of 2002.[61] Thanks to African pushback and global debt relief efforts, African countries have reduced expenditure on debt service payments by 2% of GDP. Between 2000 and 2008, African countries reduced the percentage amount of their export earnings dedicated to servicing their external debt from approximately 27% to 12%.[62] However, the challenges of managing debt and development still remain.

While colonial powers ceased to govern South Africa in 1961, it took a protracted liberation struggle to achieve democracy with universal suffrage.
Photo: Eric Miller

Features of development

Notions of progress were informed by "predominant development thinking that low-income countries should invest in industry, particularly import-substitution industrialisation and infrastructure", and the "prevailing view was that governments should play a leading role in this industrialisation".[63] The backbone of the development strategy pursued by the IMF, World Bank and US Treasury Department was the Washington Consensus, which emphasised liberalisation, privatisation, fiscal discipline, openness to trade, protection of property rights, market-determined exchange and interest rates, and redirection of public spending toward education, health and public infrastructure.[64]

Innovation systems and technology

Weapons: The Cold War initiated a nuclear arms race between the Soviet Union and the United States, and also lead to the stockpiling of illegal biological and chemical weapons. In early 2010, the total declared stockpile of the world was about 30,308 tonnes.[65]

Radio: Radio, being cheap, flexible and oral, has been a predominant form of communication across Africa. The first radio stations in the 1930s were used as part of colonial administrations' public service. By the 1960s most independent countries had established their own radio broadcasting services.

Television: As with radio, domestic TV was primarily state-run in Africa until the 1990s – the decade when widespread access to satellite technology allowed for market entry by numerous domestic and international private TV operators. African TV consumption was until the mid-1990s primarily an activity for urban, wealthy elites.[66] Over the past two decades, private media have brought a measure of political independence and access to news. With the increasing adoption of mobile technology there has been rapid growth in terms of the number of media outlets and the size of audiences.[67]

What held particular value?

> *"Since the 1950s, the debates had become intense and polarised. The issues changed: Economic reconstruction, the building of a social welfare state and the emancipation of new nations in the 1950s; the Cold War, democratisation and development in the 1960s; concluding decolonisation, a New International Economic Order and the provision of basic human needs in the 1970s; the primacy of the market, the defrosting of the Cold War and the sharpening of economic dualism within and between countries in the 1980s. All of these debates came together in the last decade of the previous century. It was the decade of neo-liberalism in economic as well as development policymaking, the decade during which the phenomenon of economic and technological globalisation reached maturity, the decade also of wide escalation of violent conflicts.*[68]
>
> Professor Jan Pronk, Dutch Minister for Development, 1973–2002

Power and knowledge governance

1945: United Nations founded after World War II, aiming to keep peace, develop friendly relations, help nations work together to improve the lives of poor people, to conquer hunger, disease and illiteracy, and to encourage respect for each other's rights and freedoms.[69]

1948: General Agreement on Tariffs and Trade (GATT).

1963: African Copyright Meeting in Brazzaville, followed by the Stockholm Conference in 1967, for revision of the Berne Convention. A "protocol regarding developing countries" known as the Stockholm Protocol was added.

1976: The Lusaka Agreement – an Agreement on the Creation of the Industrial Property Organization for English-speaking Africa (ESARIPO) – was adopted in Zambia, with assistance from the United Nations Economic Commission for Africa (UNECA) and the World Intellectual Property Organization (WIPO).

1994: Signed in Marrakech, Morocco, the Agreement on Trade Related Aspects of Intellectual Property (TRIPS), set down minimum standards for intellectual property rights and linking intellectual property to trade for the first time on a global scale.

Current paradigm

What the discovery of African writers did for me is this: it saved me from having a single story …[70]

Chimamanda Ngozi Adichie, writer

CHANGE AND COMPLEXITY

The global euphoria and stability at the start of the new millennium has given way to a new dynamic. Constant disruptive change and complexity characterise the 21st Century as globalising forces multiply interconnections, linking more and more people and systems across growing numbers of interfaces.

This has led to a growing cacophony of opinions and voices, and divergent interests. Although we have multitudes of competing stakeholders, interests and mind-sets, many of the systems underlying these interactions are standardised, so that there is a powerful dynamic between heterogeneity and homogeneity. Geopolitics and geo-economics are fundamentally intertwined and there is constant flux. The paradigm of today is always-on, constant adaptation. Amidst the high unpredictability at environmental, social, economic and political levels, there is one certainty: there is no monopoly on wisdom.

AFRICA'S SPRING?

A decade into the 21st Century, Africa has confounded global expectations for some onlookers, with among the world's fastest growing economies and the explosion of mobile networks leading to new innovations. This progress has been widely celebrated. What is often overlooked is that countries that have grown most rapidly are those engaged in the production of new technologies rather than simply being users of, and at best service providers to, the technology of others.[71]

For some Africans, the result of the mobile revolution has been horizontal power, growing individualism and a new climate of optimism. The Arab Spring started in Tunisia with the self-immolation of Mohamed Bouazizi at the end of 2010, and it spread like wildfire to Egypt, Libya, Yemen, Morocco, Western Sahara and Syria. People everywhere are demanding transparency, an end to corruption and cronyism, and employment for the ballooning youth population.

The Arab Spring started in Tunisia at the end of 2010 and spread like wildfire to Egypt, Libya, Yemen, Morocco, Western Sahara and Syria.
Photo: Wael Abed Revolution Archive

A HARSHER SEASON

Other Africans experience a cycle of weak governance, poverty and violence. There are four "failed states" and several on the alert list. The problems of fragile states spread easily.

Features of development

The framework of the Beijing Consensus[72] sees development as involving constant experimentation, described as "groping for stones to cross the river". The key is self-determination defined by, and the product of, a specific society. Power means change, newness and innovation. Sustainability and equality have been adopted as key measures alongside GDP *per capita*.

Another version is the World Bank's Comprehensive Development Framework, which integrates both economic and social aspects of development based on four principles:

- a long-term, holistic vision of a country's needs
- focusing on macroeconomic aspects but also on social and structural aspects
- a focus on results rather than inputs
- country-owned strategies and collaborative partnerships.[73]

What holds particular value?

> *Governance is about managing this place. … It's a mess. There is a need to enshrine the rule of law. That is the first step toward building an advanced society. Transparency. Lack of corruption. Human rights of individuals. Building infrastructure. Taking care of education. Health. All these things are pillars of a civil society. [What prevents these is] lack of good governance.*[74]
>
> Mo Ibrahim, quoted in an interview in *The New Yorker*

> *Justice and equity are certainly not new concepts. Here we use them in their broadest sense. By looking at the triangle of jobs, justice and equity, we underline the role of empowerment and equality of opportunity as indispensable for progress and thus particularly powerful focal points for domestic policy initiatives and international development assistance. We highlight jobs because it is through their livelihoods that people achieve social progress, for themselves and for others, and because the need to create jobs for the continent's rapidly growing youth population stands out as among the most pertinent challenges for Africa's policymakers.*[75]
>
> Kofi Anan, seventh Secretary-General of the United Nations

Power and knowledge governance

Multiple and conflicting perspectives between:

- different donors, and increased South-South co-operation and trade between developing nations following models such as the Beijing Consensus;
- different systems: open source, copy left and intellectual property rights.

Innovation and technology

Mobile telephony: Cellphone access and usage began to spread rapidly in Africa in the late 1990s, a trend resulting in the ubiquitous mobile usage that is a feature of 21st Century Africa. There were fewer than 4 million mobile phones in Africa in 1998. There are more than 400 million today.

Internet: The growth of internet usage in the late 1990s is less strong than that of mobile telephony, due to internet's then reliance on fixed-line infrastructure (which was and is weak in most of Africa). It is only with the arrival of widespread access to wireless mobile internet, in the 2000s, that the internet has become a strong technological factor throughout Africa.[76]

Cutting-edge technologies: We can hardly imagine the future implications of technologies such as 3D printing and nano-technologies. Even less can we predict how emerging technologies will synergise or clash with each other, and the feedback loops. 3D printing side steps the need for major centralised manufacturing machinery and infrastructure. It takes a digital version of an object and creates the physical object by laying down thin layers of a material such as plastic to form the shape. The prototype is distributed electronically and the object can be manufactured anywhere where there is a 3D printer. Nano-technologies manipulate the building blocks of matter at the nanoscale of atoms and molecules. Convergence of four major technologies (nano-bio-info-cogno) could radically alter society and human lives.[77]

Lessons from history

I have felt my strongest artistic emotions when suddenly confronted with the sublime beauty of sculptures executed by the anonymous artists of Africa. These works of a religious, passionate, and rigorously logical art are the most beautiful things the human imagination has ever produced.[78]

Pablo Picasso, artist

The previous pages touch on examples of African visioning and scholarship, ingenuity and creativity, and innovative technologies and governance. African creativity and innovation have long inspired those from outside. Over the past century, the dominant, regimented bureaucratic-industrial knowledge has not straightjacketed African innovation and creativity to the extent that it has in the developed world. This may give Africa a unique edge in the knowledge society of the future.

CONTEXT MATTERS

When the Open A.I.R. research network started scenario building three years ago, we spent countless hours consulting and discussing the links between valuable knowledge, its governance (i.e. the way it is owned, shared and protected), information communications networks, innovation systems, and human development or socio-economic progress. Research reveals not only that these topics are interrelated, but also that they are time-bound. Together, they form the particular context of the time, shape societies and cultures, and are in turn shaped by them – until there is a disruption that tips the balance, or an accretion of changes that ratchets these interconnected factors into a new paradigm.

Despite being airbrushed out of the story of human progress held in the popular consciousness, Africa's historical tapestry across aeons of time illustrates that different economic and political systems give rise to different knowledge governance paradigms and regimes. A deeper look into the anthropological, archaeological and historical evidence and scholarship that abounds is warranted.

> *"African innovation outside the global process will be a most uncharitable concept if not an exercise in intellectual fraud … You may be suggesting that African innovation can be isolated from the innovation and development of Europe and America. No, Africans were true participants and architects in those regions and cannot be excluded from the global narrative of innovation.*
>
> Charles Okafor, Nollywood actor, Lagos (Open A.I.R. interview)

However, two points are immediately apparent. First, knowledge is transitory and its preservation contingent. Disruptors include technological innovation, but also the natural environment, political forces, social norms, and cultural values. Important knowledge for one society or grouping, or at a particular time, can lose value as contexts or perspectives change. Knowledge useful in one context or society can be disastrous to another society, or under different circumstances. Second, yesterday's understandings have shaped our current reality. Even when previously unquestioned knowledge no longer dominates, its impacts remain embedded in culture, ways of working, social interactions and economic organisation.

Just when you thought ...

The preservation and transmission of knowledge are vulnerable and tenuous.

Much knowledge in Africa was handed down orally and through intergenerational experiential learning. Somalian oral and written practices make for an interesting case. The Somalis have been described as a nation of bards, with poetry preserved orally by poets who were accorded high social status. Somali is spoken throughout the eastern Horn of Africa, in Somalia, eastern Ethiopia, northeast Kenya and southeast Djibouti, and by a large global Somali diaspora. The Somali language only acquired an official writing system based on the Latin alphabet in October 1972, bringing to an end the "alphabet wars" between factions promoting several possible scripts – Latin, Arabic or Osmaniya.

Many repositories and centres of knowledge have disappeared, prey to the vicissitudes of history, such as the Great Library of Alexandria, the University of Timbuktu, and the ancient city of Jenne. In contrast, Al-Qarawiyyin in Fes is the oldest educational institution in the world, continually operating since it was established in 859 AD.

Knowledge transmitted orally can degrade, or be embroidered

Photo: Mikael Damkier/ Shutterstock

in the telling over time; written information can be destroyed or damaged; information transmitted digitally is easy to duplicate and can be subtly altered without the changes being easily visible.

Knowledge can be lost. We have seen how the ability to innovate and build a canal in the 13th Century BC to link the Nile and the Red Sea disappeared until the need arose centuries later when the shipping route was "reopened" as the Suez Canal in 1869. Romans in the 1st Century AD had all the makings of steam engines, yet this technology was only put to use in industrial production many centuries later.

The lion and the hunter

Periods of slavery and colonialism provide clear examples of knowledge regimes and innovations which nourished some while poisoning others. Knowledge can be distorted through the lens of an interest group – as Achebe says, the hunter describes it differently from the lion.

Traditional African practices of farming include no-till agriculture, the use of planting sticks and rotating a mixture of crops. With colonialism came cash crops and later industrial agricultural methods with pesticides and artificial fertilisers, seen to increase yield. However, the drawbacks of these methods have subsequently become apparent: release of carbon held in the soil; greater evaporation of water; compacting and degradation of soil; loss of organic matter and nutrients and hence soil fertility; adverse changes in salinity; acidity or alkalinity; death or disruption of soil microbes and other organisms such as earthworms and bees; soil erosion; and loss of topsoil. A return to indigenous forms of knowledge may hold a key to more sustainable agriculture, and since labour, fuel, irrigation and machinery costs are reduced, greater surpluses can potentially be realised.

The future of the past

Examples abound of how our thinking today is still shaped by implicit understandings from our past. Oral traditions continue to influence what knowledge is valued and how it is governed. The era of colonial racism is in most respects officially over in Africa, yet it still patterns thoughts and behaviours. The rhetoric of independence struggles persists, even though it often has little relevance for the economies and politics of today.

The disruptors

Slavery and colonialism – economic drivers of change – caused the greatest disruptions experienced on the continent.

Technological disruption of an existing order is seen in the Assyrian overthrow of the Nubian Dynasty of Egypt due to superior military technologies; the arrival of guns on the continent with the Ottoman Empire; and the dissemination of information technology.

Similarly, environmental changes can disrupt established ways of life. The desertification of the Sahara appears to have commenced abruptly about 5,440 years ago due to subtle changes in the title of the earth's axis.[79] The result was a change from a well-watered lush environment covered by annual grasses and pollens suitable for farming and pastures to an extremely arid, inhospitable desert – with major changes for the human beings dependent on it.

A population can reach its growth limit and be threatened with collapse. This occurred in Africa several times, as a society's requirements for food and water exceeded the environmental capacity of a region. For example, Great Zimbabwe existed for over three centuries and was home to a population of more than 10,000 people, but the demand on the hinterland required to support this level of society was not sustainable.

The most powerful weapon in the hands of the oppressor is the mind of the oppressed.

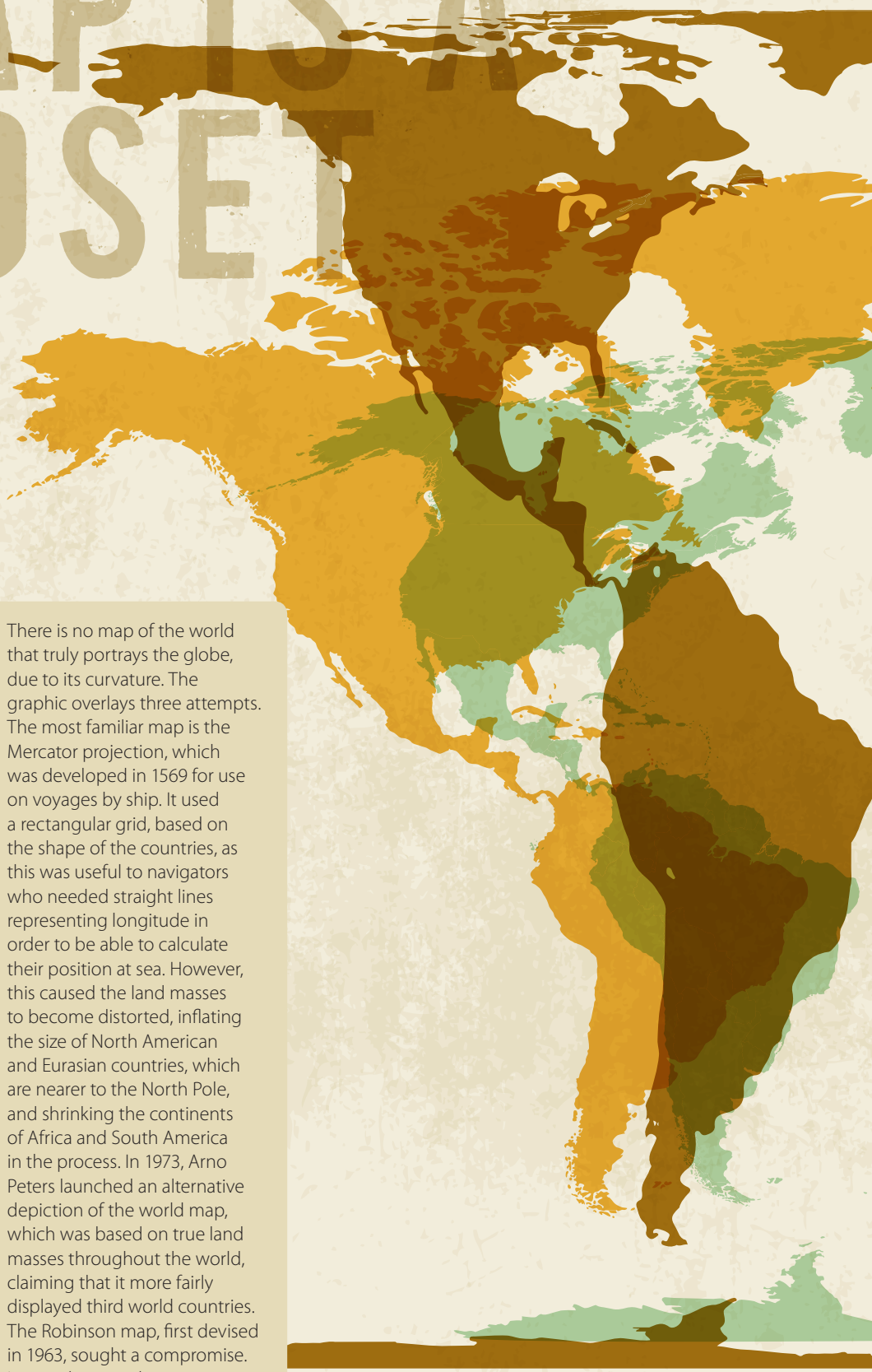
Steve Biko, South African Black Consciousness activist

WHERE DO WE STAND?

The road of industrialisation that humankind has taken over the past three centuries has been uneven. Some people benefitted from great leaps of progress, but at the cost of the environment and human equity.

Humankind's ability to innovate has been the impetus for development since we first emerged on the African plains. The growth of new technologies, and the complexity of their interaction, has been exponential.

A MAP IS A MINDSET



A MAP IS A MINDSET

The conundrum today is how African countries can participate in the global model yet also craft a successful economic model that they can claim ownership over. China, Brazil and Japan are examples of nations that have forged their own paths. If African states play in the capitalist game according to rules set by others, they may get left behind and exploited just as they have over the last few centuries. African countries could seek to merely get stronger footholds in the capitalist dispensation and gladly participate.

Or might African nations be able to draw on their current positions in the global order to lead in a new direction? What role for Africa? Do its history and diversity offer unique potential for innovation and new ways of thinking? Might emerging global contexts – contexts shaping what knowledge has value, knowledge governance, and what constitutes worthwhile innovation – be tilting in favour of African countries? Will African progress, development and innovation benefit the few,or the many?

Seeking answers to these questions, we turn now to the driving forces of change that are at present pushing Africa and the rest of the world into uncertain futures. After that, three scenarios are set out: three possible contexts in which Africans might have to operate in 20 years' time, around the year 2035.

There is no map of the world that truly portrays the globe, due to its curvature. The graphic overlays three attempts. The most familiar map is the Mercator projection, which was developed in 1569 for use on voyages by ship. It used a rectangular grid, based on the shape of the countries, as this was useful to navigators who needed straight lines representing longitude in order to be able to calculate their position at sea. However, this caused the land masses to become distorted, inflating the size of North American and Eurasian countries, which are nearer to the North Pole, and shrinking the continents of Africa and South America in the process. In 1973, Arno Peters launched an alternative depiction of the world map, which was based on true land masses throughout the world, claiming that it more fairly displayed third world countries. The Robinson map, first devised in 1963, sought a compromise. It is neither equal-area nor conformal.

The map shapes our conception of reality.


Robinson projection
Mercator projection
Peters projection

Drivers of change

There are forces driving the futures of Africa – indeed the entire world – in different directions. These forces can be unpredictable, complex, or uncontrollable. What are they?

Through three years of work, dozens of Open A.I.R. researchers have together distilled the insights of hundreds of interviewees and thousands of survey respondents to identify the key drivers of Africa's futures.

The process involved exploring issues such as elements already in the pipeline, cause and effect relationships, key patterns and trends. These issues were then ranked in terms of degree of importance, uncertainty and level of ignorance. In each case the objective was to determine the tectonic force that would shape the trajectory of the future.

Five drivers have been distilled. Each of the five drivers could not only evolve in many different ways, but also interact with the other equally uncertain drivers of change (and others not considered here), with feedback loops, knock-on effects and trade-offs. In this section, we try to tease them out, look at trends and explore how they might play out.

The five drivers are:

- **Global relationships**: the countless interconnections and interdependencies that span the globe to unite its people – or distance them.
- **Statehood and governance**: the role of the state in relation to residents, balancing the innate tension between individual rights and freedoms, and state power.
- **Identities and differences**: the values that evolve in the face of social, political and economic changes taking place at global, local and personal levels.
- **Infrastructure and technology**: disruptive enablers to leapfrog conventional structures and methods to create new economic, social and political development and disrupt the *status quo*.
- **Employment and livelihoods**: the ability to create opportunities for a growing workforce, so providing the means to reduce poverty and create economic growth, social empowerment or even social cohesion.

After centuries of continuities, modern rates of change have shown that it is often that which no one imagined or expected that drives history – the wildcards and shocks. We have tried to imagine such possibilities that might rupture any road map.

Global relationships

Will these relationships be collaborative, competitive or coercive – and who benefits?

AFRICA'S CENTURY?

Home to among the world's poorest and hampered by its historical position in the global economic and power relations, Africa has been caricatured as the world's economic basket case. Over the last decade, Africa has rebounded greatly in terms of economic reality and global perception. Continental economic growth has trebled since 2002 with the continent averaging 5% GDP growth annually over that period. In 2012, Africa's GDP grew 6.6%, up from 3.5% in 2011.[1]

Over the period 2001 to 2010, 6 of the 10 fastest growing economies in the world were in Africa. The IMF forecasts that by 2017, 11 of the world's 20 fastest growing economies will be in Africa.[2] Countries as diverse as Botswana, Nigeria, Zambia and Sudan have transitioned into middle-income nations in two short decades. Pundits have highlighted the parallels between the growth of Africa's "Lion Economies" over the last decade and the rise of the "Asian Tigers" in the 1990s. (The Lions are Algeria, Botswana, Egypt, Libya, Mauritius, Morocco, South Africa and Tunisia, whose combined GDP *per capita* exceeds that of the BRIC nations.[3]) Will this optimistic economic growth trajectory persist throughout the 21st Century and change Africa's position in the global economy?

GLOBAL REALIGNMENTS

African countries' roles in the interplay between the various global economic players will frame economic and political pathways on the continent. During the Cold War, the United States and its allies simplistically categorised African states as either capitalist/Western, or socialist/communist and aligned with the Soviet Union. The demise of the Soviet Union and then the 2008 global economic crisis (which called unbridled capitalism into question) disrupted 20th Century notions of "progress".

The United States sees its agenda in Sub-Saharan Africa as being to "strengthen democratic institutions; spur economic growth, trade, and investment; advance peace and security; and promote opportunity and development".[4] In contrast, China's stated goal is to establish relationships by seeking "mutual benefit for China and African nations and by following a policy of non-interference in countries' domestic affairs".[5] Much as it did with regard to Soviet actions, the West has sought to caution African nations about Chinese advancement on the continent, while African engagement with China has posited alternative thinking in terms of economic and cultural development. Meanwhile, Africa's traditional aid and trade relations with European countries are beset by economic woes.

Cutting across geopolitical poles, transnational corporations make up 51 of the 100 largest economies in the world, and their behaviour and relations are of fundamental importance.

Africa and China: handshakes or handcuffs?[6]

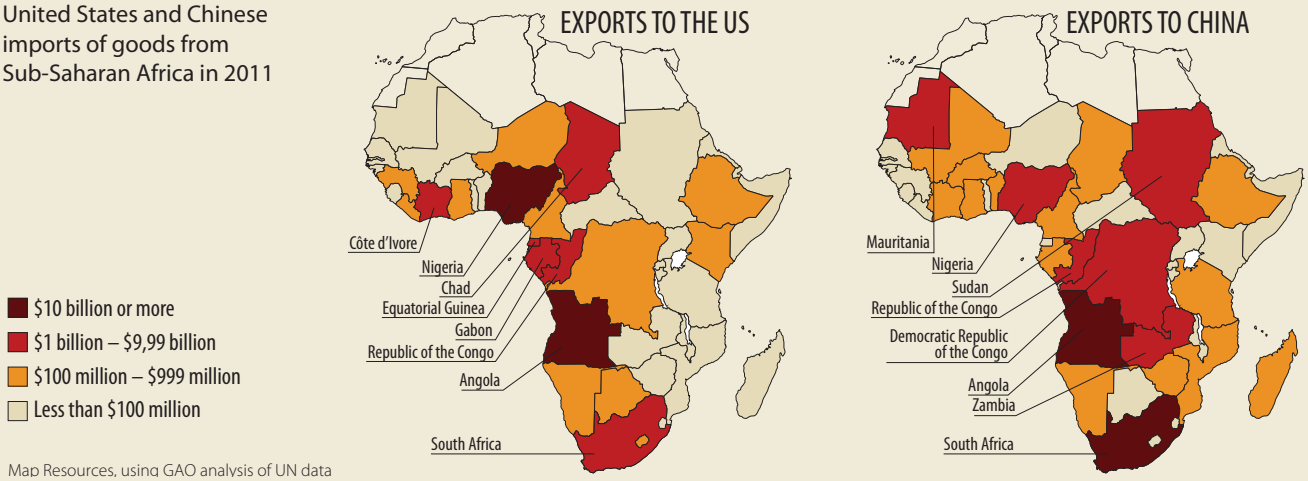
Official and unofficial data indicates that from 2000 to 2006, China quintupled in terms of the number of projects in Africa. At the end of 2011, Chinese investment stock in Africa stood at $16 billion, with Sub-Saharan Africa the focus and South Africa its leading recipient.[7]

African responses strike different notes. Some dub Chinese interests in the continent as neo-colonial – designed to expropriate African resources to fuel Chinese growth. Others welcome Chinese investment, citing economic growth and development as the overarching priority in terms of international partnerships.

> *"The Chinese must come to Africa on African terms. The terms that will allow the Chinese to make money but the terms that will also allow Africa to develop, win-win.*
>
> Arthur Mutambara, former Deputy Prime Minister of Zimbabwe

> *"Why when we have relations with the others there is no problem? But when we have relations with China, oh boy! So many questions! Tanzania looks for investments, technology, markets and development assistance. This is all we are getting from China. Our relationship with China is about that. With the US is about that, with Europe is about that, with Japan is about that, with India is about that. So if the issue is neocolonialism then it is with everybody.*
>
> Jakaya Kikwete, President of Tanzania

United States and Chinese imports of goods from Sub-Saharan Africa in 2011



Map Resources, using GAO analysis of UN data

TRADE PARTNER PATTERNS

The economic fortunes of other countries play out in trade with Africa. Previously Africa's largest trading partner, the European Union's share of African trade is down to 30%, from 50% in 2000.[6] From 1990 to 2008, Western Europe's trade with Africa shrank from 51% to 28%. Although China's interests in Africa have received much attention lately, reports suggest India is not far behind.[7] African trade with the BRICS countries is calculated to have increased more than tenfold over the course of a decade (to $340 billion in 2012).[8]

Growth in trade based on the current patterns of globalised relations presupposes that new forms of protectionism will not be put in place. Historically, many countries have resorted to high tariffs, non-tariff barriers, import substitution or legislation and regulations to restrict unfavourable trade.[9] A new element entering the picture is that of "eco-protectionism", as countries seek to avoid importing the water and carbon intensity, and environmental damage, of other countries' outputs in the face of consumer pressure and national carbon emission reduction targets.

FOREIGN INVESTMENT SHIFTS

In 1970 FDI from three countries – France, United States, United Kingdom – accounted for 99% of Africa's input, but by 2000 it had slipped to 89%, and just a decade later to 79% of the total – still dominant, but dropping. By 2010, BRICS represented 25% of FDI flows and 14% of stock investments in Africa.[10] BRICS investments in greenfield projects look to surpass those of developed countries as the top investors in Africa by the end of the decade.

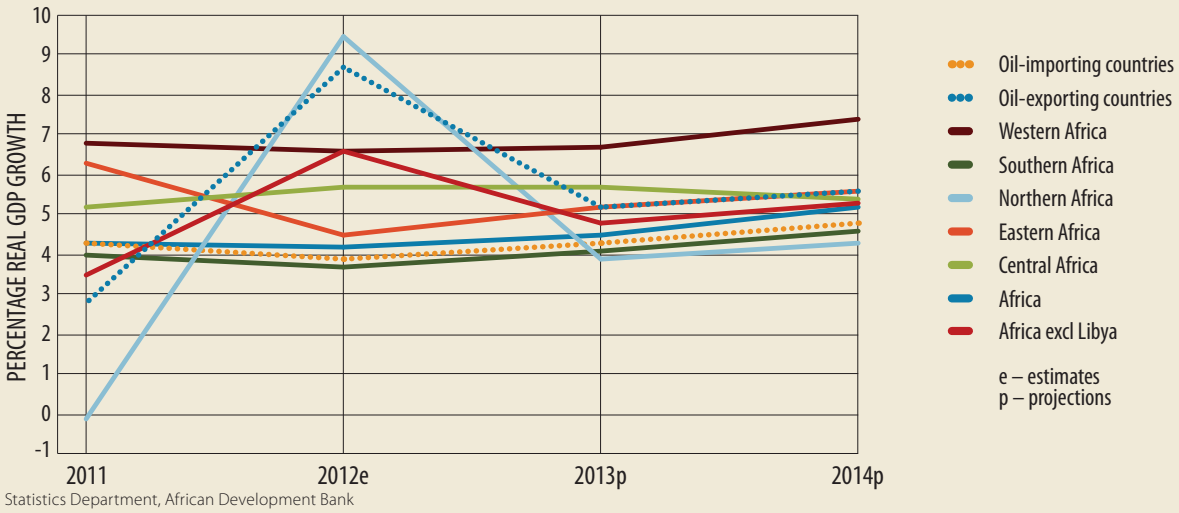
Looking at the picture from the side of the investors, Africa's share of investment outflows from the EU, US and now BRICS has increased sharply in recent years.

EMERGING INVESTMENT MUSCLE

Two new kinds of public investors are becoming increasingly important as FDI players.

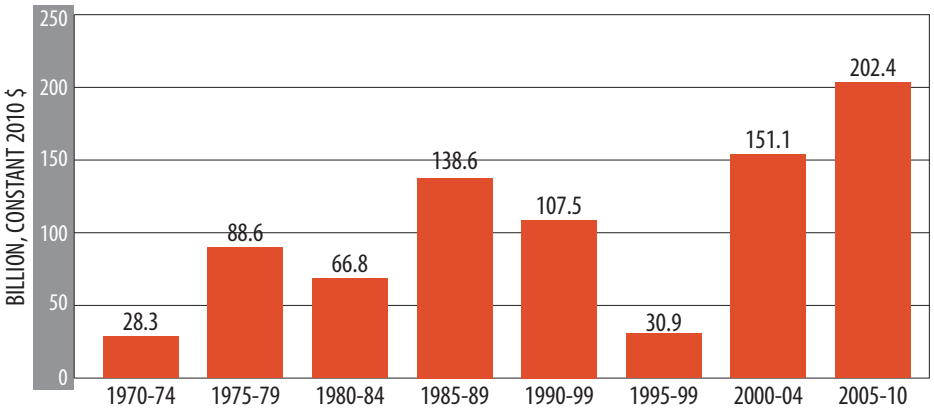
State-owned enterprises: In 2010 there were 650 of these, operating about 8,500 foreign affiliates.[11] Two years later, their numbers had risen to 845 and the FDI flows they were responsible for amounted to $145 billion, reaching almost 11% of global FDI.[12] The majority of their

Percentage real GDP growth by regions and country groupings



Statistics Department, African Development Bank

Total net capital flight from 33 Sub-Saharan African countries



Source: James K. Boyce and Leonce Ndikumana[15]

assets were acquired in developing countries, usually motivated by the search for strategic assets (e.g. technology, intellectual property, brand names) or natural resources. In Africa, their search has usually been for the latter.

Sovereign wealth funds: Their foreign direct investment (FDI) in 2012 amounted to $20 billion, double that of the previous year, bringing the total value of their stock to $127 billion. Geographically, over 70% of their investment has been targeted at developed economies, most of it in finance, real estate, construction and utilities, but with total assets valued at $4–5 trillion,[13] there is tremendous scope for further investment elsewhere.

AFRICA INVESTING IN ITSELF

Intra-African investment has grown at a 32.5% compound rate since 2007. South Africa is leading in this regard and in 2012 was the single largest investor in FDI projects in Africa outside of South Africa itself.[14] Forecasts estimate that in the future, intra-African investment will surpass external investment on the continent.[15]

POLICY ISSUES REGARDING GLOBAL VALUE CHAINS

POTENTIAL BENEFITS	POTENTIAL PITFALLS
■ Provides capital.	■ Unhealthy alliances between the interests and actions of the political elite, transnational corporations and international banks, especially in weak states where there is little transparency.
■ Contributes and disseminates technology and innovation, increasing domestic technological sophistication.	■ Transitory and insecure employment.
■ Builds productive capacity.	■ Poor working conditions, with attendant occupational safety and health concerns.
■ Local firms can move up the value chain.	■ Increased volatility that accompanies this fragmentation of trade and international dispersal of production processes. Many poorer countries strongly depend on inward direct investment, which makes them vulnerable.
■ Creates jobs and incomes.	
■ Builds skills.	
■ Over the longer term, industrial upgrading of the domestic economy, from resource-based exports to manufactures and services of increasing degrees of complexity, and greater domestic value-added.	

MULTINATIONALS AND THEIR GLOBAL VALUE CHAINS

Globalised value chains characterise today's global economy and account for approximately 80% of global trade.[16] Such value chains comprise intermediate goods and services with cross-border trade of inputs and outputs taking place through multinational corporations' networks of affiliates, contractual partners and suppliers. According to UNCTAD, these global value chains currently contribute nearly 30% to the GDP of developing countries.[17]

Co-ordination of the chains by multinationals can take on many different guises, from direct ownership of foreign affiliates, to contractual relationships (from contract manufacturing or production, to services outsourcing, licensing, franchising or contract farming), to arm's-length dealings. The investment decisions create different relationships between the foreign company and domestic business partners that will have significant bearing on the distribution of economic gains and on development impacts.

How African countries and companies leverage the nature of the value chain, the power dynamics with the corporation, as well as the local business and institutional environment for doing business, will determine the benefits they derive.[18]

Multinationals have been able to move relations and operations to take best advantage of conditions, supplies and the labour market. A new trend to watch is that of "reshoring" (also called homeshoring, onshoring, backshoring, insourcing, and repatriating) back to the company's original home country. Motivations vary from customer pressure for local procurement, higher and volatile transportation and fuel costs, and rising wage rates and higher reject rates in developing countries.

CAPITAL FLIGHT AND TAX AVOIDANCE

If Africa's GDP continues to grow, and trade and foreign direct investment increases, where and

in whose interests will the income be used? Are regulatory changes required, or deeper systemic changes?

The increased African *per capita* income has had no discernible effect on poverty levels across the continent, and inequality gaps remain severe. The African Commission on Human and Peoples' Rights recognised in April 2013 that capital flight is a major concern for African nations, noting that "illicit capital flight undermines the capacity of State Parties to implement the African Charter on Human and Peoples' Rights and to attain the Millennium Development Goals".[19] It is estimated that Sub-Saharan African countries lost $202.4 billion in capital flight from 2005 to 2010.[20] In countries dependent on oil exports (Gabon, Angola, Republic of the Congo, Côte d'Ivoire, Nigeria), capital flight *per capita* is nearly twice *per capita* income.[21]

Illicit capital flows are due to corruption, criminal activities and commercial tax evasion, and estimates are that the latter constitute about 60%. Multinational corporations are able to use their global presence and influence to double count trade, so evading taxes in developing countries and thus seriously undermining development.[22] According to UNECA, Africa lost about $854 billion in illicit financial flows over the 39-year period from 1970 to 2008; corresponding to a yearly average of about $22 billion.[23] Much of this has been exported by multinationals, according to the African Development Bank.[24]

AID FLOWS

In 2010, 20 out of 28 low-income countries (52% of Africa's population) relied on aid as the largest external resource.[25] In 2012, Official Development Assistance equalled 64% of total external inflows of capital for these countries.[26] Is there a way out of this continuing dependence, and what will happen to aid flows when donors feel the economic pinch? And what exactly are the conditions attached to aid?

DEBT

The shadow side of a picture of Africa's growing assertiveness and collaboration in trade and investment is the crushing burden imposed by interest on debt ($340 billion by 1995[27]). The interest payments to public and private lenders in the developed world are often at the expense of social spending. In 2005 the group of eight leading industrialised countries (G8), World Bank and IMF announced the Multilateral Debt Relief Initiative (MDRI) for 18 Highly Impoverished Poor Countries (HIPC), 14 of which were in Africa. The initiative provides for 100% relief on eligible debt from three multilateral institutions. The total cost to the IMF of MDRI debt relief was estimated at about $3.4 billion by 28 February 2013 (being 0.03% of the IMF's about $12 trillion international reserves shown in its latest available annual report[28]). The deal still requires the majority of African countries to meet economic conditions that are harmful to their development as a condition for future debt relief or cancellation.[29]

Africa-debtudoewa.blogspot.com_2008-07_africa-and-debt_html, accessed 25 August 2013

WHERE TO?

The new optimism about Africa's future growth assumes that globalisation in its current form will continue apace, and that new dynamics such as reshoring or protectionism will not rupture the rules of the game. Understood against a backdrop of imperialism and its sister, global capitalism, the internationalisation of the global economy has led to a change in the ownership structure of existing assets, rather than redistribution of the geography of economic activity.[30] More recently, Africa's global relationships are becoming increasingly collaborative thanks in large part to the development of commodities and manufacturing sectors on the continent, spurred by FDI from BRICS. Each of the Open A.I.R. scenarios explores different trajectories and interplays of these relationships between and within countries – collaborative, competitive or coercive.

The time has come to end this charade. The debts are unaffordable. If they won't cancel the debts, I would suggest obstruction; [Africa] **you** *do it, yourselves. Africa should say: "Thank you very much, but we need this money to meet the needs of children who are dying, right now, so, we will put the debt-servicing payments into urgent social investment in health, education, drinking water, the control of AIDS, and other needs.*[31]

Prof. Jeffrey Sachs, Director of The Earth Institute and Special Economic Advisor to UN Secretary, General Kofi Annan

Statehood and governance

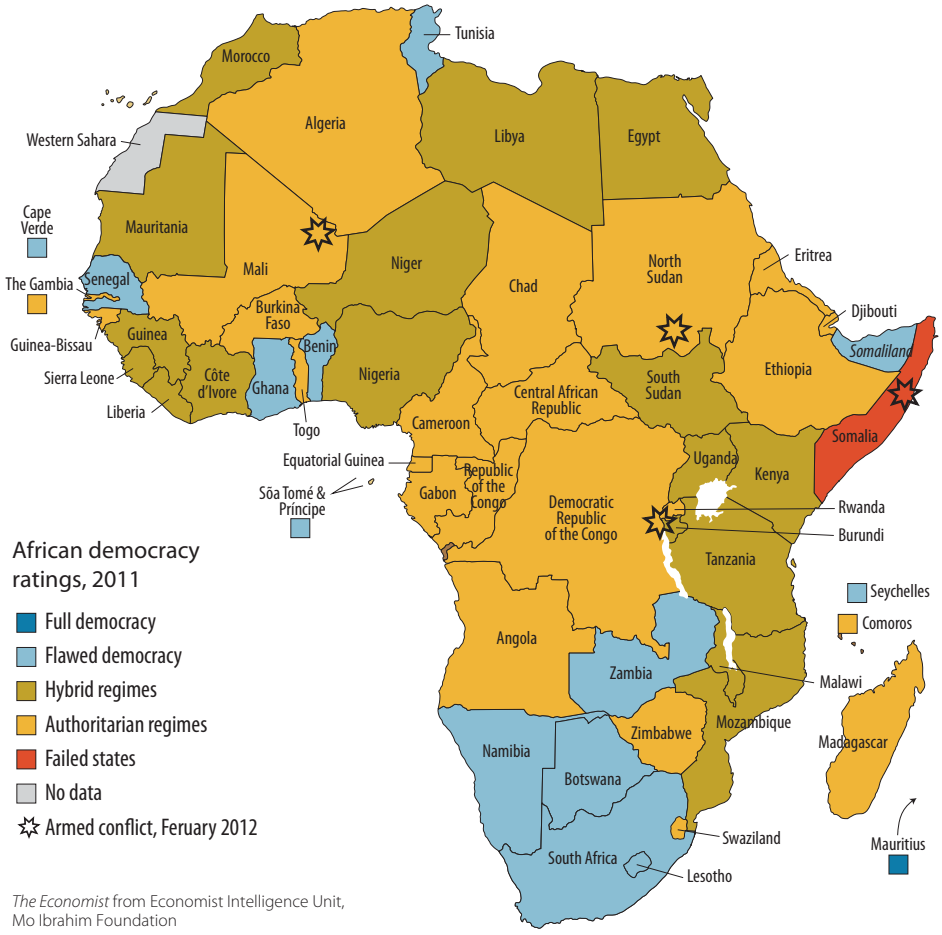
Will African governance be cohesive, challenging or communal – and whose interests will it serve?

SHADES OF DEMOCRACY AND DICTATORSHIP

Notions of what constitutes democracy and good governance are open to interpretation. African political formations have historically ranged from states with elaborate centralised structures of authority to stateless societies with diffused decentralised authority. Along this continuum there is on the one hand reliance on formal rules and forms of policing these, and on the other reliance on custom, tradition and the value of consensus not only within families and clans, but also externally between groups. International institutions such as the World Bank and IMF perceive multi-party democracy as the most effective vehicle for achieving good governance.

Despite waves of post-colonial democratic transition in Africa, many states still have political systems dominated by a single party or personal autocracy. Of the 52 countries evaluated in 2011 by the Economist Intelligence Unit and the Mo Ibrahim Foundation, only Mauritius was considered a fully fledged democracy while nine were considered flawed democracies. At the other end of the spectrum, 23 were classified as authoritarian regimes. Of these, six have had the same ruler in power for more than a quarter century.[32] In many states, political interaction continues to be marked by the marginalisation of opposition parties, or political alliances defined by ethnic allegiances.[33]

Whether persisting as a colonial legacy, emerging through rural-urban migration trends, or coalescing around family and community relationships of support, ethnic identities may become a focus for mobilisation to bridge lacks in democratic participation or developmental delivery, or to capture access to resources, as has happened in Ghana, Uganda and Nigeria. This holds the potential for a divergent trajectory for African statehood.[34]



The Economist from Economist Intelligence Unit, Mo Ibrahim Foundation

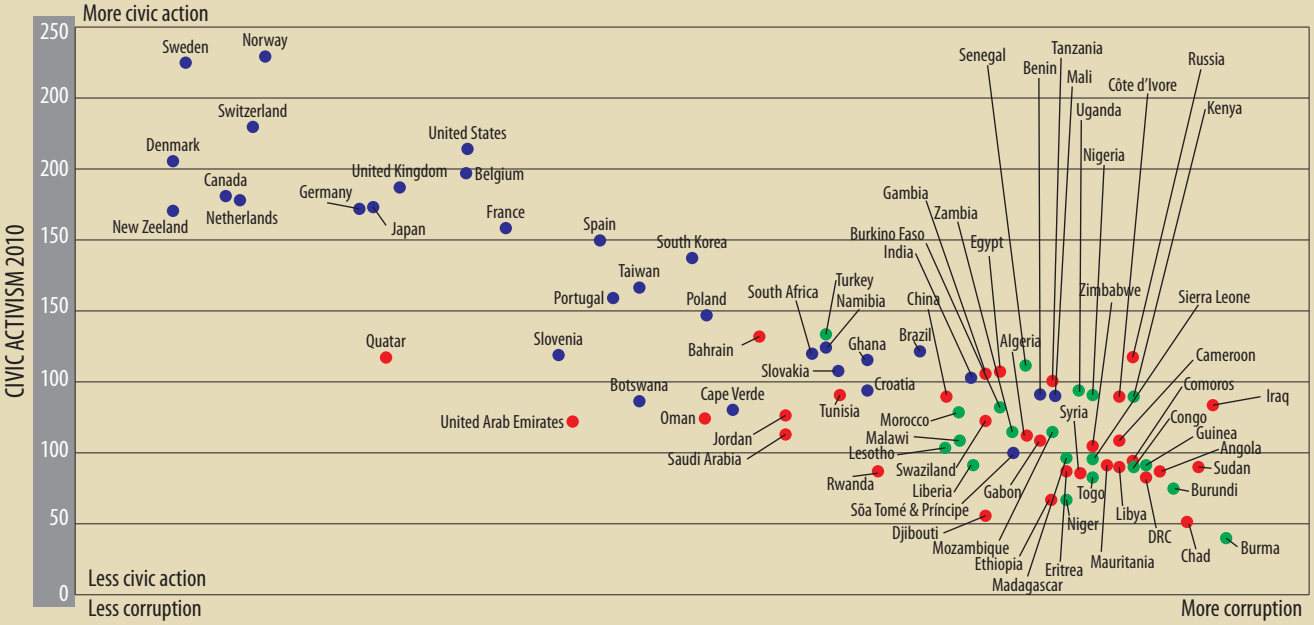
NEW EXPECTATIONS

In today's globally interconnected world, governments are faced with citizens that expect a breadth and depth of economic and social development, and civil and political

Corruption perception index

In the diagram, "civic activism" is rated using a range of items such as surveyed levels of participation in boycotts, demonstrations and petitions; newspaper circulation; and membership of international NGOs. Countries marked "free" have high levels of civic activism, democratic institutions and protection of civil liberties.

The diagram indicates a significant correlation between levels of corruption and civic activism. States with perceived high levels of corruption were more likely to have low levels of civic engagement.[35] Where space for active citizenship is closed off and rights marginalised, personal freedoms and concomitant development have stagnated.[36]



Africa Progress Panel (www.africaprogresspanel.org), using data and ratings from the Institute for Social Studies' Freedom House Report and Transparency International Report of 2011 (www.indsocdev.org)

rights that are not mediated through traditional structures. Women are increasingly challenging their status, and a capable and less deferential growing youth population poses new expectations. Many of Africa's emerging generation of youth are politically engaged and lack historical affiliation to the parties of colonial liberation.

A CONCEPT OF CIVIL SOCIETY

> *[Civil society encompasses] a constellation of human and associational activities operating in the public sphere outside the market and the state.*[37]
>
> African Development Bank

There is a significant trend in Africa toward a greater role of civil society in increasing state accountability and capacity.[38] Over the past decade, civil society has effectively "[contributed] to public participation, clamoured for more transparent and accountable governance; lobbied for women and children's rights to be understood and respected, and demanded better basic public services. African civil society has been an integral part of the real change that has swept over the continent in the last decade".[39]

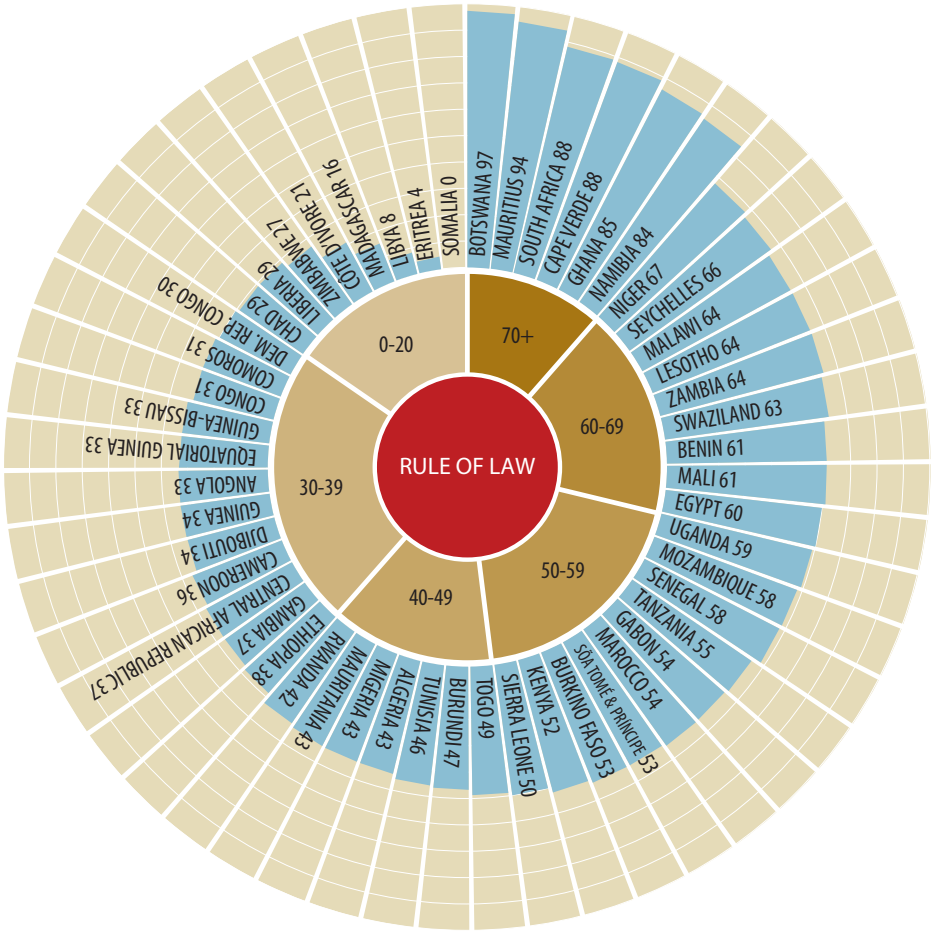
WIELDING STATE POWER, IN WHOSE INTEREST

Challenges remain of ensuring a concept of civil society that the state develops in a way that benefits the whole of society. In some cases, control of the apparatus of the state is competed for as a tool for self-enrichment – through access to foreign inflows, the means to extract rents from natural resources, jobs and other social benefits – exploited through corruption and patronage. The exclusion or marginalisation of any sector of society can have significant implications for their interests and welfare. When state resources are continually used for the benefit of minority interests within society, increased fragmentation, volatility and conflict are likely, as groupings seek to gain access to state apparatus.

Organisations of civil society in themselves are interest groups and may co-opt the state at the expense of the interests of others. The role of civil society in driving change will largely be influenced by the way in which the state responds to the accretion of such interests and power.[40] Besides contestation of the electoral political process, the pursuit and retention of power has sometimes led to repression or outright violence.

REPRESSION OR FREEDOMS

Where violence or challenge to state authority surrounds the political process, some governments have resorted to cracking down on dissent, limiting or reversing the progress achieved for citizens' political freedoms through the democratic process. Freedom



Africa's continental rating is 48 where the maximum positive score is 100. The highest score is Botswana (97), the lowest score Somalia (0), the highest regional average Southern Africa (63) and the lowest regional average Central Africa (36).

2012 Ibrahim Index of African Governance

House's 2013 annual report on Freedom in the World highlights that Sub-Saharan Africa ranked as the most politically volatile region in the world, and including North Africa does not improve the picture.[41] Two countries seen as having relatively strong democratic governance institutions, South Africa and Uganda, were among countries noted as seeing a decline in freedom. Where gains have been made in "freedoms" as understood by Freedom House, the challenge is to stabilise such.[42]

POLITICAL VIOLENCE OR PEACEFUL ELECTIONS

Equally concerning are the levels of political violence that surround the electoral process. In 2010, it was estimated that between 19 and 25% of elections in Africa were affected by violence.[43] Between 2000 and 2012 there were 10 successful coups on the continent.[44] Although a decline from 20 per decade between 1960 and 2000, this is still high relative to the rest of the world.

RULE OF LAW

Strong alignment between the intentions of government to effect change, and the actual ability to do so provides a clear and reliable environment for social actors. Current indicators are that the rule of law continues to show overall positive gains, which is a source of optimism.[45] States that have the capacity to implement and enforce laws will have a greater influence on how their countries develop, and enjoy greater social stability. Where states are weak, other forces such as corruption or ethnic affiliations may co-opt the state or dominate domestic change. Failure of the rule of law and delivery of services has the potential to cause people to lose trust in the institutions of governance, driving sectors of society toward more parochial, closed approaches to meeting their needs and interests.[46]

DELIVERING DEVELOPMENT

Promises envisioned at the end of colonialism have failed to materialise entirely or evenly. Many states struggle to deliver, with capacity and a lack of resources being among the reasons. Governance features a tension between the exercise of state power and expenditure of resources, and the meaningful participation of sectors of society in the processes of decision-making and implementation.

Civil society can be viewed by the state as challenging government's vision of progress, its authority and its capacity to "get things done". A robust civil society in the face of a weak state could further undermine the capacity and relevance of the state, as the state loses legitimacy in the eyes of citizens when it is no longer able to deliver education, health, a functioning banking system, security, and so on.

The involvement of civil society organisations can increase state capacity, as noted by the African Development Bank in projects ranging from sanitation to rural development.[47] Informal or organised social networks are sometimes better able to provide services such as health care or social assistance,[48] allowing the state to focus resources more intensely on other areas. Civil society can be a reservoir of co-operative values, caring, cultural life and intellectual innovation. Social capital, added to governance, brings down the transactional costs of implementing policies, and enhances the ability of

Rwanda's Institute of Science and Technology. Governments have a responsibility to cater for formal education.
Photo: Eric Miller

> *Recent and ongoing disturbances in northern Nigeria, Kenya, Somalia, Mali, Ivory Coast, the Great Lakes, Egypt, Libya, Tunisia, the Democratic Republic of Congo, and Central African Republic are flashpoints of both Africa's political vulnerability and the continent's political renewal. As Africa engages its current positive, albeit, controversial economic transition, the tail of its political contradictions within a hypocritical world order continues to wag the continent.*[55]
>
> Chidi Oguamanam

the state to achieve its objectives.[49] It appears that civil society is consistently trusted more than government or business[50] and its involvement can increase confidence in the accountability of the state.

EMPOWERING WOMEN

As women have become more of an economic force, they have paved the way for more women in politics. In some countries, quota systems aiming to ensure a gender balance are being applied until the barriers to women's entry into politics have been removed. The presence of these female trailblazers in positions of power at local and national levels has had real impact where they have instituted policies that benefit women.[51]

SKILLS IN THE STATE

A rise in technocratic leadership in Africa is one of the most significant recent shifts. As of 2012, at least nine countries were headed by scientists or engineers.

> *The rise in technocratic leadership in Africa is directly related to the emphasis that the continent is placing on economic transformation. But more important, there is growing preference for blending democratic change with managerial competence in running public affairs. This suggests a different type of governance system that combines western party politics and eastern technocracy.*[52]
>
> Calestous Juma, Kennedy School of Government, Harvard University

WHERE TO?

A key issue in the role governance will play in driving change is the interaction of the state with society in determining how the resources and energy of society will be guided and deployed. Will the state become a site of cohesion and inclusion, or will cleavages and exclusion characterise governance? How will the state balance the demands of legitimacy, effective delivery and authority? How responsive will the state be to which socio-economic interests? The scenarios explore different dynamics of the state's overt and intentional involvement or groups' establishment of alternative avenues of governance.

Above:
A electoral worker in South Africa scans the barcode on the identification document of a resident registering as a voter in the general elections.
Photo: Eric Miller

Identities and differences

Will multiplicity, fluidity or stability hold sway as Africans' identities and values evolve?

THE OTHER

In Africa, with its extraordinary diversity of people, language, customs, and beliefs, navigating identity is complex.

> *"Occidental conceptions of itself and the rest of us have damaged and constrained, distorted and inferiorised "the African Mind" [while] our sense of the West distorts our sense of ourselves and of our traditions. … In depression and distress and always on the verge of the tragic, our engagement with the West becomes susceptible, and in fact readily transposes itself to the realm of the radically mythical: the West is against us, yet the West is our saviour.*[53]
>
> Emmanuel Chukwudi Eze, in *Postcolonial African Philosophy: A Critical Reader*

Any unitary "African identity" attributed by the imagination of the West is formulated in terms of its opposite relation to the Western world. The West's narrative of contemporary Sub-Saharan African identity begins with Islamic and Portuguese merchants and slave traders in the 16th Century: the moment of encounter was when identities were formed in relation to difference.[54] Stereotypical views spread with such encounters around the world via (mainly) European exploration and trade, through a process termed "othering" by philosopher Emmanuel Levinas and later deepened by Edward Said and Franz Fanon. This involves understanding one's own identity by using another culture as a reflective mirror, and is largely derived from 18th Century liberal philosophy, global capitalism and an unfettered belief in civilisational and social progress. The "other" internalises the self-image projected by the more powerful. Discarding such "mental slavery" has been part of the task of African resistance and independence. Do notions of "African pride" and a return to our "roots" advance this cause, or still reflect the mirror?

THE LENS OF LANGUAGE

Culture and mother tongue are intertwined identities, and every language provides unique windows on the world and reflects embedded power relations. There are six major language families globally, four of which are spoken in Africa, a greater diversity than on any other continent.[55] There are 2,146 living languages in Africa, 30% of the world's linguistic total, disproportionate to Africa's 12.7% share of the world's population.[56]

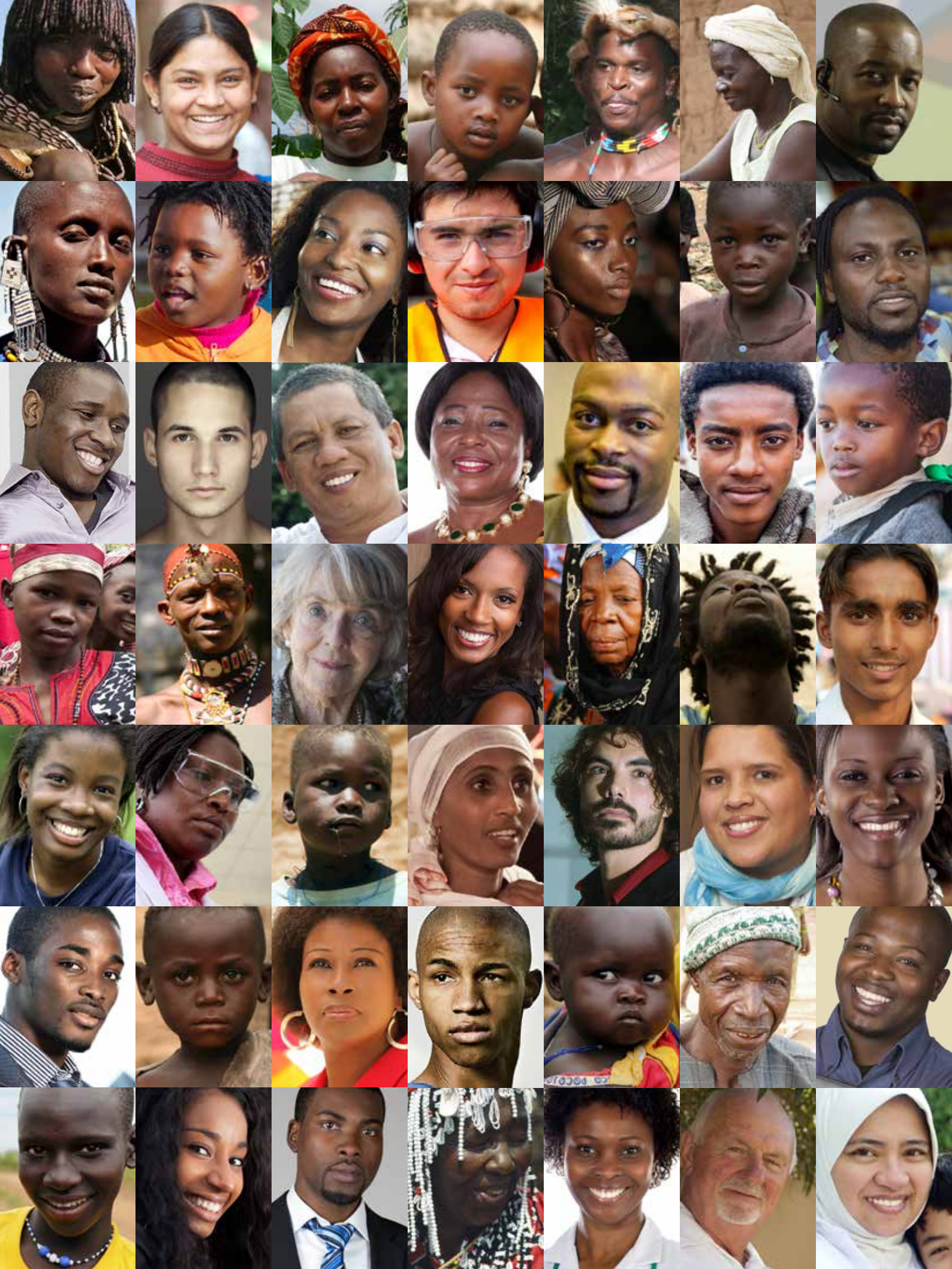
Language is the means by which cultures develop and transmit accumulated data and tacit knowledge. A multi-edged sword, missionary education led to codifying written languages, with knowledge filtered by the colonisers yet available to all who can read. The coloniser's worldview and language became the currency of public life and the world of work. As the written form opens up access, so knowledge embedded in the indigenous spoken word is lost. As print dissolves into internet media, visual and cyber-literacy come to the fore. Urbanised dialects and slang such as sms language tussle with the "pure" form of the language. Will younger generations abandon, reclaim or creolise languages and identities – and which ones?

OLD AND MODERN

Sharper discontinuities with the past that may be found in developing countries can heighten constructions of inter-generational and urban-rural dynamics that could be found anywhere. In Africa, this might typically be framed through notions of "traditional" or "old", and "modern".

The older generation are seen as mired in the traditional past with little relevance or understanding of today's lifestyles. Conversely the youth are seen as abandoning respect for elders and moral values and ways which have stood the test of time.

With urban centres having a greater concentration of work, infrastructure and services and rapid urbanisation, urbanites are identified with that which is modern, and rural dwellers with ways that are outdated.



Africans practice faiths from Islam to charismatic Christianity, sometimes concurrently maintaining indigenous practices.

Photos: Eric Miller, taken in Mbale, Uganda

RELIGIOUS COHESION OR CRUSADE?

Religious beliefs explain the world and the believers' place in it. Most indigenous African religions have a multifaceted and decentralised concept of divinity, with ancestors playing an important role. Some traditional religions also have animistic tendencies, blurring the distinction between the divine or supernatural, and humans and nature. In contrast to indigenous religious practices, Judaism, Islam and Christianity are monotheistic and more centralised.[57] With the advent of missionaries, forerunners and agents of colonialism, 40% of Africans converted to Christianity in little over a century, and millions more converted to Islam.[58] Christianity, and to a lesser extent Islam, led to the erosion of African religion.[59]

A survey across Sub-Saharan Africa by the Pew Forum on Religion and Public Life found that one-quarter of the respondents worried that religion would lead to conflict in their country.[60] There are signals of growing tensions between sections of Islam and Christianity. Charismatic churches are proliferating and dismissing more established Christian denominations.

However, many Africans practise multiple faith systems and hybrids of religions have been created. Will the contradictions hold or crystallise into conflict?

FROM "WE" TO "ME"

Laurenti Magesa refers to two conceptions of identity: the communitarian theory "claims that there are social attachments which determine the self and thus individuals are constituted by the community of which they are a part … The individualist approach, on the other hand, prioritises the self, placing almost exclusive importance on the individual and his/her ability and freedom to act."

Communitarian identities inherited from traditional African societies are interpolated with increasing individualism of post-independence economies. This dynamic can be seen when individual success is both admired and resented because it is not communally shared.[61] People's forms of organising and actions in creating change will be fundamentally based in their communitarian or individualist orientation.

A related determinant is the strength of identification with a group relative to differentiation and independence. Group membership can provide social and economic resilience and a sense of belonging and solidarity. However, group identities such as nationalism, ethnicity or religion can harden into forms of xenophobia and intolerance.

FACING OUTWARD AND INWARD

We all have the right, if not the opportunity, to exercise our global citizenship and international identities as the world opens up. Yet there are contradictory trends. The dissemination of Western culture, facilitated by ubiquitous Western media, has led some to close themselves off to protect what they experience as a cultural identity being devalued. Under economic or social stress, many people turn to their group identity and networks for support, and some become insular. Turning away from public life, some find solace in the comforts of home, shutting out what is experienced as a harsh wide world.

SOCIAL CULTURE

Culture is an integral part of identity. It comprises:

> *"… the totality of socially transmitted behaviour patterns, arts, beliefs, institutions and all other products of human work and thought.*[62]
>
> Kwame Anthony Appiah, philosopher and cultural theorist

THE GENDER GAP

One of the key differences in terms of African identity is that of gender. Women make up about half of the population, although this ratio varies: in Southern, Middle and Eastern Africa there are more

Framing the concept of identity

The concept can refer to individual or group identity, and also encompasses relationships formed internally and externally. Identity may be derived from nationality, ethnicity, social class, community, gender and sexuality, religion and place. There are no absolutes in identity – one negotiates multiple identities and can be part of multiple communities simultaneously.

> *If at the very bottom of things identity implies a personal commitment or offer of loyalty to a group, and since loyalty can be withdrawn, there is a component of choice in human identification.*[63]
>
> Laurenti Magesa, author of *African Religion in the Dialogue Debate: From Intolerance to Co-existence*

Starting with radio, communication technologies have exposed people to identities and value systems in the virtual space that can challenge, reinforce or homogenise their understanding of themselves formed from family and community relationships. In some regions, this exposure had little impact upon the norms and values of society, while in others it eroded previously accepted conventions. Some African philosophers speak of the "dilemma of modernity", where identity "involves the reclamation of a cultural and spiritual heritage considered to be imperilled".[64]

A challenge arises when different identities are forced into stark contrast through circumstance, and this can lead to inner and intra-group conflict. Sometimes, particularly in contexts of a conflict of interest, a group is defined in terms of its difference to other identities, creating a caricatured "us" versus "them" opposition. Historically, identities of power have often been structured around "racial" and "ethnic" categories,[65] with gender constructions running throughout.

women than men, in western and northern Africa the reverse.[66]

All too often women's role is subordinate, with their value unrealised and their status questioned. Gender discrimination remains a real and persistent source of inequality. Despite movements to close the gender gap in respect to primary education enrolment, life expectancy and labour force participation, women still face an unequal access to economic opportunities, less control and decision-making power in their homes.

In the Human Development Report of 1995, the UN Development Programme, concluded that "human development if not engendered is endangered".[67] They developed two metrics that attempt to capture gender dynamics: the Gender-related Development Index (GDI) and the Gender Empowerment Measure (GEM), which focus primarily on quantitative data. Subsequently, UNECA have developed the more specific and qualitative African Gender and Development Index (AGDI), which measures gender differences in terms of social power, or "capabilities", economic power or opportunities, and political power, the ability to have a political voice.[68]

Despite growing awareness of inequalities, there are still many parts of African society that are divisive and sometimes even abusive along gender lines. A recent WHO report concluded that whilst gender-based violence was widespread globally, both Sub-Saharan and North Africa have close to the highest prevalence rates of physical and/or sexual gender-based violence: 36.6% and 37.0% respectively.[69] The adverse consequences to society are incalculable.

There are positive signs regarding gender parity. For example, Rwanda has the highest number of women parliamentarians in the world: 63.8% female representation in the lower house, 38.5% in the upper house. Senegal follows in sixth place with 42.8%, and South Africa in eighth place with 42.3%.[70] Information technologies also have the potential to redefine gender relations.

> *It may, for the majority of African women, still be a long walk to freedom, to the type of self-determination that women in Africa want to have, a self-determination that only they can define, using ICTs to enhance their lives and the lives of those they love.*[71]
>
> Ineke Buskens and Anne Webb, in *African Women and ICTs: Investigating Technology, Gender and Empowerment*

WHERE TO?

Unfolding identities are in flux to a greater or lesser extent, forming, overlapping, cohering, dissolving, hardening. Each scenario adopts different takes on how we and others understand ourselves and relationships as an individual, group or nation – and as "African".

Infrastructure and technology

Will infrastructure and technology investment be inclusive, strained or reconceived?

Providing sustainable energy for all could be the biggest opportunity of the 21st Century … Sustainable energy is the golden thread that connects economic growth, social equity, and a climate and environment that enables the world to thrive.[76]

Ban Ki-moon, United Nations Secretary-General

INFRASTRUCTURE

Infrastructure development under colonialism was largely designed to support natural resource extraction,[72] and slowed to a trickle following independence.[73] Africa was left with a weak infrastructural endowment.[74]

To make up the shortfall would require about $93 billion annually or 15% of Africa's GDP, of which over 67% relates to capital expenditure and the rest to operation and maintenance.[75] Many small countries do not have the ability to achieve economies of scale without regional co-ordination. Different responses about questions of financing, prioritisation and trade-offs, phasing, climate-proofing and regional collaboration have different implications for a country's future development.

There is the potential for disruptive technologies to bridge aspects of these gaps – famously, cellphones having leapfrogged the need for landline rollout. However, certain traditional infrastructure is seen as a foundation for development: people need basic services like sanitation and water, and people must move and goods have to reach markets. But different choices for developmental paths could imply different infrastructure needs, for example, integrated transport networks with a web of railways rather than a dependence upon roads for logistics.

RURAL ACCESS OR EXCLUSION

The usual focus of a traditional development model is on growing urban areas and trade routes, to the exclusion of rural areas. The lack of energy infrastructure in rural areas widens the digital divide. A contradiction is set up as rural areas increasingly become virtually interconnected via mobile phones while being physically isolated. Constrained by a lack of infrastructure, rural economies may not appear to warrant infrastructure investment, a chicken-and-egg dilemma.

CO-ORDINATED DISARRAY?

The biggest challenge to infrastructure and technology investment is making different aspects function in concert using a systemic approach and thinking – not simply in terms of the infrastructure but also the social, institutional and economic systems that support, operate, legislate and maintain it.

In addition, there is a risk that the rate and speed of technological change may lead to obsolete infrastructure and technology. Disconnected *ad hoc* responses are inefficient and expensive. What yields the best outcomes: centralised planning, investment decisions dominated by financial criteria, or patronage and party-political pressure?

ENERGY EMPOWERMENT

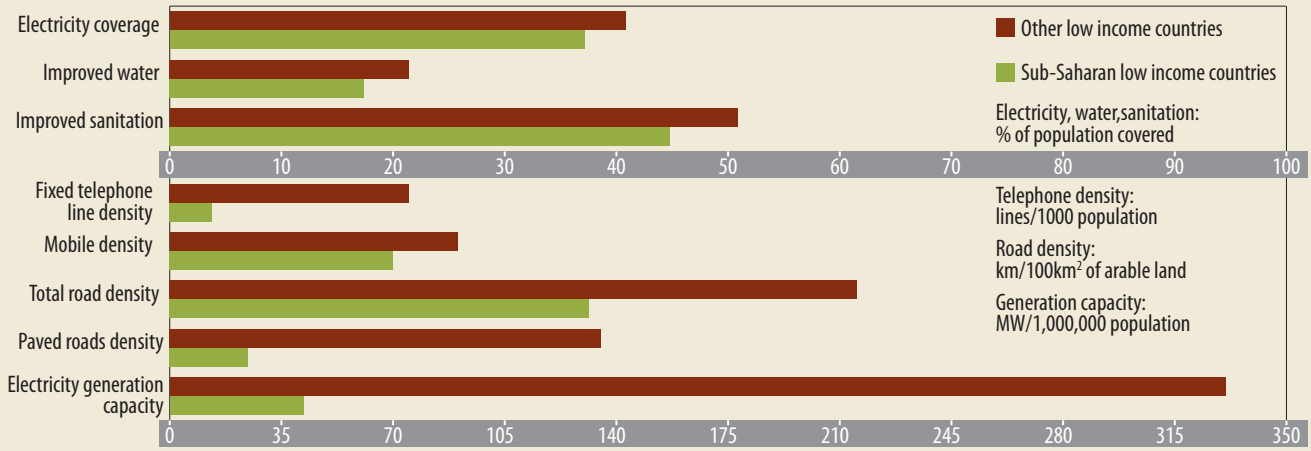
The most underdeveloped infrastructure service is electricity coverage. Despite growing numbers of people living close to the power grid in urban centres, most Africans remain unconnected.[76] At least 30 countries face regular power shortages. Surveys indicate that firms consider electricity – availability and access to reliable, affordable supplies – one of the most limiting factors in doing business.[77]

The 10 most costly places in the world to get electricity are all in Africa. Every round of technological innovation demands ever more electricity, which is a barrier to uptake. Currently, the power required to run server centres is too great in relation to current supply levels for this to be a viable sector for industrial and service expansion.[78]

Without infrastructural "lock-in" to large fossil fuel power stations and electricity distribution networks, Africa has the opportunity to leapfrog to renewable energy provision – and the resource blessing of ample solar and wind supplies, which come free. This could provide for greater energy security, allow for distributed supply in remote areas and avoid costly and wasted investment in fossil fuel assets.

The rate of uptake and diffusion of renewables and decentralised micro-generators is in question. Some African countries' economies are dependent on their fossil fuel exports, and vested interests resist a transition. With the prices of renewable energy technologies

Comparing infrastructure in low-income countries of Sub-Saharan Africa with other low-income countries[71]



falling, will Africa and its entrepreneurs find ways to stretch limited resources during initial implementation to expand access beyond expectations, and will this overcome existing disparities?

TECHNOLOGY TRANSFER

In the context of historical inequity and the subsidies provided to developed countries by their colonies, developing countries are raising issues of technology transfer or sharing at international forums. Issues of transfer between developed and developing countries, and between public and private sectors, are being debated.

> *I foresee a positive future in which technology will help Africa to exploit [its] resources. When I was working in Mozambique, I was involved in Technology Innovation Support Centres, which had resulted in a pool of about 100 active innovators. Such initiatives will, in the long term, lead to a highly innovative and productive Africa.*
>
> Fernando dos Santos, Director-General, African Regional Intellectual Property Organisation, Open A.I.R. workshop, Cape Town

APPROPRIATE TECHNOLOGY

There have been many cases of technologies transferred that were not suitable for African contexts. In order to be effective, some technologies require a foundation of other technologies, which may not be available in a country. Factors affecting diffusion of a technology in a particular context may not be taken into consideration, including support required. There are instances where Africans have adapted imported technology for local conditions.

INFORMATION AND COMMUNICATION TECHNOLOGY

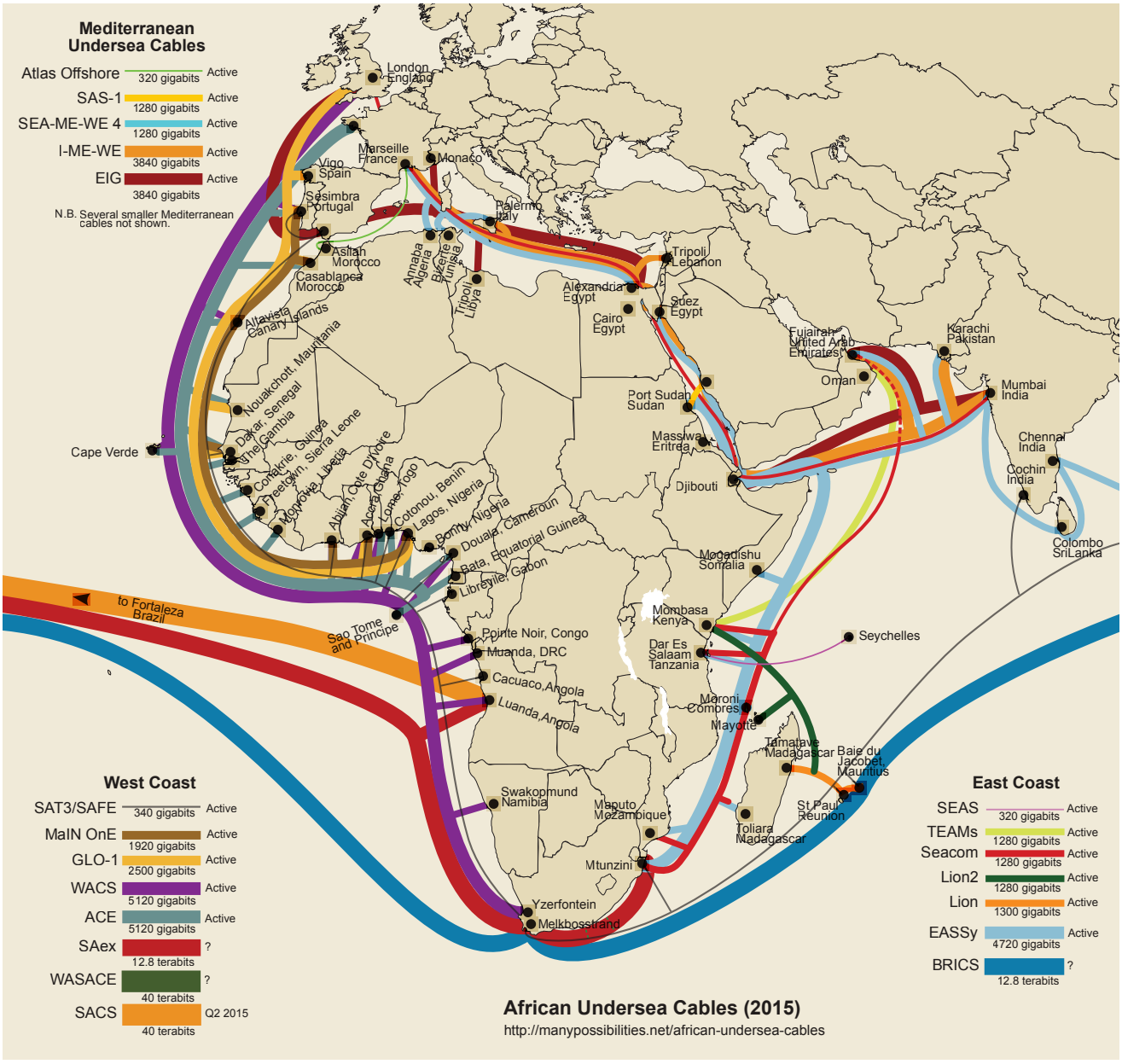
The widespread development and deployment of information and communication technology (ICT) has had a profound impact on many aspects of Africans' lives. Although Africa still lags far behind most of the rest of the world, available bandwidth and the number of internet users rises and accelerates year over year.[79]

The innovations of cheap and portable cellphone solutions filled the opportunities left by a lack of older telecommunications infrastructure, and the cost of personal computers and broadband access in contexts of poverty and limited education. Africa is the first continent where most people will be introduced to the internet in mobile form. Access to and the transfer of information is being used to bridge existing infrastructural gaps in banking, health, market information and more, creating new forms of interaction that circumvent the traditional less flexible institutional structures and frameworks of the developed world.

> *ICTs have transformed the landscape of developing countries and opened up new opportunities for advancing human development. The increasing presence of these technologies is shifting developing countries toward a more highly networked society, where social structures and activities evolve around networks through ICTs. …*
>
> *Although changes brought on by a networked society can open up opportunities for development, they might also lead to certain development problems. For instance, if "going digital" is increasingly the norm to access social services or to gain competitive advantage, those without access will be further excluded from such benefits. In many developing countries, women are underrepresented in the production and consumption of digital products.*
>
> *Moreover, power, gendered and social relationships within societies are often replicated and reflected in the virtual world, which could create new forms of exclusion.*[80]
>
> Laurent Elder, International Development Research Centre, in *Into the Future: New Opportunities and Threats in a Global Networked Society.*

There may be unintended consequences of public investments in ICT infrastructure. The most serious may be to create centralised monopolies with anti-competitive pricing. Powerful incumbents can be more likely to stifle innovation than to encourage it. Moreover,

> *We don't want technology dumping under the guise of "technology transfer", nor foreign private sector investment which does not meet our country's needs, driven purely by their market expansion agenda. We can't really divorce these technology transfer issues from WTO and IPR issues.*
>
> Sisa Njikelana, Chairperson: Energy Portfolio Committee, Parliament of the Republic of South Africa



Africa's undersea connections to the rest of the world (2014)[2]
By Steve Song

reliance on mobile platforms could impede the introduction of other technologies, such as personal computers offering different functionality.

Whether transferred or home-grown, technology is not a solution if it does not meet the challenges faced by developing countries.[81] Similarly, unsustainable technologies ultimately exacerbate rather than solve challenges. Given the unimaginable options brought about by technology since industrialisation, there is a risk that we may imagine that some new miracle technology can solve coming crises that can only be addressed through changes in human behaviours.

WHERE TO?

The nature of technology and the relationships between different forms of technology make it difficult to envision how future development trends might unfold: their implementation changes the scope of possible horizons for future technological developments.

This is true of sustaining technologies that provide innovative efficiencies for solutions provided by existing technology, and even more so for disruptive technologies that provide entirely new solutions to existing or emerging challenges.

Understanding technology as broader than machinery, and including processes, data and skills, our scenarios imagine technology's role in enabling human potential.

Employment and livelihoods

Will African economies diversify, informalise or reconfigure to meet the needs of the increasingly youthful population?

YOUTH BULGE

The "youth bulge" is one of the most significant issues that will influence employment and productivity in Africa. The African workforce grows at an annual rate of 2.8%,[82] the highest growth rate in the world. This represents about 13.8 million new entrants a year, presenting a challenge and an opportunity for increased productivity. Trends that could further increase the size of the labour force[83] include more women coming into the labour market[84] and fewer chronic absences from work due to improvements in health care.

Historically, in many countries, a large pool of youth created rapid economic growth. With a large employed youth population growing faster than the dependent population, the dividend enabled governments to expend resources in other areas such as health and pensions. However, when youths remain without employment, the risks are social tensions,[85] along with a decline in growth, standard of living and productivity. In Sub-Saharan Africa, youth comprise 30% of the workforce (higher than any other region),[86] but youth have a rate of unemployment close to double that of adult unemployment. The growing youthfulness of the labour force poses the risk of increasing rates of unemployment overall.

Women fish processors in Ghana, West Africa.
Photo: WorldFish

EMPLOYMENT TRENDS IN SUB-SAHARAN AFRICA

In African countries with formalised labour markets, unemployment tends to be high.[87] Conversely, countries with large informal sectors have lower levels of unemployment.[88] In Sub-Saharan Africa, non-wage work accounts for around 80% of employment.[89] This is mainly a reflection of the small-hold agrarian structure of the economies. Sub-Saharan Africa is the only region in the world where a large majority of workers – 62% – are still employed in the agricultural sector.[90] Of these workers, 90% own small farms averaging 1.8 hectares. The structure of large, family-based agrarian and informal service sector employment makes the economy adept at absorbing increases in the size of the labour force.

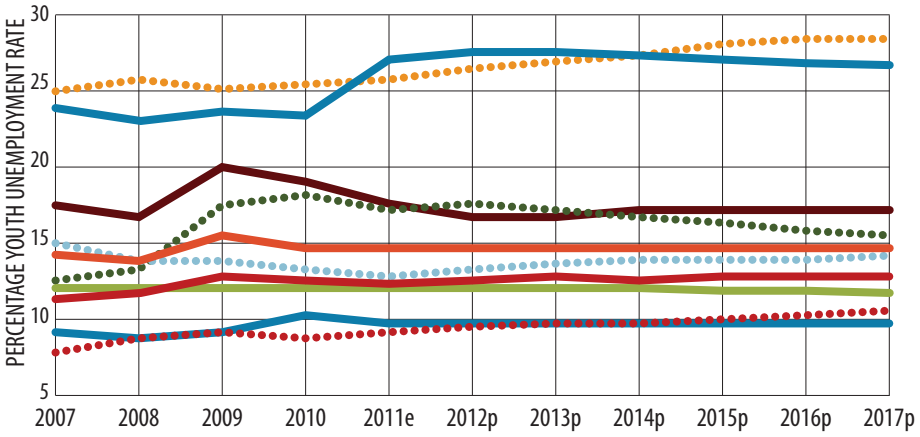
The abundant supply of labour primarily reflects the vulnerability of workers; they cannot afford to exit the labour market as they have no alternative means of survival in the absence of adequate social security and safety net programmes in the region.

The challenge in Sub-Saharan Africa is therefore not so much to get more people integrated in the labour market, but far more to improve labour productivity, conditions of work, and the returns and benefits people derive from their work.

Employment only plays its intermediary role between growth and poverty reduction if it is productive.[91]

Maputo, Mozambique.
Photo: Eric Miller/iAfrika Photos

Percentage of global and regional active youth (15–24 years) who are unemployed.



Estimates (e) are for 2011, and projections (p) for 2012–2017.

- Middle East
- North Africa
- Central and South-Eastern Europe
- Developed economies and European Union
- South-East Asia and the Pacifie
- Latin America and the Caribbean
- Sub-Saharan Africa
- South Asia
- East Asia
- World

e – estimates p – projections

International Labour Organisation Global Employment Outlook, using Trends Econometric Models, IMF World Economic Outlook[104]

EMPLOYMENT TRENDS IN NORTH AFRICA

Levels of youth unemployment are higher in North Africa than Sub-Saharan Africa (as indicated in the graph above). In North Africa, the state has long been a leading employer, but as public finances have deteriorated, public sector jobs are fewer and there is growing unemployment, underemployment and labour productivity stagnation.[92]

The increasing size and youth of the labour market is likely to place pressure on the need to generate more formal sector jobs. The balance of available labour not captured by increases in the formalised sector is likely to be absorbed by a robust network of informal employment. The informal sector is defined by networks of familial connections and vulnerability, and also by creativity and micro-entrepreneurship.[93]

TRENDS IN PRODUCTIVITY

A trend since the 1990s is Africa's shift from higher- to lower-productivity employment.[94] Domestic economies will need to absorb (or export, through emigration) the increase in workers to ensure that the ratio of employment to working-age population remains constant if they are to prevent an increase in unemployment or a decline in productivity.

Several trends are significant in Africa's productivity trajectory:

- The shift towards urbanisation in most of Africa has been relatively slow. The convergence of people in urban centres tends to create the critical mass necessary to foster increased productivity and value. Therefore, the wave of industrialisation that often follows in the wake of urbanisation and the migration of labour from rural to urban areas did not happen in Africa, so the growth driver in Africa has been almost entirely structural changes in the economy.[95]
- Workers often migrate to where the jobs are, so generating pockets of growth. However, migration presents a challenge in the form of brain drain, as many of the most educated and productive workers take opportunities outside the continent, and in countries and cities that offer better opportunities.[96] Migration can generate xenophobia as local workers face competition and feel threatened by hard-working foreigners.[97]
- The decline in agricultural employment has almost exclusively led to increased

Above:
Workers in a coffee bean processing facility in Ethiopia.
Photo: Chidi Oguamanam

participation in the informal urban service sector, leaving the manufacturing industry stagnant.[98] On other continents, industrialisation was responsible for increases in productivity.

Africa's productivity relative to its population is starting from such a low base that the growth of secure, formal sector jobs in the service and manufacturing sectors will struggle to keep pace with the growth of new entrants into the workforce. For example, "in Uganda, waged jobs grew at 13% a year between 2003 and 2006, but this absorbed less than one in five new labour-market entrants."[99] However, there are trade-offs to be made between higher productivity, numbers of jobs available and salaries.

While education has progressed across the continent, building the skills necessary for tomorrow's future is difficult. Africa's growth in skills might not attract or create the large numbers of jobs, which provide economic and social development.[100] There are many other reasons why jobs might not materialise, such as lack of finance, infrastructure and institutional certainty.

IS ENTREPRENEURSHIP KEY?

There is a growing belief that entrepreneurship offers the key to economic development in today's global marketplace. Entrepreneurship flourishes and can foster a sustainable employment economy when it is supported by a "solid institutional foundation within which entrepreneurial investment can be leveraged to stimulate the type of industrialisation required for structural transformation and development".[101] It also needs structures that support and encourage innovation.

In a study of nine Sub-Saharan African countries, most non-farm jobs were generated by households starting businesses, rather than entering the rapidly expanding private wage sector. These jobs were driven by entrepreneurs, whose dynamism and innovation offers a potential solution for increasing productivity and employment.

TECHNOLOGY AS A PRODUCTIVITY DRIVER

The micro-entrepreneurial nature of Africa's informal sector is well positioned to adopt and incorporate low-cost and easy-to-use technologies. The incorporation of mobile technology to provide more efficient services and gain market information is just one example. The use of 3D printing may be another.[102]

Such technology may permit growth of a decentralised industrialisation labour model, whereby co-ordinated networks of entrepreneurs overcome some of the obstacles to more centralised models of increasing productivity.[103] A decentralised model of manufacturing production may dissipate the risks of technological innovation, driving increases in productivity and growth. However, it may also facilitate a decline in employment as fewer workers are required to continue driving growth. Increasing productivity of some parts of the economy, with declining overall employment is a recipe for facilitating increased inequality.

The gradual emergence of a consumer middle class is likely to encourage demand-driven increases in economic productivity.[104]

Progress and productivity

Normative narratives about development and growth posit an ideal: expansion of the formal private sector drives GDP growth which spurs higher increases in employment, and employment is high relative to growth. However, many outcomes for employment and productivity do not fall within this dominant narrative of "progress". Higher productivity creates economic growth, but it is often linked to downsizing and job losses. Global value chains have improved livelihoods in some fragile states, but whether this translates into sustained and decent employment remains to be seen. Even if so, the global recession demonstrated that economic downturns can wipe out years of formal sector employment growth in a single crisis. Some African countries have experienced "jobless growth"; explainable either by productivity increases due to automation or the migration of workers between industries and economic sectors.

WHERE TO?

Currently the natural resources sector is unsurprisingly the most economically productive, measured by value of output per worker.[105] If revenues from finite natural resources falter, governments may have a greater incentive to formalise economies and collect revenue from informal sectors.

Wild cards and shocks

What shocks or ruptures could radically alter Africa's future?

Dadaab refugee camp in Somalia, in 2011.
Photo: Sadik Gulec/ Shutterstock

THINKING WILDLY

Wildcards are singular or interconnected events with such dramatic consequences that, despite their low probability of occurrence, must be considered. Some things are more certain to happen, but will still cause shocks that radically disrupt the future. While we cannot possibly consider everything that might happen, here are a few wild ideas:

United States of Africa: Africa as one unitary formation, either by governance with quick and easy movement of people, goods and services and no requirement for visas; or economically integrated, with all trade barriers between African countries removed.

Back to Timbuktu: Western states increase surveillance of inhabitants to the extent there is little personal privacy and freedom of thought, and Africa remains one of few centres of free intellectual enquiry.

Radical technology: Emergence and dissemination of a game-changing technology currently thought impossible. What about a small flying machine that enables access to remote communities?

A new religion: A new spiritual leader or prophet figure from Africa; religion as the major determinant of policy and economic decisions.

Major societal change: People establish underwater living hubs, so national land boundaries get redefined.

Climate change: A not-so-wild idea, but likely to cause shocks. The Intergovernmental Panel on Climate Change assesses that Africa is the continent most vulnerable to climate change and its extreme weather events. Regional effects will vary.[107]

Pandemics: With free movement of goods and people, deadly bacteria and viruses spread very quickly.

Refugee displacement: Displacement of undocumented migrants, asylum seekers and refugees on a presently unimaginable scale.

Rapid destabilisation: Military intervention, terrorism, or other forces throw entire regions into chaos.

Vulnerability

Wildcards and shocks can be the tipping point into degradation of the existing social, economic and ecological systems, bringing social insecurity and conflict in their wake.

Degree of physical exposure: The more people that depend on a particular resource, the more vulnerable the entire population is to threats to that resource. For example, a regional famine has a more devastating impact than a localised hazard, destabilising and displacing far more people.

Community resilience: There are large variations in the levels of resilience of communities living in adversity. Resilience depends on income levels, education and health, food and water security, social cohesion, and the ability to access support.

Quality of governance: Governments vary in their effectiveness, their levels of accountability, their political stability and their access to international assistance. Consistently weak governance is often combined with cycles of poverty and violence. In a climate of violence, normal functioning of society and communities is not possible. Local violence can spill across borders to create regional instability.

West Africa

- Forestry and fisheries ecosystem changes affect livelihoods.
- Health burden: changes in vector-borne diseases.
- Sea level rise and coastal floods impact coastline economies, e.g. Cotonou, Lagos.

North Africa

- Reduced water availability.
- Agriculture: reduced yields and rising irrigation costs.
- Higher energy use and costs for cooling in summer.
- Health effects of heatwaves.
- Sea level rise and coastal floods create economic damages, rising costs of coastal protection, possible long-term risks and migration, e.g. Nile delta.

Central Africa

- Forestry and fisheries ecosystem changes affect livelihoods.
- Health burden: changes in vector-borne diseases.

Southern Africa

- Reduced water availability.
- Effects on agriculture, including costs of irrigation.
- Tourism and livelihoods suffer loss of ecosystems and natural resources.
- Increased risk of forest fires.
- Health burden: changes in vector-borne diseases.
- Sea level rise, coastal floods, coastal erosion create economic damages and rising costs.

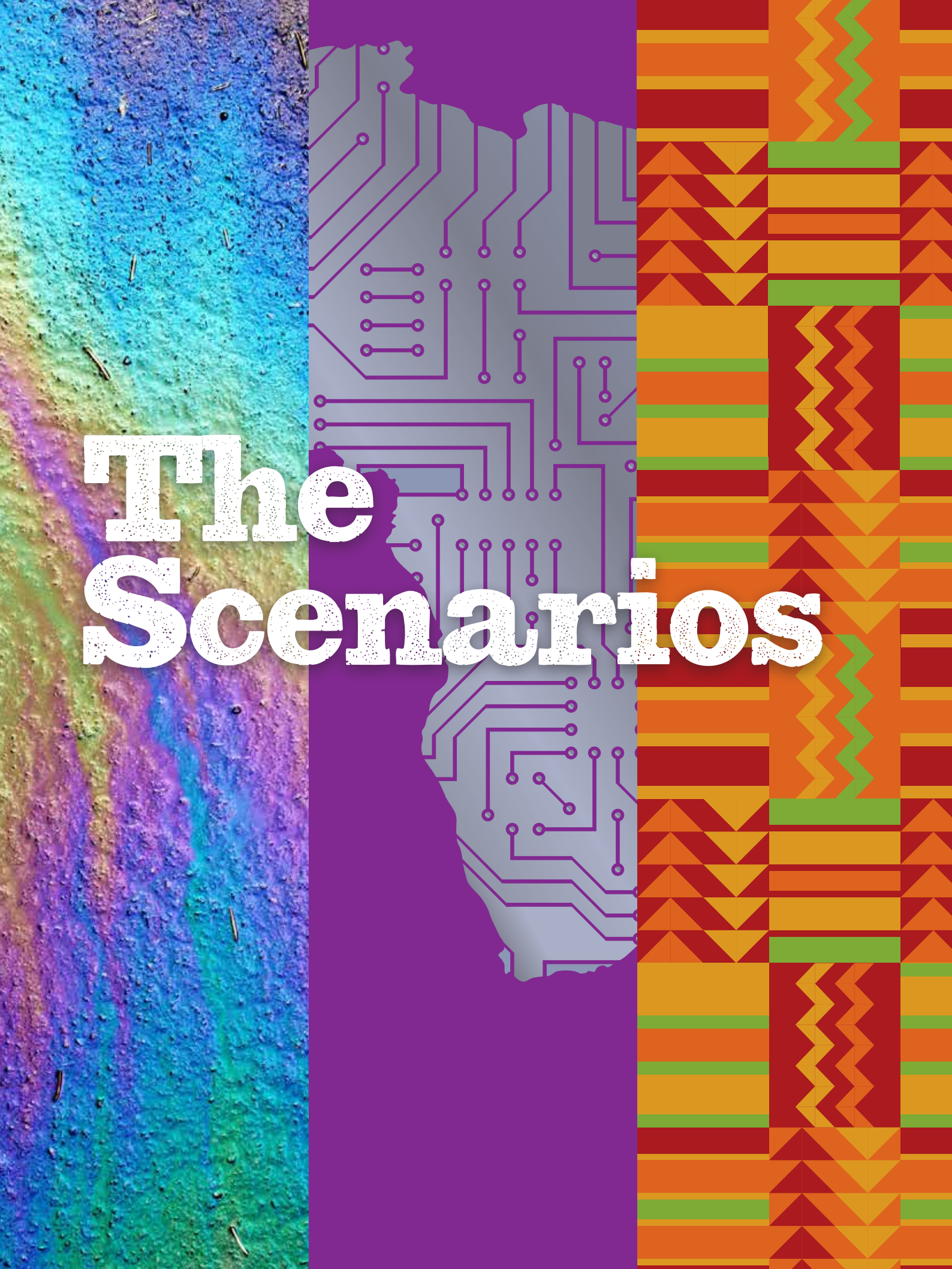
East Africa

- Changes in water availability, with implications for livelihoods and services from lakes, hydropower.
- Changes in frequency and magnitude of floods and droughts.
- Reductions in agricultural production.
- Tourism and livelihoods suffer loss of forest and coastal ecosystems, affecting wildlife and corals.
- Health burden: spread of malaria to highlands.
- Sea level rise and coastal floods impact particularly Dar es Salaam and Mombasa.

Stockholm Environment Institute AdaptCost Project

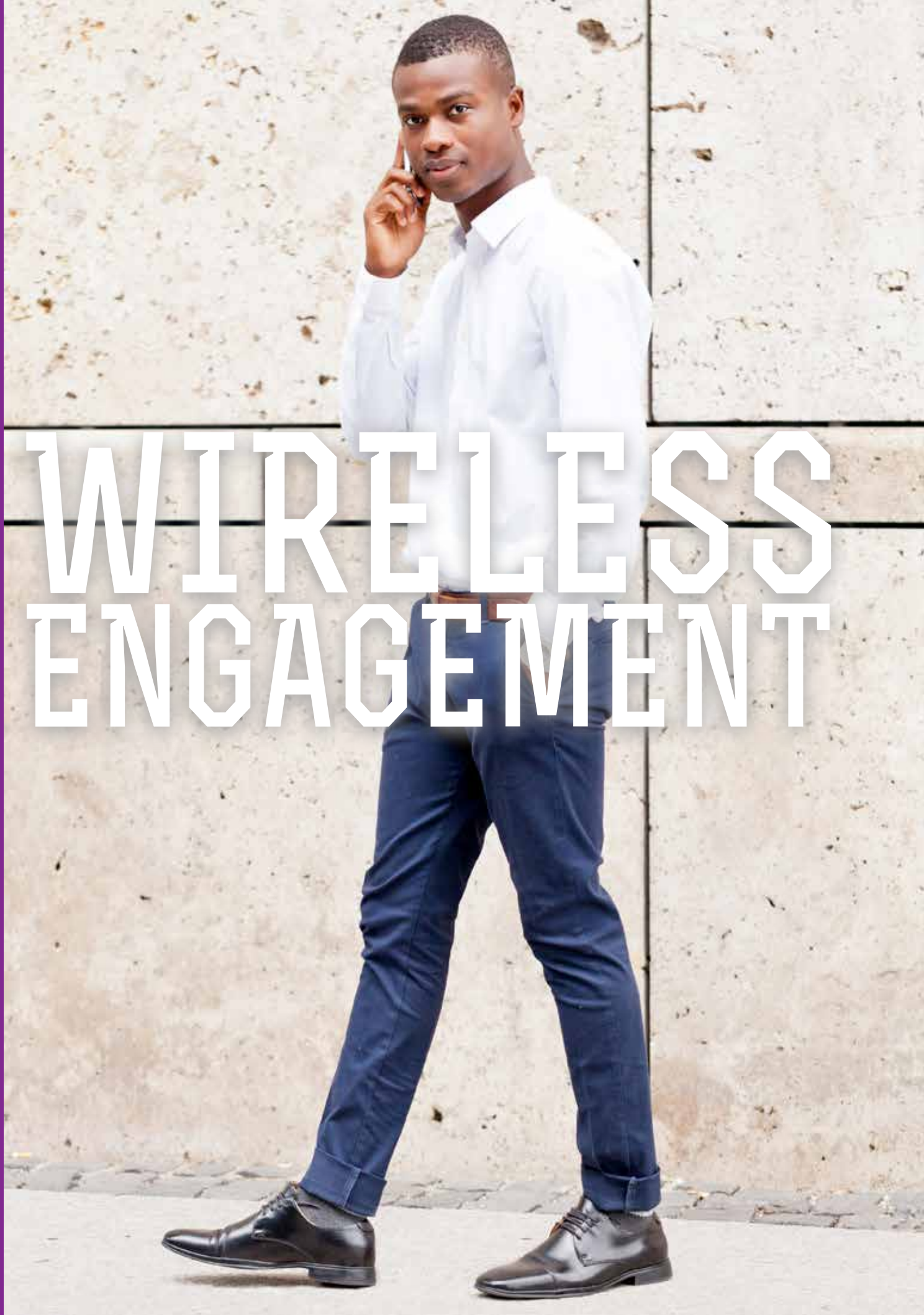

Global relationships
Statehood and governance
Identities and differences
Infrastructure and technology
Employment and livelihoods
Wildcards and shocks
Good neighbours
Proxy politics
Africa pawned
Inclusive government
Who do you know?
Back to basics
The "cheetah" generation
Social networks
Community bonds
Technology for all
Creaking infrastructure
Sustainable technology
Diversification of economy
Informalisation
Sustainable development
• Violent conflicts
• Overthrow of the state
• Criminal economy
• Extreme weather events
• Collapse of natural resource base
• Pandemics

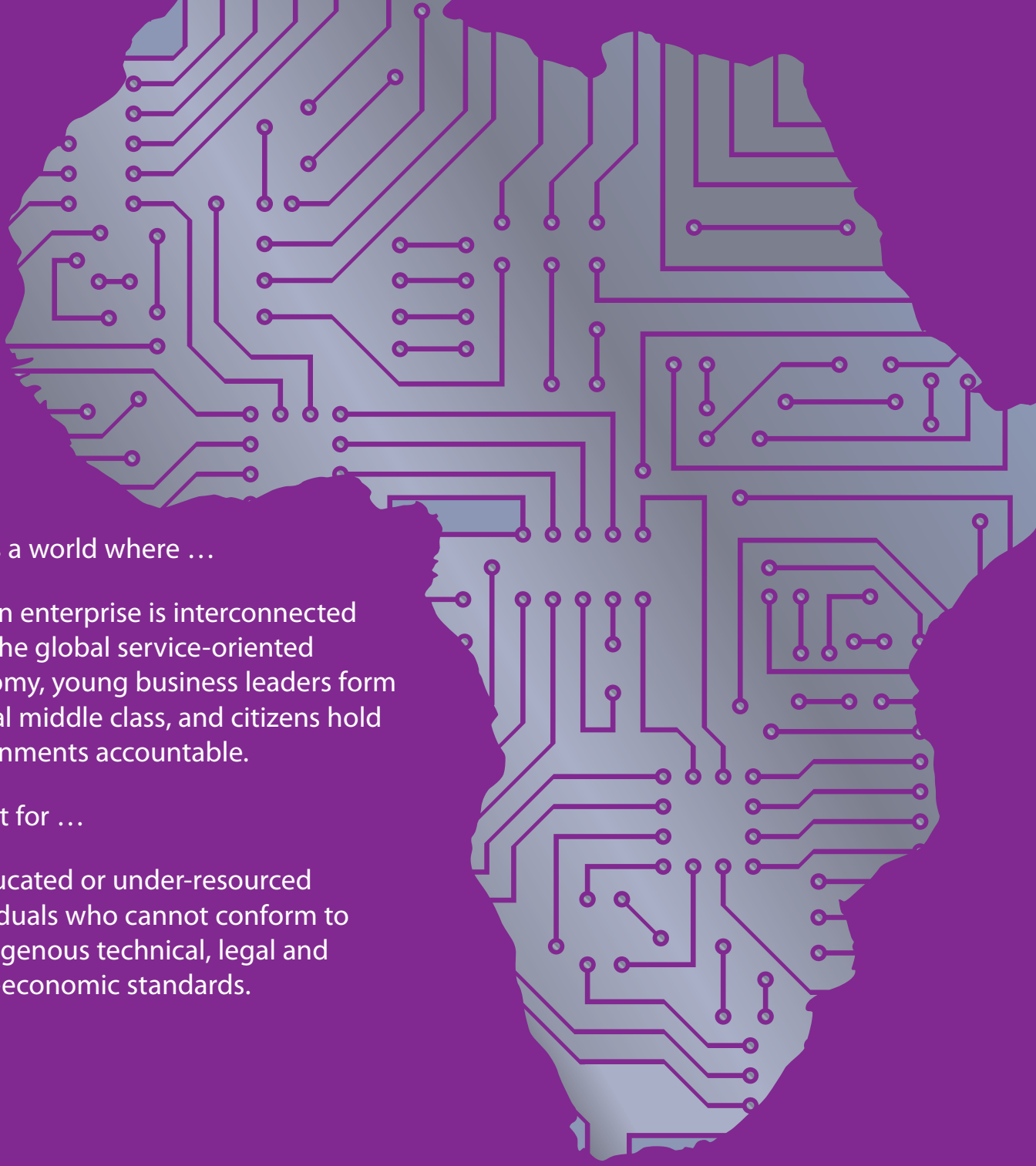

Africa interconnected and collaborating on equal terms on the global stage
Africa as global proxy for remote-controlled geopolitical power dynamics
Covert and overt resource and land-grabbing takes place across the continent
Strong national governments kept in check by participatory networked public sphere
Formal and informal spheres operate as symbiotic parallel universes
Resource constraints and external pressures lead societies to draw together
The rise of an educated digitally interconnected and culturally homogenised middle class
New forms of social organisation based on shared interests or needs
Community-centred collectives based on shared values and knowledge
Increasing connectivity and investment in physical, telecoms and economic infrastructure
Access is ad hoc and disorganised, with frequent brownouts as systems overload
New technologies appropriate to context, which are low carbon, low cost and low impact
Africa's youthful entrepreneurs become a source of competitive advantage tapped into global markets
The youth bulge and global economic pressures leave many outside the formal sector
Africa sets its own rules for sustainable development and growth
What makes for resilience?
Wireless engagement
Informal – the new normal
Sincerely Africa
Unexplored futures


The
Scenarios

We arrive at our set of three Open A.I.R. scenarios: *Wireless engagement*, *Informal – the new normal* and *Sincerely Africa*.

Sweeping statements about a whole continent cannot reflect its realities. For every commonality one might endeavour to identify, there is another perspective on it, and many exceptions. Hence, the scenarios are broad brushstrokes which may have greater or lesser relevance according to one's context. Within every scenario, the range of options vary on a continuum from mild to extreme, and their usefulness will depend on the magnification of focus and analytical enquiry.


WIRELESS
ENGAGEMENT



This is a world where …

African enterprise is interconnected with the global service-oriented economy, young business leaders form a vocal middle class, and citizens hold governments accountable.

Except for …

uneducated or under-resourced individuals who cannot conform to homogenous technical, legal and socio-economic standards.

Call me Lucky! Lucky by name, lucky by nature. For me, life is good, and the world seems to be made for me.

Waiter! Over here! Another round of drinks – Black and Red for everyone!

You know, I made it out from a humble background. Even though I grew up in a small village, and attended the local school, we were given an opportunity and I made the most of it. Our school was chosen as a test case in using the new resources, so we got more attention than the others in the area. The teaching was better too – it was my teacher who helped me to apply for the special international programme financed by the Helping Hand Foundation. I was lucky, they chose me. They paid for my studies and my living costs to leave the village and go to boarding school in the city.

I found it very hard at first. I was shy and was teased because I came from a different world, a different class. I was the only one in my class who had to work all the time. But this made me stronger. I could always find new ways to make a bit of extra money, and I often worked nights to earn extra. It was hard to be the only one without all the cool stuff others had. But I knew that education could bring the success I wanted. I was driven and hungry to show how I could be a success too. I could have a better life, a future, and I was determined to succeed. I really struggled back then, I was just surviving, but now I'm really living. I laugh about it all now.

When people know what you can do, they come to you. Just last week one of the students from the village school came and asked me for a job, but I said no. Rather not look backwards – what matters is tomorrow. People should make it happen for themselves. If you try hard enough, you can get or do anything.

I learned a lot about people and I made some very good connections. My friends now are everywhere: online, across the city, and all over the world. Some of them I met when the first Innovation Centre opened. We thought we were the smartest youth in town, and maybe we were. Together, we make things happen. We live wherever we like or wherever the work takes us, and we are all always on the move. We work hard and play hard, round the clock. Next week I am off to Santiago and Shanghai, maybe stopping off in Seoul. It is time to catch up, do a little business, find a new product that I can put together.

People come to me when they want to get things done. When they want things to be cool, stylish and profitable. I know how to make things happen and good business is good for everyone. It provides jobs, pays taxes and helps people get what they need.

Africa is the continent of abundance: abundant resources, land, sunshine and people. Everybody wants to do business here. For us, life is in the fast lane. We are enjoying the fastest growth rate in our history. The number of households with money in their pockets has been rising and we all want to flaunt it. If you have it, show it off. Africa is the place where it's all happening, and global investment is flowing.

These are good times, but we all know being an entrepreneur is a tough game. It's high-risk. I have watched others come and go, many times, and I know this life is for the brave and the fast. To make it, you have to set trends, keep one step ahead in

fashion and in technology. Everyone wants to be different, so what is cool today is lame tomorrow. We have to stay two steps ahead of the competitors, and they are in the race too. Most people can't keep up with the pace of change. The game keeps changing, and we, as global players, have to try to find new business opportunities. If you don't have your finger on the pulse, or you make the wrong bet, you're dead meat. You are either at the table, or on the menu. When you are sitting at the table and lucky, it is the ultimate high.

Sorry, I have to take this call. It's international, so I will probably be a while …

I've lived in this village all my life. Others have left, but I have been left behind. My parents didn't have money to send me to school: I had to stay at home and work in the fields. Now they are old and I am the one who must look after them, even though I have nothing – not like my older brother, who is the one who succeeded in our family. He went to school, left here, and now he is too rich and important to come and visit us. Sometimes he sends us money, but we don't hear from him much. He doesn't visit often and we don't get to meet the people in his life, not even his girlfriend.

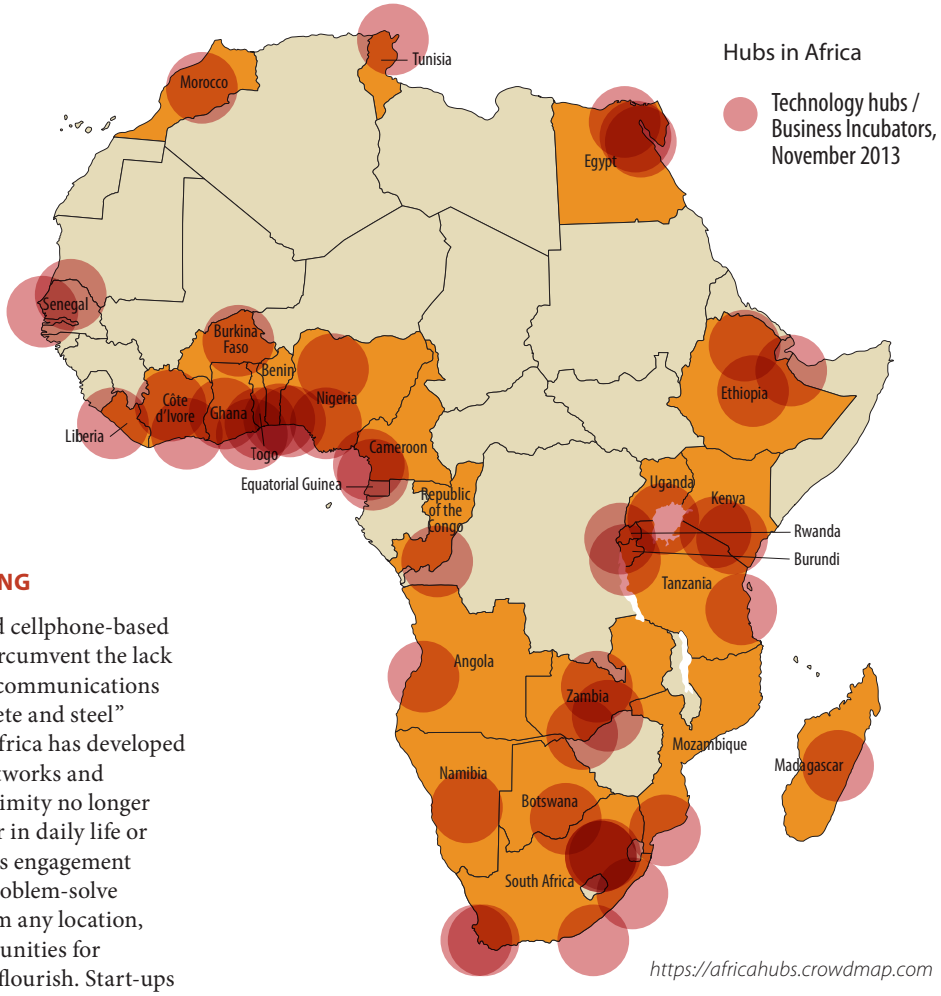
Once he gave me a new phone. It was so smart and shiny, everyone came to look at it. I didn't know how to use most of the things and didn't want to ask my brother; he always seems to be in a rush and he thinks I'm too stupid. It's true that I had to teach myself to read with my friend and I don't understand many of the words on the phone. And you know, even though the phone is so smart, it always needs to be recharged. So it is difficult. We don't have a generator and I have to ask the neighbours to charge it for me. They complain and ask for money.

My brother said I could go on the internet with the phone. He said I just need to save money and then I can go and see. He says we can learn about stuff, but there is not much in my language and it is all confusing. What is the internet really? Will it help my life? My future? My life is so far from them. Also, I can only do that a few times each year.

This life I have is just surviving. I feel like I am stuck in a world without hope … everyone else is moving into a new future, and I am left behind. My brother has everything, he can understand all these things that are meant to connect us, but we are alone and struggling. My parents complain. They say that when a child has success, that child should share with the whole family, so everyone is part of the success and could have a better life. Today, things are different. It seems this new way has no interest in the community, everyone just takes for themselves.

We often joke that in Nairobi people don't think you have a job unless you wear a suit and tie and head to the city centre each day. In a world where suits and ties are expected, who provides the space for the next generation to work, build companies and be taken seriously as start-up coders wearing ripped jeans and a T-shirt? … Innovation comes from the edges, so it comes as no surprise that innovators are found in the margins. They are the misfits among us, the ones who see and do things differently.[1]

Erik Hersman, founder of iHub in Nairobi and co-founder of mapping website Ushahidi



The internet is the most powerful infrastructure known to mankind. The internet is the platform for creation of ideas, exchange of ideas, and implementation of ideas. It empowers both individuals and people who want to collaborate. The opportunity in Africa is that there are almost 700 million people that could join this world of the internet and become connected.

Wael Fakharany, Google Regional Manager for Egypt and North Africa (Open A.I.R. interview)

UP AND RUNNING

Having pioneered cellphone-based applications to circumvent the lack of fixed-wire telecommunications and other "concrete and steel" infrastructure, Africa has developed extensive ICT networks and capabilities. Proximity no longer serves as a barrier in daily life or business. Wireless engagement allows users to problem-solve and innovate from any location, providing opportunities for entrepreneurs to flourish. Start-ups use crowdfunding and businesses carve out new niches. For example, it is commonplace for small-scale farmers in isolated rural areas to access the internet through mobiles to price their goods, trade, source supplies, manage finances, exchange knowledge and stay informed about best practices.

Underpinned by its ICT infrastructure, Africa is able to navigate and adapt nimbly to global and regional market dynamics. Many African countries are accelerating their development and growth. FDI continues to rise, having early in the century exceeded an earlier UNCTAD projection of up to $100 billion by 2014.[2] BRICS countries are strongly investing, including diversifying into manufacturing and service sectors, and coupling their investments with developmental projects.

A NEW GLOBAL ORDER IN AN INTERCONNECTED WORLD

Africa's strong and attractive economic position strengthens its negotiating position in the WTO to achieve temporary trade protection, subsidised credit and publicly supported research and development. The Forum on India-China-Africa Co-operation has broadened from its origins as a platform for Chinese business to engage African governments, and enables a united political bloc where interests intersect.[3] All in all, Africa has a substantial voice in global decision-making processes, such as in the expanded successor to the UN Security Council.

In a bid to secure supplies and access to markets, and counterbalance stagnating economies within Europe, the European Union has opened its membership to its strategically important trading partners in Africa. From time to time, the United States has amended its African Growth and Opportunity Act of 2000 (which had allowed for preferential trade arrangements with selected Sub-Saharan African countries) to expand the number of products granted duty-free access, eliminate quota restrictions, and require gradual reciprocal duty-free treatment for American exports – laying the basis for a free trade agreement with Africa.[4]

In many cases, Africa is able to respond to the global scramble for resources by adopting legal provisions defining the conditions for foreign presence so as to benefit domestic needs. These conditions variously apply to technology transfer, sharing of economic returns, local content, employment quotas with agreed remuneration and working conditions, and commitments to social investments.

Not all countries are in a position

> *The idea of economic catch-up has changed …Just as inequality in income and wealth has been rising in the United States, newly growing nations find themselves in a more stratified world, without developing their own strong egalitarian histories to undergird political institutions or economic expectations. In some countries, there may be a de facto "rule by consent" from abroad if, for instance, you are an African working in a Chinese-owned mine and living in a company town, while receiving your vaccines from a Western non-profit organisation. … [T]he future path of developing countries could be much different from that of recent, high-growth success stories. The next set of emerging-market winners, for example, may retain very large pockets of poverty. And as the expectation of a single, common path for economic development fades, governments may need to rethink what they can accomplish – and how.*[5]
>
> Tyler Cowen, American professor of economics and co-author of the economics blog *Marginal Revolution*

Above:
Students of the Kigali Institute of Science and Technology (KIST) in Rwanda in class, learning to dismantle and put together computer equipment.
Photo: Eric Miller

to negotiate such terms, leaving them open to unfettered foreign investment and exploitation of local resources. They are at risk of having their interests sidelined as others play "Africa's" global role.

INTRA-REGIONAL TRADE INTERDEPENDENCY

In addition to greater muscle on the international stage, African countries are multiply interconnected among themselves and with other rapidly leapfrogging countries.[6] The African Union has driven a "minimum integration programme" of projects and programmes identified as priorities to foster regional and continental integration,[7] and still hopes to realise a continental free trade area.[8] A plethora of regional economic communities – AEC, GZALE, UMA, CEN-SAD, IGAD, ECCAS, ECOWAS, WAEMU, EAC, COMESA, SADC, SACU[9] – has been rationalised to a few major blocs based on common economic features and business culture affinities rather than geography.

Problems arise when a country jockeys for advantage by negotiating within two separate customs unions, or when overlaps between economic communities create a tangle of trade and IP regimes. Businesses rely on wirelessly connected legal and logistics consultants to find a way through. Some countries opt to align with their major offshore trading partner, rather than their continental competitors.

Within the major economic community blocs, tariff barriers are reduced or dropped, customs procedures simplified, and countries tackle other non-tariff barriers to intra-regional trade. This allows for economies of scale and facilitates the transfer of technology and knowledge via spillover effects. Landlocked countries or those without well-equipped ports that previously faced challenges in trading internationally can particularly benefit.

With increased interdependence among national economies, a new trend is emerging where economic advantages are concentrated.[10] Underneath the wireless economy still runs a physical one. Certain regions on the continent offer competitive advantages for particular industries, such as access to undersea cables, natural resources, transport corridors, perceived stability and efficiency, and human capital, and core economies are coalescing there. These industries are dominated by a few regions populated by oligopolistic firms that make the most of the economies of scale, and lower transport and transaction costs.

ACCOUNTABILITY AND GOVERNANCE

The largely stable regulatory and political environments in Africa are key to attracting investment, and FDI can be flighty. Setbacks such as when inflows to North Africa halved during the Arab Spring period in 2011,[11] are a distant memory, but remain a possibility.

Civic organisation and involvement benefit from the information access afforded by ICTs, citizen journalism, the ability to aggregate data from voluntary public online inputs[12] and people's opinions (crowdvoting) regarding government action, and the use of social media to make voices heard and to mobilise. Citizens have been able to demand and monitor improved democratic processes, governance, transparency and delivery from their governments. Watchdog pressure from civil society and international players serves as a barrier to corruption. In turn, good governance builds citizens' trust in elected leaders. This environment attracts investors who feel more comfortable with recognisable features of Western liberal democracies.

FROM RESOURCE CURSE TO BLESSING

A few resource-rich countries remain rentier states[13] dependent on primary natural resource exports, with associated jobless growth and negative developmental outcomes,[14] and often corruption and authoritarianism.[15] Their extractive sector is still an economic enclave, with little attachment to other production processes of the economy.[16] They remain captive to long-term contracts giving an unequal share of revenue to

One model for realising the potential of natural resources: the "natural resource management value chain". It requires that different government entities be clearly aware of their responsibilities and have the necessary institutional capacities to carry them out. Source: Mayorga-Alba, 2009

We also believe that other avenues of investment, in addition to infrastructure should be explored, such as invention and innovation, research and development, and especially the training of the men who constitute the "grey oil", to use an expression of our head of state.

Malem Tidzani, Director General of the Agency for Standardisation and Technology Transfer, Gabon (Open A.I.R. interview)

foreign shareholders and a limited number of domestic actors. Indeed, vested interests in the state resist relinquishing their personally lucrative position and have little motivation to shift the *status quo*.

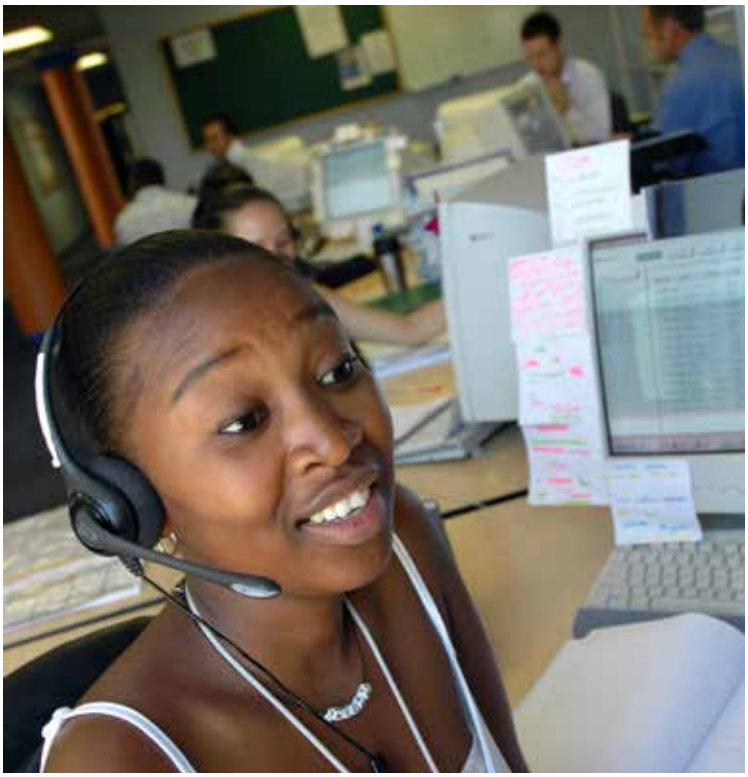
However, certain resources are becoming scarcer in relation to demand, or have high or volatile prices, and countries endowed with them are in a position to command terms from foreign companies that are more favourable to the host country.[17] Competitive and transparent auctions have proven to generate more revenues than one-on-one deals. Some countries tax windfall profits.

Most African countries early on realised that Africa had a comparative advantage when it came to renewable energy resources and avoided the "resource curse" in relation to these. Using the Green Climate Fund for capital, and working at regional levels, they made the provision of renewable energy a cornerstone of their developmental agenda. Not only did they enhance their own energy security, they are also able to export surplus power. By leapfrogging to low-carbon energy supply they also escape import barriers to carbon-intensive products put up by the developed countries seeking to lower their own emissions accounts. Countries where vested interests clung on to fossil fuel extraction were not so fortunate. The carbon price reflected in emissions trading schemes has long exceeded $55 per tonne.[18]

It is not a foregone conclusion that increased state revenues are redistributed to benefit society more broadly.[19] Shifts in previous asymmetries between extractive companies, the state and civil society have created conditions in certain countries for turning their resource curse into a blessing.[20] This is underpinned by efficient and effective institutions, policies and laws. A couple of countries have counter-rentier policies, such as a low exchange rate, a stabilisation fund, careful investment of resource revenues, a ban on borrowing, and transparency.[21] A few use informed consultations to make optimal expenditure choices.[22]

NEW ECONOMIC DYNAMICS

Ultimately, it is those countries with explicit measures to capitalise on wireless infrastructure, develop local industries and businesses, and diversify their economies that can be held up as beacons of real development.



A worker at an international call centre of Ambition 24, a British company based in South Africa. Photo: Eric Miller

The Millennium Villages Project: In Ghana's Amansie West District, Nathan Ayonke on one of the computers in the solar powered, mobile phone connected, "internet cafe in the bush".
Photo: Eric Miller

Many different business models operate, both horizontal and vertical, faltering or forging ahead. The services sector plays a bigger role, creating jobs, diversifying exports and providing public services.[23] Global businesses also outsource part of their operations to local ventures run by savvy African entrepreneurs. Those with the abilities to develop solutions to domestic challenges, and to adopt and adapt imported knowledge and technology to solve local problems (absorptive capacity), perform best.

Parallel to the formal economy is another globally networked one – that of organised crime. The wireless world facilitates communication between organisations operating outside of the law, white collar crime, bribery, scams by impersonators on the internet, identity theft, and money laundering through electronic transfers. Cyber crime is far less easy to police. To some savvy entrepreneurs, the criminal economy offers lucrative opportunities with no regulatory or taxation strings attached. The extent to which this is eating into the legitimate economy is not known and depends on quality of governance.

MORE MIDDLE CLASS

Contributing to economic and political stability, and domestic demand, the growing middle class is a marked, albeit patchy, phenomenon.

In some cases, good governance has dislodged the elites who previously gained wealth from rent seeking or corruption, dropping them down into the middle class. The gap between rich and poor narrows, but there is no guarantee of improvement in the lot of the poor.

In other cases, poorer people's incomes improve, whether due to government-led employment creation, more labour-intensive foreign investment ventures, or proliferating small local businesses. The middle class grows not only by working in better paid jobs, but through better education and innovative initiatives.

There is some recycling into and out of the middle class: first generation middle-class entrants are expected to uplift extended families, have little cushioning against shocks and are at risk of dropping back into poverty.

A bigger middle class has greater expectations of government and services, and provides impetus for improved social policy on health and education, accountability and governance, and respect for the rule of law. A virtuous cycle is set up.

In an effort to service a middle class demanding a higher standard of living, some countries privatise infrastructure or service provision, using concessions, outsourcing or setting up public-private partnerships. The jury is still out on whether this will adequately serve the interests of the majority as companies see value in the "bottom of the pyramid", or whether the wealthier will disproportionately benefit as they yield better returns.

Self-service by clubbing together

Consistent energy supply	Buy a generator
Consistent, clean water supply	Dig a borehole Contract for regular private water tanker supplies
Education	Private institutions
Security	Employ private security guards
Health care	Private practitioners and clinics
Parks and recreation	In gated suburbs, or private clubs
Consumer credit	Mutual banks
Investment	Offshore

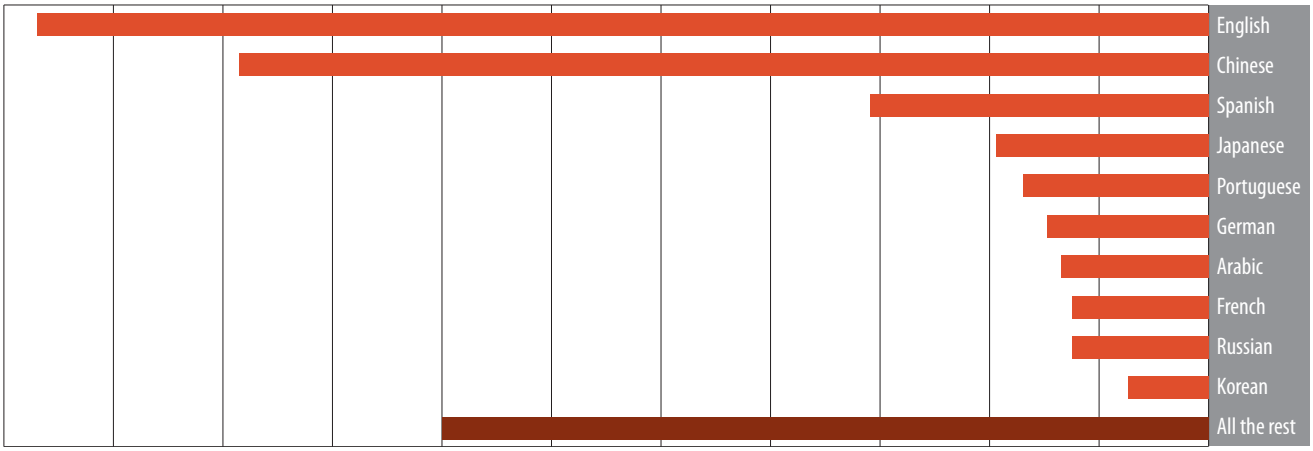
Loss of state capacity to deliver services may be a longer-term disadvantage.

New middle-class entrants grapple with redefining the "good life". There is lingering resentment that what were previously considered basic middle-class entitlements cannot be had. Some of the wealthier have recourse to an enclave of privatised services that they can afford to provide to themselves.[24]

THE CHEETAH GENERATION

Within the expanding middle class is a core group, the "cheetah generation", who have overtaken the old guard as business and political leaders.

Top ten languages used on the internet (June 2010)[25]



Young "techproneurs" emerging from innovation hubs in Nairobi, Nigeria and other parts of Africa will drive innovation. They will depend on an open society concept and the quality of education and opportunities for learning. They will depend on cheap infrastructure. For the internet generation, the cost of devices and electricity and connectivity is very important and is likely to be more affordable.

Wolfgang Fengler, lead economist in the World Bank's Nairobi office (Open A.I.R. interview)

> *"The Cheetah Generation refers to the … generation of young African graduates and professionals, who look at African issues and problems from a totally different and unique perspective. They are dynamic, intellectually agile and pragmatic. … They brook no nonsense about corruption, inefficiency, ineptitude, incompetence or buffoonery. They understand and stress transparency, accountability, human rights and good governance. They also know that many of their current leaders are hopelessly corrupt and that their governments are dysfunctional and commit flagrant human rights violations. The Cheetahs do not look for excuses for government failure by wailing over the legacies of the slave trade, Western colonialism, imperialism, the World Bank or an unjust international economic system.*[26]
>
> George Ayittey, Ghanaian economist and president of the Free Africa Foundation in Washington DC

WHO IS UP-AND-COMING?

The technology innovation hubs established across Africa have borne fruit.[27] Despite the inherent risks of entrepreneurship, the 20-somethings whose ideas and creativity were incubated are now middle-aged and running their own enterprises, opening the way for the next generation.

While educational opportunities are open to both boys and girls, patriarchal gender patterns still generate a self-fulfilling prophecy. Girls' participation in mathematics and science drops off in high school, families favour sons when money for higher education and ICT devices has to be prioritised, young women find fewer role models in top levels of government and business, men appoint and mentor men, and mothers are still presumed to be the primary parent. Even though girls utilise technology to gain relatively better status than before, the cheetah generation is still mostly male.

EDUCATION AND LEARNING

The new technologies can be harnessed to provide education. Children and youth are able to self-learn, even in the absence of good teachers, and are exposed to a wider world. Children quickly teach themselves to use computers, without any instruction. Governments have tackled the challenge of creating an education system, which develops the knowledge and skills to engage in a global wireless environment. Many curricula have been geared to developing skills needed for the new economy, stimulating creativity and initiative. A culture of lifelong learning is applied in all domains of professional and social life.[28]

The historic brain drain is turning into the brain train, drawing on Africa's diaspora to share their education and skills

Pupils of Kimisagara Primary School in Kigali using laptops during a lesson. Rwanda is among the top 10 African countries in ICT usage.
Photo: The New Times/T. Kisambira frank.kanyesigye@newtimes.co.rw

Children in Ethiopia using computers supplied by One Laptop Per Child.
Source: www.dvice.com/archives/2012/10/ethiopian_kids.php

> *We left the boxes in the village [in Ethiopia]. Closed. Taped shut. No instruction, no human being. I thought, the kids will play with the boxes! Within four minutes, one kid not only opened the box, but found the on/off switch. He'd never seen an on/off switch. He powered it up. Within five days, they were using 47 apps per child per day. Within two weeks, they were singing ABC songs [in English] in the village. And within five months, they had hacked Android. Some idiot in our organisation or in the Media Lab had disabled the camera. And they figured out it had a camera, and they hacked Android.*[29]
>
> Nicholas Negroponte, founder of One Laptop Per Child, at a MIT conference in 2012

gained internationally. Thanks to technology, businesses are created by Africans in the diaspora with branches housed and run by the educated in Africa. Many of these are involved in outsourced businesses from the developed world. Some are attracted back home by the vibrant milieu and incentives in some cities; others share and train virtually.

WHO IS LEFT BEHIND?

Success in this world is predicated on access to and fitting into a globalised network. Those who qualify tend to be the relatively privileged, with a better level of education and disposable income. Access involves energy supply, being able to afford the technology devices and pay for downloads, and some facility with the languages used on the internet, let alone basic literacy. Global interoperability depends on standardisation, and the corollary is loss of diversity. Not so long ago, Africans were at least bilingual, if not multilingual, speaking both a mother tongue and the language inherited from colonialism. Now the cheetah cubs have almost lost their vernacular. Fitting in requires compatibility with the hardware, software and computing standards that are globally recognised and legal, complying with standard licensing terms or open source conventions.

Without command of the rules of the game, it is difficult to participate. No one is explicitly locked out of this open world, but there are both tangible and unspoken barriers. The wireless environment disadvantages large portions of the population that are less educated, have no spare cash, and are unfamiliar with a digital culture. There remain those who are unconnected, on the other side of the digital divide. Some countries neglect the marginalised, which causes economic hardship, finding expression in political and religious tension.

The story of Tolika

> *So here I was asking myself a question "What is a squirrel in isiZulu, mhhh?" Aha! I know, I'll Google it. Squirrel in isiZulu, tell me Google, tell me. After 30 minutes of searching and searching, I found nothing. Maybe there are no squirrels in Africa. Yeah, it's an American animal, so I convinced myself.*
>
> *I decided to call great great grandmother to confirm. "What is a squirrel great great grand Gogo?" "It's a nsindane my son." "No! Are you for real, Gogo?" "Hehehe, you township kids know nothing," said great Gogo. Eish! So great Gogo revealed how moronius I was. I can't accept that, let me ask my fellow people what a squirrel is. Ha! None of them know what nsindane is either and the sad part is they are not even ashamed of it. Nsindane is one of many. What is a spider, an apple or an orange? Better yet, what are they in Xhosa, Ndebele, Swati, Afrikaans, Sotho, Pedi, Tswana, Tsonga, Venda or even Sign Language? That is why tolika.co.za had to be created.*
>
> Mdu Ntuli, co-creator with Gaoretelelwe Molebalwa of an online word translator

Gogo means grandmother, tolika means translate. South Africa has 11 official languages, named in this quotation. People may use their mother tongue when communicating via ICTs, there are academic works about the linguistics and literature of the African languages, and online courses to learn them. But no one computes, transacts or codes in them.

The potential for transforming the continent's dysfunctional educational system is immense, as mobile phones – cheaper to own and easier to run than PCs – gain ground as tools for delivering teaching content … It offers ways to fill this gap by exposing scientists and students to modern instruments in many fields of science while integrating potential strategies for mobilising [Africa's] diaspora.

Yacouba Diawara, Head of the Nuclear Spectrum Laboratory, International Agency for Atomic Energy, Republic of Mali (Open A.I.R. interview)

Above:
News anchor in the newsroom at eTV, an independent media company in South Africa.
Photo: Eric Miller/iAfrika Photos

INNOVATION AND INTELLECTUAL PROPERTY IMPLICATIONS

Return on R&D investment

Previously, IP regimes were designed to protect innovators, creators and the firms that invest in them. It seemed obvious that strong IP rights were necessary to encourage trade and investment. International corporations doing business in Africa needed to be satisfied that their intellectual assets would not be misappropriated.[30] International treaties and trade agreements are still aligned largely with this historical outlook, with relatively few exceptions.

Today, both domestic and foreign firms still insist on satisfactory financial returns on their R&D, but there are many different ways of achieving this. An increasing number of medium-sized local enterprises and African-based multinational companies have built successful businesses based on open innovation. They rely on open-source platform technologies, and encourage their suppliers and consumers to engage with and improve their products and services. For these particular firms, too much IP protection in the marketplace causes economic gridlock and impedes returns on investment.[31] However, there is still some uncertainty as to whether platform providers become free-riders on user innovation, or help to create shared value.[32]

A key challenge for policymakers is how best to mediate between these commercial constituencies that base business models on different legal strategies, for which a single public policy framework is difficult to fabricate.

FDI and technology transfer

When policymakers had to choose one approach over another, the preference was to adopt whichever policy promoted the most FDI and technology transfer, as these are key priorities in this interconnected world.

> *Many high-income developing countries are now approaching a crossover point at which they switch over to the more promising side of the intellectual property divide – the proverbial gap between those who benefit from the existing intellectual property system and those who do not. This crossover process is likely to have significant implications for the future development of the intellectual property system.*
>
> Peter Yu, Director of the Intellectual Property Law Center, Drake University Law School[33]

Unfortunately, it is always difficult to determine empirically whether a proposed policy intervention will have the intended economic effects, or whether it comes with unwelcome consequences. Some officials wanting to encourage FDI

Tanzania, Arusha. Entrepreneur and tanzanite mine owner Papaking in his city office, housed in the same building as the disco club he owns.
Photo: Eric Miller

and technology transfer presume a necessary causality between such protection and positive economic outcomes. This belief has persisted despite substantial evidence from academic research that challenges such assumptions.[34] In fact, IP rights protection has been shown to be only one of many factors influencing FDI decisions, and in some circumstances also raises the cost of technology transfer.[35]

Beyond IP rights protection, both FDI and technology transfer have been found to be influenced by a host of "push" and "pull" factors, covering many economic, political and institutional factors in the industrial and host country. The interplay of these factors varies depending on the circumstances of each country, the industry in question, and the nature of technology and type of investment.

IP training and education

African policymakers generally emphasise IPR protection and enforcement based on the training and education they received early in their careers, during the first decades of the 21st Century, often from foreign governments and international organisations. Because the majority, though not all, of these capacity-building programmes have been initiated to promote strong IP protection, officials in powerful positions implement policies that now reflect such beliefs.

Thanks to good education in general, Africa now has better equipped international negotiators, supportive of and supported by key business interests. Offshore companies now deal with Africa's officials and professionals on an equal basis and can no longer dictate IP terms. A highly globalised Africa has learned and plays well by the global rules.

Business strategies and policy frameworks

Some businesses practise open innovation while others prefer tight control over their creative ideas. But often strategic tensions exist within the same medium-sized or multinational firm. The "innovator's dilemma" is whether to

The internet is not going to save the world, whatever … Silicon Valley's tech billionaires believe. But eradicating disease just might … "Innovation is a good thing. The human condition – put aside bioterrorism and a few footnotes – is improving because of innovation. [T]echnology's amazing, [but] it doesn't get down to the people most in need in anything near the timeframe we should want it to."[38]

Bill Gates, in an interview in the *Financial Times*

The links between copyright and access to education

In the world of *Wireless Engagement*, the best places to be are the countries where the digital divide is a key policy concern. In order to address this, copyright policymakers will have to strike a balance between IP protection and access to knowledge. Perhaps nowhere is this balance more important than in the area of copyright in textbooks, articles and other learning materials. Education is a fundamental prerequisite to participation in this world, and copyright licensing terms dictate the terms of access.

In 2010, empirical research on the relationship between copyright and access to learning materials in eight African countries – Egypt, Ghana, Kenya, Morocco, Mozambique, Senegal, South Africa and Uganda – found that copyright law in Africa was widely ignored, and far removed from the everyday realities of many Africans. In the 2030s, this gap has narrowed substantially for globally interconnected individuals, but many people are still left behind.

> *"When copyright enforcement begins in earnest (as research indicates it will), then, without mechanisms in place to secure non-infringing channels of access to knowledge, many learners, particularly at the tertiary level, will be in a precarious position. Entire systems of education will be vulnerable. Thus, maintaining the status quo is not a sustainable policy option.*[36]
>
> African Copyright and Access to Knowledge Project (ACA2K)

Access to Knowledge in Africa: The Role of Copyright[37] looks at the legal and practical issues posed by copyright for access to learning materials in Africa, and identifies the best policies and practices that could broaden and deepen this access. Africans with the necessary skills and bandwidth now have the global knowledge commons at their fingertips – will copyright facilitate or frustrate this potential?

Key uncertainties

- How to narrow the digital divide, ensuring that better governance translates into inclusive development?
- How to design education systems that teach standard skills but also encourage experimentation and critical thinking?
- Is a "silicon savannah" simply modelled on geographic clusters in the developed world, or are African innovation hubs distinct?
- Can tensions between proprietary and open business models and associated policy frameworks be resolved in Africa's favour?

[S]ubsidising even basic [connectivity] services for free would exceed many people's income and it would be difficult for the industry to build a profitable model. [We] expect the efficiency of delivering data to increase by 100x in the next 5–10 years … from two types of innovation: bringing down the costs of delivering data, and using less data by building more efficient apps … then it becomes economically reasonable to offer free basic services to those who cannot afford them and start to deliver on the promise of connectivity as a human right.[39]

Mark Zuckerberg

move beyond previous and present successes to seize new opportunities, even though those opportunities may disrupt a comfortable *status quo*.[40] That is one reason firms are still reluctant to fully let go of the proprietary models that worked well for many industries in the past.

The policymaker's dilemma has been similar: why reform IP rules just after African businesses have learned them and begun to succeed in the global game, just for the sake of those excluded? Companies continuing to promote disruptive business models, therefore, do so using legal strategies that exploit rather than undermine IP policy frameworks for copyrights, patents and other formal modes of protection. They create their own kinds of licensing agreements, like the Creative Commons for creative content or the General Public Licence (GPL) for software.

If a relatively small collection of standard-form "open" licences dominates the digital environment, the divide is exacerbated between people who embrace such standardisation and people who are unable or unwilling to conform. But unless licensing terms and conditions are relatively stable and people adapt to new rules, endless permutations of possible contractual arrangements would add to transaction costs and cause the gridlock that open licensing is intended to avoid.

Students in computer class at the Rand Afrikaans University, South Africa.
Photo: Eric Miller

Valuable knowledge

Value is ascribed to knowledge that is *globally generalisable*. The type of knowledge required is widely applicable, with an emphasis on efficiency. Such knowledge can be commoditised and more easily lends itself to social and commercial applications. *Codified* knowledge is valued over *tacit* knowledge, because the former is much easier to acquire or distribute online. Successful African-based businesses will be those that know what to do in order to exploit opportunities in a global marketplace.

Digital learning resources are among the most valuable sources of codified acontexual knowledge. Access to this knowledge is what enables participation in the world of *Wireless Engagement*. But like any valuable resource, conflicts over control and access abound. The best online courses could create educational opportunities for the world at large, or become open only to those willing and able to pay for access. Similarly, e-books and scholarly articles could be freely accessible to Africans, or publishers could continue to use legal and technological measures to control this body of knowledge.

As FDI in Africa grows and the emphasis on innovation continues, there is growing *convergence* between local and imported knowledge. Consequently, Africa runs higher in formal global metrics for measuring knowledge and innovation, such as the World Bank's Knowledge Assessment Matrix (KAM) and the WIPO/INSEAD Global Innovation Index (GII).

Innovation and creativity

Across Africa, there has been growing emphasis on creating an enabling environment for innovation. Innovation hubs abound, and African universities provide science and technology laboratories, increasingly supported by industry investment into R&D. Excellent training and opportunities exist for innovation within the framework of standardised global ICT platforms. The emphasis is on finding *commercially viable* outputs. Such innovations will be primarily "*plug and play*": adding new ideas and value into existing products and systems, invariably with an online component. Opportunities exist for online innovation in professional and other services, linked to a global rather than local innovation system.

Africans are not only importers but also *exporters* of innovation, developing technologies and creating new applications and inventing things that have applicability beyond the continent. Multinational business ventures based on African cultural output are particularly successful. African movie and music industries have succeeded in selling cultural output bundled in packages with other products such as telephones, activities such as performances or subscription services. These are taken to global markets, targeting diaspora especially, and carve a niche in world cultural trade. Domestically, entrepreneurs have succeeded in bundling products of cultural output in packages selling other services, for example performances and television or phone subscriptions, or simply products such as phones.

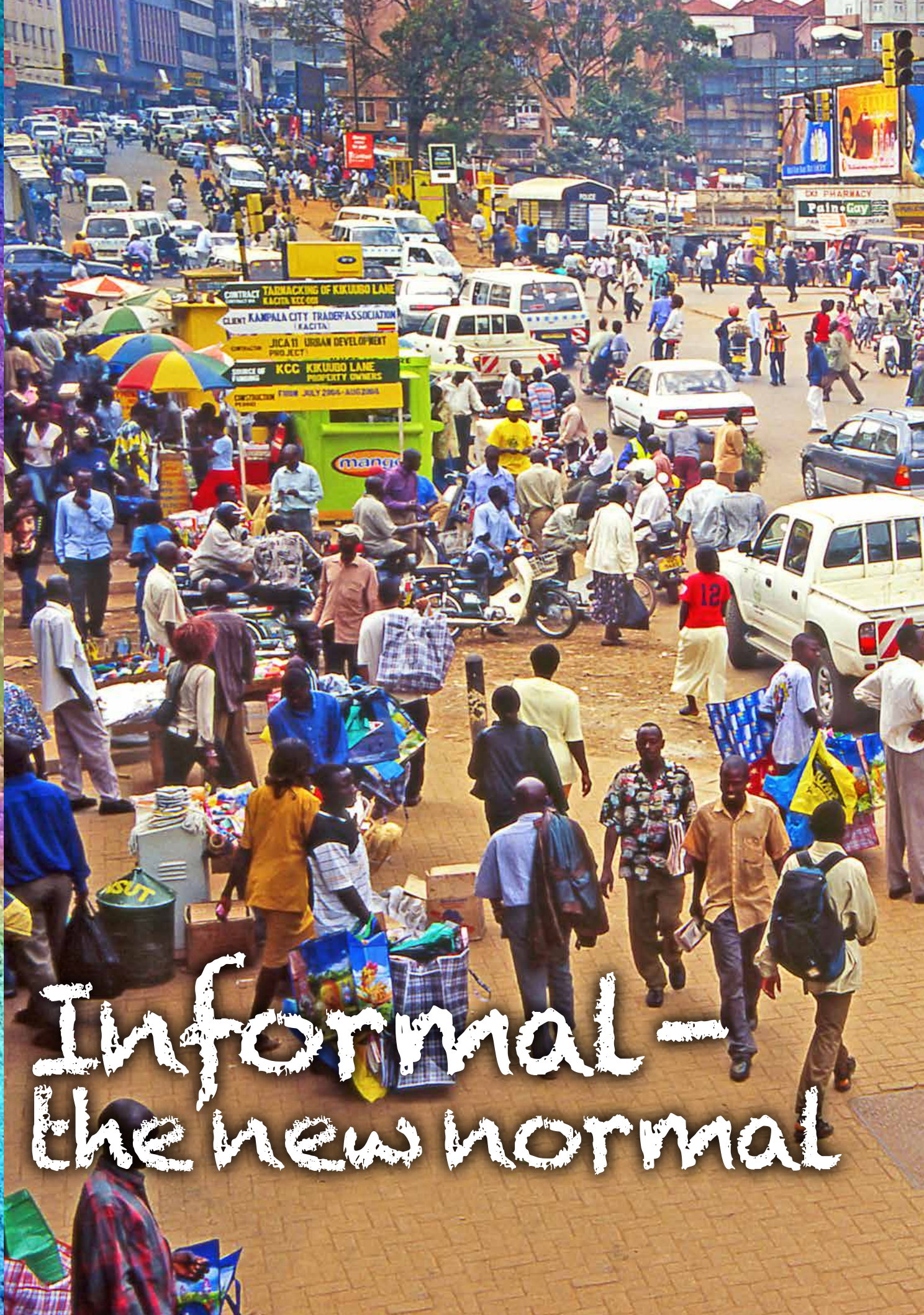
The emphasis is on lucrative global markets, so innovative and cultural output has not ensured free access for all. Those without resources will be denied access – digitally locked out of the world of *Wireless Engagement*. Some technophiles can circumvent these barriers, but break the law by doing so.

Intellectual property

The adversarial dynamic between proprietary and open business models is still prevalent in many countries. The majority of businesses play by the mainstream rules, and are still controlled by the standards and rules of a few long-established incumbents, monopolising patents, copyrights and production capacity. Most innovations tend to build on *pre-existing proprietary* hardware and software, rather than being completely independent creations. However, there is a trend of proprietary models moving to incorporate limited collaborative open source components within novel hybrid models.[41]

Conflicting strategic perspectives continue to be a focus of policy debates, intergovernment negotiations and lobbying by the private sector, special interest groups and consumer advocates. The stakes are high. The companies that control the standards wield control and reap the benefits that come with enforced licensing, but the costs are passed on to the consumer. Those who seek to make a profitable return on their knowledge, innovation and R&D investments are well served by internationally accepted *IP protections*. Standard licensing contracts with pre-set options make for convenience and easier policing. Exceptions can be agreed via lawyers.

There are also attempts to promote public domain content that is free to anyone without restriction, but as global competition grows, it becomes a struggle to maintain financial sustainability. There is an unacknowledged and illegitimate underground of those who *ignore the rules* of IP, don't know how to navigate permission or licences, cannot afford to pay for the use of IP, or don't respect the concept. When discovered, they are penalised as a deterrent to others.



Informal – the new normal

This is a world where …

dynamic informalities cross every aspect of African societies and ideas constantly recombine within communities built upon interpersonal trust, triggering innovations adapted to relentless change.

Except for …

those people unable to establish local grassroots relationships, who fail to build thriving businesses or wield social influence.

Can I help you? Yes, you are right. You won't find these designs anywhere else in the market. Each one is unique. I produce my fashions from home, and my mother and two cousins sew my designs for me. I get the materials from Italy and China, some also from America. The buttons I usually get from a friend on the coast, but I always look out for different styles. The jewellery mostly comes from South Africa and the shoes are all best Nigerian leather. Everything comes from someone I know. We know each other, trust each other and help each other, so I can guarantee you top quality.

Don't worry, if it doesn't fit, we can make something up for you by tomorrow or the next day. Otherwise, I can show you something similar from my sister's stall. She is just around the corner, but I will take you, it's not easy to find things now because we're just starting again.

Some big shots, so-called developers, they put money in government pockets and then think they can do what they like. They had these big graders… trucks… and came to break down our stalls.[1] They said we all had to go because they have "official papers" from the government and we were trespassing. Trespassing! When my family has had a stall here for years! We paid our rents every week – just ask the head of our Traders' Association. We lost everything, but we could fight back, we know where to get help and our customers fight for us.

We told them they could not do this… we traders and our customers. We must all live and we don't know these developers with their big centres. You don't even know who supplies their products. No, they are expensive and they don't know the people. We know the people and we can do things to keep prices that our customers can pay. We can teach those others, but they don't listen. We made them listen and now because everyone said they would not let them come here, we are back.

With the market, we can make a living for ourselves and our families. We can do it ourselves, find the best deals and work together so everyone can afford to come to our shops. We all help each other.

The men in suits were back yesterday, and they were talking about health and safety and new planning regulations. But do you think they will provide us with cheaper water and electricity? That costs me almost 20% of the money I make! And then government wants us to pay them – for what? We take care of ourselves. They just give us paper. But I am talking too much. You want to buy the original. You can see my work in the papers … stars, they wear my designs. They all come to me and you can too, my sister.

Photo: Eric Miller

I work in the Ministry of Finance. It is a job, it pays the bills, and I must not complain. But this job is a burden: a heavy weight on my life.

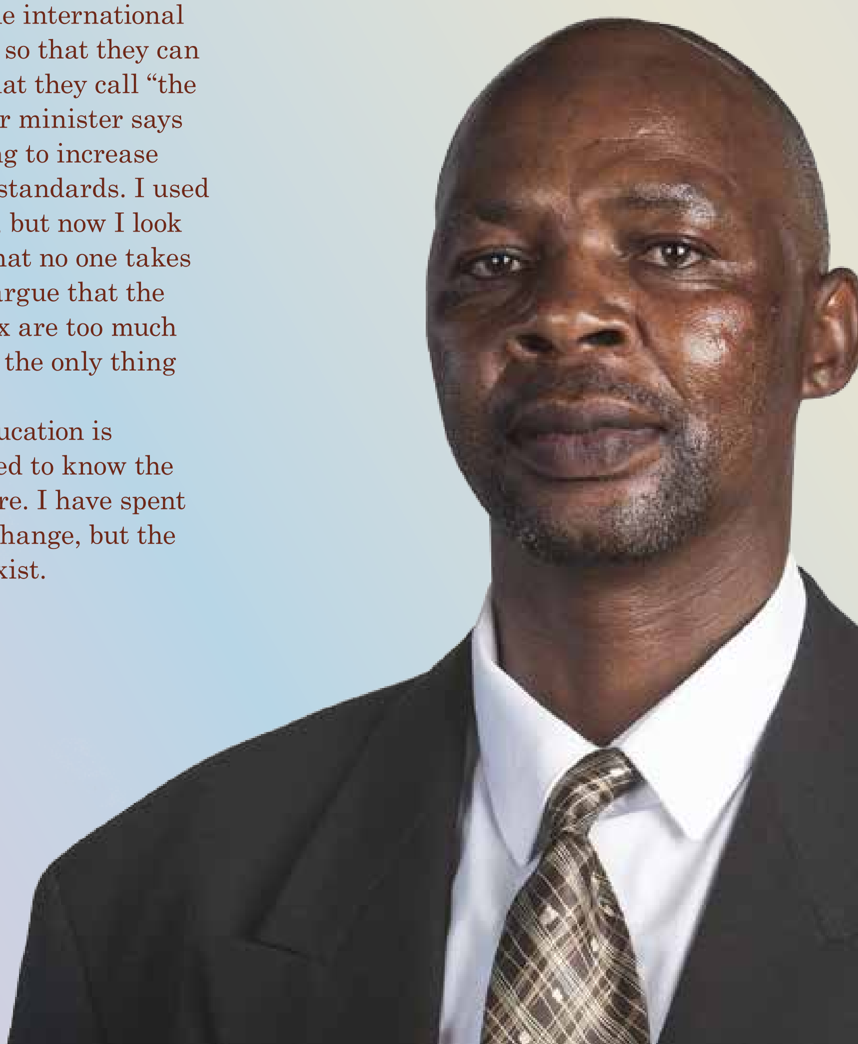
I pay my taxes, even though they take more and more every year. Everybody wants more from the government, and they complain because they don't like what they see, but where are those who put their hands in their pocket and pay the taxes?

I have been doing this job for 15 years now. Every year we give the international people all this information so that they can rank our country about what they call "the cost of doing business". Our minister says we are doing the right thing to increase efficiency and meet global standards. I used to be proud of our ranking, but now I look around me, and it seems that no one takes notice. On the news, they argue that the costs of regulations and tax are too much and too complicated – that the only thing that matters is jobs.

My children say that education is pointless, that you only need to know the right people to get anywhere. I have spent my life trying to push for change, but the world I imagined doesn't exist.

Now we don't really have borders between our countries, all the rules have changed. Nothing is stable any more. It's even the same at work. I hear talk about us merging with the other countries in this region, so I might also not have a job tomorrow!

I thought I could help to change things for the better. But now, I just work, because I must work. The government seems to be a joke that others are laughing at.
I am now part of that joke.



Photos: Shutterstock

INFORMALISATION IS HERE TO STAY

In the 2030s, government and "the people's economy" seem to operate in different worlds.[2] The key drivers of life in Africa lie in the informal economy, outside the formal, regulated sectors of society.[3]

Most people earn part or all of their livelihoods through informal activities, and get the goods and services they need within a social network "defined by norms and institutions that are in essence non-economic".[4] Africa's labour, livelihood, political and social needs are met by informal organisations, businesses and supply chains, by informal skills transfer, by informal innovation approaches to intellectual property, and by informal provision of social services.

In some cases this has happened to fill the gaps left by a state, which is no longer supplying adequate services or an enabling environment for bigger business; in others, because regulations governing the licensing and registration of businesses are unnecessarily onerous.[5] Citizens have turned towards informal mechanisms for meeting their needs and entrepreneurs are just getting on with doing business.[6]

Africa's informalisation represents a form of "glocalisation."[7] Economies and societies are global/local hybrids, with multiple identities and diverse organisational forms. These are in constant flux – organic, dynamic, explosive, unpredictable and improvisational.

In general, this world has resilience and an internal order, but there are pockets of chaos in some countries. Where overseas development aid has shrunk, the impacts on the formal sector have been profound. Even in countries not plagued by warfare or overt formal sector breakdown, there are those in government and business, or in the informal sector itself, who see rising informality as a convenient cover for corruption and criminality.

Historically, the informal economy was seen as an undesirable element of developing country economies that would gradually fade away.[8] In the 2030s, notwithstanding efforts to re-establish the primacy of the formal sector, with greater or lesser success in different contexts and countries, the informal economy is a "permanent feature" in Africa.[9]

The extent of informality varies with differences in productivity across firms and workers, as well as with differences in the nature of regulations and the degree to which they are enforced. Whether informality is the result of exit, exclusion, uneven enforcement, or low firm productivity is still a matter of debate.

World Development Report 2013: Jobs

What do we mean by "the informal sector"?

Informal economic activities are typically defined as those outside or beyond government regulations such as taxation, registration or licensing. Formal activities tend to be defined as those within the reach of government regulations or agencies.[10]

The International Labour Organisation characterises the informal sector as:

> "consisting of units engaged in the production of goods or services with the primary objective of generating employment and incomes to the persons concerned. These units typically operate at a low level of organisation, with little or no division between labour and capital as factors of production and on a small scale. Labour relations – where they exist – are based mostly on casual employment, kinship or personal and social relations rather than contractual arrangements with formal guarantees."[11]

Informal *employment* is a distinct concept. In 2003, statisticians agreed on a standard definition for informal employment, for inclusion in countries' national accounts: "the total number of informal jobs […] whether carried out in formal sector enterprises, informal sector enterprises, or households, during a given reference period".[12]

The activities of formal sector enterprises, informal sector enterprises or households are variously legal, not underground, underground or illegal, and any combination of these. Illegal production activities include drug trafficking, for example. Underground production is concealed from public authorities and may contravene some laws, but can nevertheless comply with others – an example is the sale of legal goods or services without tax declaration.[13]

Photo: Shutterstock

Ends of the continuum[14]

	INFORMAL	FORMAL
Labour	Intensive	Automated production
Entry	Low barriers	High barriers
Size of the business	Small (five or fewer staff)	Large (over five staff)
Skills acquisition	Mentors (apprenticeship)	Formal education
Adaptability to market	Indigenous culture	"Western" approach

A RECOMBINANT CONTINUUM

The most formal enterprises pay taxes and adhere to government-mandated standards and regulatory frameworks. The most informal entities are far removed from government oversight and regulation, and some may even conduct illegal or illicit activities. Between the two are a mix of actors whose characteristics are complex and often difficult to measure or place at a point along the continuum. Some of the most dynamic and sustainable are those operating near the middle of the continuum. They are properly constituted, organisationally and in terms of their business operations, but are still outside most government oversight mechanisms – and in some cases they vacillate between formal and informal status.[15]

A dualistic framing of the formal and informal sectors may serve an explanatory purpose, but the situation in different countries reflects permutations of economic production, distribution and employment relations on a continuum.[16] Multiple forward and backward linkages between the formal and informal activities create interactive, symbiotic dynamics.

HOW "MUCH" INFORMALITY IS THERE?

In 2009, the OECD estimated that the informal sector[17] represented 43% of official GDP in Sub-Saharan Africa, almost equivalent in size to the formal sector.[18] Since then, the contribution of the informal sector has grown across Africa, including in North Africa. While a large proportion of this remains informal agricultural activities, non-agricultural informal enterprises are increasing their share of GDP.

WHAT IS GOING ON WITH GOVERNMENT?

Some national states are weakening to the extent of becoming sidelined as role players in the body politic, which are inadequate in providing governance – a self-accelerating spiral. There are some self-interested efforts to preserve the fading function and diminishing relevance of the nation state, but they generally do not succeed.

The informal economy is based on cash or barter, and microloans instituted within the network, rather than on transactions via a formal banking system. Small, electronic transactions made via mobile phone systems occur across formal/informal boundaries. Larger economic transactions cannot easily be monitored, so there is little ability to control inflation or drive monetary policy. Greater informalisation involves avoiding the reach of centralised governance via activities such as tax collection and formal business registration.

> *"Globalisation not only pulls upwards, but also pushes downwards, creating new pressures for local autonomy. […] [T]he nation becomes not only too small to solve the big problems, but also too small to solve the small ones.*[19]
>
> Anthony Giddens, sociologist

Tax revenues have shrunk to the point where many government functions have become financially unsustainable and are not being performed. In some countries, there is a deterioration in state provision of quality infrastructure and administration, as well as co-ordination of essential services. Government finds it difficult to enforce health and safety standards, labour standards, building

Photo above left: Pecold/Shutterstock

Photo above right: M R /Shutterstock

regulations, wages and working conditions. While regulations might well be on the statute books, without well-functioning institutions such as courts, collateral registries and credit information bureaus, formal sector systems cease to work effectively.

When people cannot see high levels of productive public sector services, they are more likely to try to avoid paying taxes, thus increasing the tax burden on the formal sector, ultimately leading to higher taxes and lower quality of social goods. *Ad hoc* legal and policy infrastructures are, paradoxically, an efficient environment for informal sector players who are resilient and adaptable.

The people's economy exists not because of government, but despite government.[20]

South African National Traders Alliance

PUSHES AND PULLS INTO INFORMALITY

Where foreign companies were attracted to the continent by rapid liberalisation policies and privatisations, they did not use labour-intensive methods and did not always employ significant numbers of local workers. Some African economies fostered African businesses at scales, which compete effectively in the formal globalised market with multinationals, but this is the exception. Globalisation thus reinforced the shift to small-scale, informal livelihoods in Africa.

In each country, different factors have contributed to the drift to a relative predominance of the informal sector.

The labour market has taken to the markets

> *[E]mployment in the informal sector is no longer a journey, but has become the destination of many.*[21]
>
> Donald Sparks and Stephen Barnett, researchers on the Sub-Saharan Africa informal sector

Africa's high population growth rate[22] has had a significant impact on levels of informality. The "youth bulge", the growing participation of women in the workforce, and the impacts of improvements in health care have meant the formal sector cannot absorb all the available labour.[23]

With mounting cost pressures and little state monitoring, jobs within formal businesses are becoming more transitory and insecure, and working conditions and health and safety conditions are worsening. Lack of state enforcement leaves semi- or unskilled workers most vulnerable to exploitation or risks, such as the collapse of unsafe structures.

With formal sector unemployment rapidly growing, informal sector activities represent a survival strategy for the people involved and for their households.[24] Graduates from formal education turn to the informal sector either to seek employment or to start their own enterprises. "[I]nformal jobs can also be transformational."[25]

It is not just a lack of formal opportunities that pushes people to the informal. As formal processes become increasingly rule-bound or unfulfilling, the informal sector becomes more appealing.

Photo: FreddieA

Photo: Shutterstock

Government devolved to local level

Municipal governments hold the potential to be more effective than centralised, national governments at managing the day-to-day complexities of the informal world. In 2012, a study by the South African Local Government Association noted that "municipalities and city councils across the continent have started to recognise the importance of the informal economy and that its negation is often impeding economic growth and sustainable livelihoods".[26] Some cities in Africa have risen to the challenges posed by the informal economy, by:[27]

- acknowledging its importance and presence
- facilitating changes in attitude towards the informal sector
- bridging the relationship and communication gap between it and local government
- dealing with the sector's complexity and diversity
- having the right skills, capacity and structures within local government to engage with it
- including informal economy issues in local government policies, regulations and planning processes, including by-law guidelines for the informal economy
- actively engaging the informal economy in developing local economic development policies
- "managing upwards" to get national departments to support local government efforts with regard to the informal economy.

Its dynamism, versatility and room for innovation and entrepreneurship have made the informal sector not just a necessity, but an attractive choice for many people.

Getting going is easier

It is easy to start and run informal income-generating activities, because people can:

- get a small amount of money to start from people they know
- use skills acquired outside the formal school system and without needing a qualification
- rely on indigenous resources and adapted technologies
- run a small-scale operation without a lot of paperwork.

Bypassing bureaucracy

The barriers to and ease of doing formal business are high in many African countries, based on factors such as the time firms spend in meetings with tax officials, or informal payments to public officials to "get things done". Trends shown in the World Bank's *Ease of Doing Business* ranking, using data collected since 2003, have not improved. The ranking ranges from 1 to 185, with the highest being the least business-friendly environment. In 2010, the OECD average was 30, the Middle East and North Africa 92, while Sub-Saharan Africa's average was 139.[28]

Satisfaction more guaranteed

In areas of social services such as health care, non-state actors have filled the vacuum created by poor government delivery or co-ordination. New forms of informal institutions and organisations have emerged not only because government service delivery is unsatisfactory, but also because informal services are tailored and closer (including literally) to what people want.

FEATURES OF INFORMALITY

Sourcing, production and selling is mostly done within families or other trusted social networks working together. These networks identify opportunities to supply the goods and services that are needed and wanted. The new informal organisations are constantly changing as the environments and needs of particular communities evolve. They use labour-intensive methods, which provide more employment, can absorb or shed labour, and are cheaper than capital-intensive production. The situation is "simultaneously a market for culturally defined goods, a pool of reliable low wage labour, and a potential source for start-up capital".[29]

"The policy challenge is to decrease the costs of working informally and to increase the benefits of working formally.[30]

Martha Alter Chen, International Co-ordinator of Women in Informal Employment: Globalising and Organising

Photo above left: Eric Miller

Photo above right: Jeffrey Attaway

The position of women

With the oversupply of labour, women's entry into, security within and working conditions in formal employment remain more tenuous than for men. Studies in the early 2000s found that informal activities involving women tended to require lower-level skills and provide lower incomes when compared to men.[31] Informal employment in agriculture and activities linked to domestic life were always dominated by women. Now, women are present in a wider range of informal economic activities and are able to command earning parity with men.

Agreeing to loose rules

Informal or semi-formal economic, political and social bodies have rudimentary governance functions, based on unwritten or semi-formalised rules and regulations. Despite the lack of formality, people participating in these groupings have a good understanding of the stipulations and the social consequences of going against them.

Multiple memberships

To meet their technical, financial and spiritual needs, individuals living and operating in these informal communities tend to belong to more than one informal organisation. For instance, a farmer might belong to the local farming organisation as well as a women's lending or credit group. The same woman might belong to the local informal organisation affiliated with a church.

Trust, the new currency

Group trust is a defining element of the functioning and maintenance of these informal groups. It is trust – and the desire to trust and be trusted – that sustains the informal rules, more than fear of the repercussions of breaking them. "Outsiders" can earn trust to gain entry into the informal collective, which gives the groups a mix of closed and open dynamics. The trust element allows some of these informal or semi-formal structures to have a national or even global reach, for example into the diaspora.

Telecommunications in Somalia

War in Somalia in the 1990s destroyed every phone line in the country. In 1994, the first private telecommunications company, Telecom Somalia, opened, followed by NationLink Telecom and Hormuud Telecom. In an environment devoid of formal regulation, these enterprises co-operated to create a flourishing, financially lucrative mobile and landline network. Despite rivalry, in 2005 the three companies signed an interconnectivity agreement to set prices and collectively expand their network access. They also co-operated to set up the Global Internet Company to provide internet infrastructure. Characterised by the World Bank as "economic enablers", these operators could install a telephony landline in just three days, provided unlimited local calls for a monthly fee of $10, charged the lowest international rates on the continent, and provided 3G services. However, the formal-informal dynamic re-emerged, and government sought to reassert control over the unregulated environment.

> *"They made a remarkable effort to expand the country's telecommunications, but lack of regulatory laws led to the misuse of our spectrum. Our aim is not to interfere with the telecommunications companies but to put in place regulatory laws that can uphold the interests of consumers and suppliers.*
>
> Abdullahi Ilmoge Hirsi, then-Minister of Information, Posts and Telecommunications, 2013

INFORMAL SECTOR SUCCESSES

Health provision

In some arenas, the informal sector is well able to provide services, primary health being one. Traditional, unlicensed medicinal

M-Pesa is a cellphone-based financial services system, which allows users with an identity document to deposit, withdraw, and transfer money, and access microfinancing.
Photo: Jeremy de Beer

practices operating at local levels are key providers of health care. There is also a second set of actors: small clinics operated by individual private medical practitioners who are not part of a franchise or any national health care system. These clinics are unregulated, or minimally regulated, and also make some use of traditional medicinal compounds and practices.

Finance

Formal banking institutions and systems are faltering in many African countries, not least because of knock-on effects of financial crises in the "declining" countries. The vacuum left behind is being filled by innovative financial systems and products from within the informal sector. Informal financial organisations and networks now dominate the management and transfer of funds.

Artisanal apprenticeships

Many learn their trade via informal apprenticeships provided on an unstructured and informal basis to "someone who knows someone" who needs help. Within this milieu, the concept of ownership of ideas is anathema: artisans work in close proximity to each other and actively share and collaborate.

One such example is provided by informal sector mechanic-engineers in Uganda. In many African countries, the roads are often rough and full of potholes. They are not suited for imported cars designed for perfect tarred roads. The cars often break down and spare parts are very expensive. In Uganda, a cadre of informal mechanics developed innovative ways to overcome the shortage of certain critical parts. These informal artisans are recognised as problem solvers who are able to improvise with new and used parts to create novel solutions.

CRISS-CROSSING REGIONAL CONTRACTS

The power of national governments is undermined from both above and below by globalisation's "reinforcement of both supranational and subnational regionalism" and by the "ongoing flow or cascade of globalisation-regionalism-subregionalism".[32] Losing their grip on national governance, governments enter into *ad hoc* economic, trade and governance agreements with any and as many partners as possible. This creates a complex web of plurilateral and regional agreements, paradoxically further undermining the autonomy and function of nation states.

MOVING THROUGH POROUS BORDERS

Informal intra-regional trade can be:

- unregistered businesses and traders that operate entirely outside the formal economy
- registered companies fully evading official border-

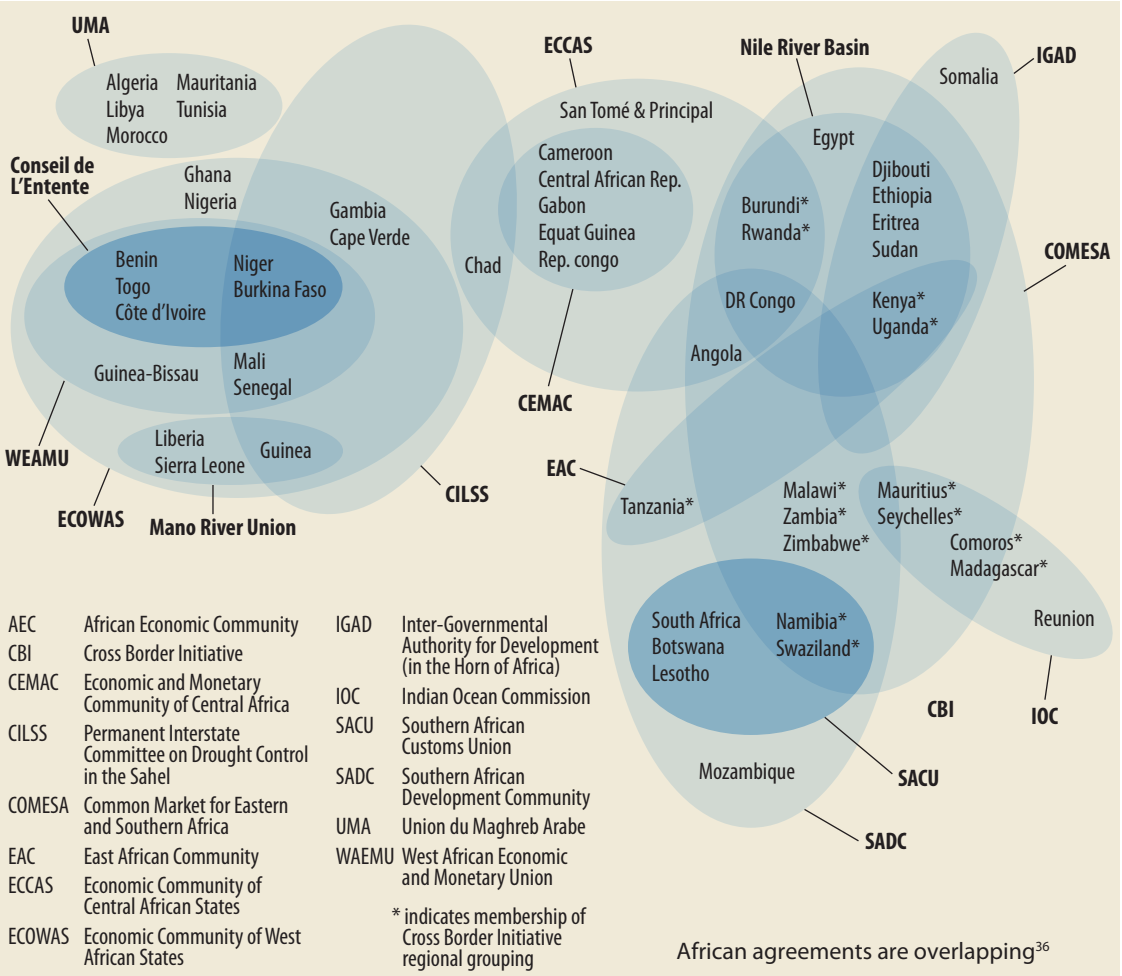
Uganda's electric vehicle

In November 2011, Uganda's President Museveni launched the prototype KIIVA electric vehicle to much acclaim. The car was designed fit for purpose for Ugandan roads and future plans included an electric bus. The vehicle was developed by a team under Professor Tickdori at the Makerere University's Centre for Research in Transportation Technologies. What is less well known is that both detail design elements and production of the car were the result of both formal and informal sector inputs. It was built by Gatsby Garage, a formal sector entity which is run by the university's College of Engineering, Design, Art and Technology. The garage operates as a semi-formal sector entity as well, drawing on the expertise of informal artisans to supplement skills and solutions that elude formally trained designers as well as academic researchers. The manager of the Gatsby Garage acts as point of reference, introducing informal sector mechanics with particular specialities to formal sector researchers and students from the university. There are now efforts from the university researchers to proactively and systematically identify informal sector artisans and co-opt them into the formal research and innovation centres.[34]

Kawooya, D. Informal-formal sector interactions in automotive engineering, Kampala

If I don't help relatives by training them and giving them hands-on skills to produce stuff or repair work, they will likely become a burden in future, or social misfits, or probably engage in criminal activities due to poverty and lack of skills to find jobs. Besides, I was helped by a relative, so it's imperative that I do the same for young relatives and friends.[35]

Ugandan artisan (Open A.I.R. interview)



African agreements are overlapping[36]

crossing posts and trade-related regulations and tariffs

- registered firms partially evading trade-related regulations and tariffs by illegal practices such as under-invoicing

Multiple regional agreements, which create both economic integration and contradictory rules, make it easier for informal traders situated near national boundaries to move goods through gates and gaps in borders. Where national and regional trade strategies have embraced the benefits of legitimate informal cross-border trade rather than criminalising it, the potential to improve food security and poverty at a regional level is being realised. In some parts of Africa, informal trade links revive pre-colonial trading geographies, particularly where language groups span borders.

LIMITING OR DRIVING DEVELOPMENT?

Where governance of the formal informal economies have become dislocated, the formal sector is increasingly irrelevant. When it comes to humanitarian issues and social programmes, international agencies and non-governmental organisations are stepping into the breach to assume responsibility. While the formal sector is not necessarily shrinking, the informal sector is growing more quickly. Such growth comes more from the proliferation of micro-enterprises than the scaling-up of particular businesses.

Informal businesses are limited by their small size – they are unable to realise economies of scale, have less access to inputs and cannot leverage formal business relationships. These factors inhibit productivity and efficiency gains in the sector.[37] Unregulated activities may also deter investment in some circumstances.[38] A lack of formal protection for property rights – both of and by informal practitioners – may be impeding scalable innovation in the formal sector.[39]

Looking at informal economies in that light, it is understandable that some economists and politicians hold the view that policy should

In 2013, UNCTAD estimated that for the SADC regional economic zone, informal cross-border trade amounted to as much as 30–40% of total intra-SADC trade, which would equate to $17.6 billion annually.[40] The value of Ugandan exports via the informal economy to neighbouring DRC, Kenya, Rwanda, the Sudan and Tanzania was estimated at $790 million in 2009 and $520 million in 2010. Trade barriers dismantled by or through regional agreements are bodies are facilitating what already happens through informal trade.

aim for informal firms to "graduate" through a linear progression into the formal sector, as the best way to add to overall economic growth. Efforts persist to emancipate informal sector actors from the constraints perceived to repress their own economic potential. Formal sector firms are much easier to regulate and control.

However, the informal economy has expanded beyond control and is now outside the influence of national politicians. In most countries, informal activities are playing a critical role in alleviating poverty, increasing employment, producing goods for the low-income majority, improving competition in the economy, supplying the formal sector, and fostering adaptation and innovation. Genuine engagement to tap the potential of informal economic activity is proving to be the better path.

Photo: Jeffrey Attaway

CO-EXISTING INFORMAL/ FORMAL CONNECTIONS

Informal economic, political and social-cultural activities and structures far outpace the formal. But the formal sector still matters, especially at the local level, to provide critical government and business infrastructures. Countries that are manifesting a symbiosis between informal and formal sectors are performing best.

Many formal private companies maintain footholds in the informal economy, for example retail chain shops supply goods to informal vendors on credit without security. Public sector entities work with and support informal sector actors. Indeed, in some cases the public sector has become a major source of demand for the output of informal businesses, providing an engine for their growth and transferring skills and capital. The informal sector attracts and benefits from both formal and informal education systems, since both supply labour possessing the skills and competencies needed to work and thrive in the informal sector.

A few countries are teetering on the brink of collapse. African nations or regions that have experienced prolonged periods of failed government and lawlessness reveal the dangers when formal structures break down almost entirely. In the absence of strong state security mechanisms, the potential exists for conflict and violence. Informal economic, political and social power can become concentrated in the hands of groups most prone to violent coercion and its corollaries – forced labour, trade in illegal goods, and terrorising of local populations.

INNOVATION AND INTELLECTUAL PROPERTY IMPLICATIONS

Policy for chaos or vibrance

Throughout Africa, there are contrasting policy responses to the informality predominating on the continent. Is it possible to support informality while at the same time maintaining a stable nation state?

Because it cannot be comprehensively regulated, the informal sector is still perceived by some as a threat to the bureaucratic structures of the formal economy. There are real challenges posed by tilting too far into informality, including issues of corruption and white collar crime, including insecurity from crime, and/or terrorism.

The inventiveness and adaptability of the informal sector presents nation states with opportunities to develop novel means of capturing the vibrancy and value of the sector, perhaps through nurturing the links with the formal sector and developing new channels for this symbiosis. There are many initiatives to devise out of the box alternatives to mainstream models of taxation, registration and public service. While chaotic at times, the result potentially provides employment for all and is also inclusive, adaptable and insulated from global economic shocks.

Recalibrated science, technology and innovation policies

Around the turn of the 21st Century, African science, technology and innovation (STI) initiatives began to seriously consider how innovation could help transform the continent. Leading thinkers examined how the right innovation systems could best tap Africa's indigenous resources for socio-economic development, while misguided policies merely replicated

Photo: Jeremy de Beer

outdated Western models that were no longer relevant to the global economic realities.[41]

By the 2030s, Africa's STI policies have clearly shifted to embrace the informal sector – or at least to acknowledge its vital role alongside the formal sector. Changes in national innovation systems to give due attention to the informal sector are now key to the health of African economies. Paramount is the need to better understand how innovation in the informal economy happens (or does not happen), how informal sector innovation interacts with socio-economic development, and how to channel this dynamism for collective benefit.

Key uncertainties

- How to avoid dysfunction while managing the "organised chaos" that exploits instead of suppresses the informal sector's virtues?
- How to determine the level of government best suited to deliver essential public goods and services?
- Is there a digital or formalised equivalent to the face-to-face interpersonal networks of trust based on proximity?
- Can any intellectual property protections be enforced if informal strategies don't ensure fair competition?

Open A.I.R. case studies included the informal automotive sector engineers in Kampala who worked on the KIIVA car prototype for Makerere University, Nigerian producers of leather textile goods, and the value chains for Ghanaian cocoa and Ethiopian coffee. The companion volume to this Open A.I.R. scenarios publication, *Innovation and Intellectual Property: Collaborative Dynamics in Africa*, reports signs of movement by relatively non-formalised actors towards informal or semi-formal appropriation strategies, such as trade secrets and first-mover advantages (for informal automotive engineers and mechanics), and collective certification marks or geographic branding (for textile and agricultural producers).

Valuable knowledge

Valuable knowledge is related to interpersonal linkages with other networks, either formal or informal. Know-what and know-why are of little use without the trusted relationships to exploit knowledge for social or economic gain. This *know-who* is highly contextualised, tacit knowledge. It is acquired by informal *learning* rather than formal *education*; significant self-learning is achieved by tinkering, fiddling and mending. Literacy is always important, of course, but equally so are social and practical problem-solving skills.

The informal sector has a unique understanding of the needs and aspirations of those at the base of the pyramid, as well as of how to access local materials, find appropriate fabrication techniques and access local distribution channels. Apprenticeships, or informal learning systems, provide the primary avenue for gaining entry to the informal sector. Learning based on hands-on skills and improvisation is more effective in imparting the skills needed to effectively function in informal activities, be they in business or other spheres.[42] Enterprising "graduates" whose flexibility enables them to navigate the informal sub-sectors they are trained to serve are best positioned for success. The fluidity of the informal sector and its activities demands these kinds of flexible individuals more than the graduates of formal education systems, whose expertise and trades are narrowly defined by academic disciplines. Many formally trained graduates are unsuited for the informal sector because formal institutions are not oriented towards training informal workers.[43]

Innovation and creativity

Grassroots innovation is informal, rapid and highly competitive. It is user-generated by individuals and communities who solve problems. Based on symbiotic relations between formal and informal sectors, innovations in some informal spheres adapt products and processes from formal markets. Artisans involved in metal fabrications, for instance, reuse old machines or parts as inputs into new products. Likewise, formal sector innovators draw on problem-solving techniques improvised by their informal sector counterparts.

Informality results in a vibrant environment, but material constraints make it unlikely that entrepreneurs will move above the radar into the formal economy – assuming that is the goal, which often it is not. Innovation systems are based on the relationships between entrepreneurs, their customers and suppliers, forming clusters based on physical proximity and face-to-face relationships. Where you are determines who you see, who you know and who you trust. Innovation systems are, therefore, local, regional or sometimes "glocal", absorbing global innovations and adapting them to requirements.

Sharing of knowledge, expertise and innovations is a defining characteristic of the informal sector, so in this way innovation systems are "open". However, sharing is restricted to trusted networks and typically based on face-to-face interactions. Openness comes from *ad hoc* idea sharing between groups with interpersonal proximity, and innovation will come from the organic circular flows between them. While everyone has an equal opportunity, those who are most adaptable are most likely to succeed.

Intellectual property

Knowledge governance is based on dynamic social norms. Informal rules are enforced by personal relationships and self-interest, where the greatest risk is reputational. Those within interpersonal networks cannot afford to compromise their relationships or they will be ostracised by peers – a far more serious sanction than any IP infringement lawsuit might bring. Identity is tied to place and one cannot afford to be excluded.

Formal IP rights, like copyrights, patents and trademarks, are relatively meaningless without the means to register or enforce them. But IP is by no means irrelevant: the forms that matter are those that can be obtained simply and cheaply (or freely), and enforced by social or cultural expectations rather than by legal contracts. Here, the emphasis is on "appropriation" strategies instead of formal IP protection.

Trade secrets and confidential information provide valuable competitive advantages to informal entrepreneurs. Rapid evolutions of new ideas bestow a first-mover advantage. Customers are attracted to the fastest innovators. The most innovative entrepreneurs and micro-enterprises emerge from particular locales, providing another layer "protection". Some formal modes of protection, however, do matter. Moral rights are relevant, as people take pride in *their* intellectual creations. Branding is also key, so groups may seek efficient ways of protecting reputations and retaining customers' trust. Collective branding schemes work because individuals in the informal sector need not worry about registration, enforcement or other formalities; those functions are more efficiently administered by others.


SINCERELY
AFRICA

This is a world where …

African communities ensure sustainability by reinterpreting traditional knowledge systems, and tapping human and natural resource riches in response to global instabilities and external pressures.

Except for …

outsiders lacking community roots or shared identities, who lose the ability to participate socially, politically and economically.

When my children left for the town, I knew I would hardly ever see them again. That was the way of life for many generations. This is what happened … they went to the cities and looked for jobs. We were left behind with the small children, keeping the family land.

But these days things seem to be different. My beloved grandson lives here with me now and other family members, like some of his cousins, have come back too. They were complaining that life in the cities was too hard and stressful. My grandson first came to protect us during the drought when those from that other village tried to stop us getting to the spring – a water source we have always shared as our ancestors did. It was very hard for us, but the elders called meetings and my grandson also had good negotiation skills, because of his experiences in the city.

Life on the land has never been easy, but it is what I know. It has got better since the young ones have come, sometimes they teach us new things that we can use to improve the way we grow our crops. Hah! They are also keeping records of what we do to help the crops when there is little rain and how we protect our crops when storms come. Sometimes they sell this knowledge to outsiders, which brings us more money. We aren't hungry here like they are in the cities. We don't need all their expensive things, so life is good. It can be hard but we work together and our crops and our traditions survive. The ancestors are happy, they don't turn away from us.

Because the land is now so dry, we have gone back to some of our old ways. There are things our parents' grandparents did that were almost forgotten, but now we think about those ways and try to see if they can help us. We plant many different crops, so that whatever the weather conditions we have some food for everybody and some for market. We watch the land and do what we can.

We also have the new ideas that come with the young people. They are always asking questions, experimenting and talking to other people in other places, sharing ideas. They always want us to try new ways of doing things to see if they work better than before.

I remember thinking there was nothing good that could come from hardships, but I think it made us a strong community. We have 10 different families who all work together to sell our crops, and one of us then works with the community up the road, and we can then sell our food and their food and get better prices. We know what to grow.

But for me, the biggest blessing is having my family back around me. My grandson sometimes complains that he is too educated to just work in the fields, but he says his future is here now. There is little work in the cities and the people are violent. Here is better. People aren't thinking only of themselves, we work together. They are not welcome. This land is for us, and we can eat and sell what the land gives us.

SINCERELY, AFRICA

I came back home when I realised that I could not get work in the city, despite my qualification. Everything goes to foreigners, and the government doesn't care. I never was part of the xenophobia, but many of the young men were fighting and killing each other. I understand that they are frustrated like me … but that violence helps nobody.

Since I returned home, I have made some good friends here and we are making changes to our community that everyone can benefit from. We use collectives to give us better negotiating powers and to make the more expensive changes that we need. Allowing women more power was difficult for the older ones, but they have always been the best crop farmers, and that's what's bringing in most of the profits here.

We have tried many new things. Water is scarce, but we are always looking for new solutions. I have been able to assist my grandmother to combine and grow some amazing seeds that are doing wonders on the family farm already. Our community has realised the blessing of the resources we have. The biggest challenge is how to do more with less.

My grandmother always talks about how much better life is now with her family to help her. I am glad that I can do this, but sometimes I wonder what I could have achieved if life in the city was different. Would I work in an office and be able to afford luxury? Would I have travelled? When I was young, I would look at maps and imagine all the places my education could take me. Who would have guessed it would have just brought me home!

Above:
Maasai
Photo: Jeremy de Beer

> *We have consistently lacked the initiative to claim what we have. We need to transcend from manual ways of doing things into mechanised ways; we are less creative in mechanisation of innovation. Americans and Europeans have since copied our braiding and weaving art and have developed technologies to mechanise the art. Most musical instruments owe their origin to Africa, because music-making is at the heart of African culture. But when African slaves took their choreographic art to Europe, the Europeans were able to capture and perfect not only these instruments but even dance steps in a mechanised system of production and reproduction that enabled them to assert ownership.*
>
> Hon. Justice Olaterogun-Isola, Senior Judge of the Federal High Court, Nigeria (Open A.I.R. interview, 19 December 2011)

TRADITIONS MAKING A COMEBACK

Traditional African values have been reclaimed, and can nurture collective approaches and sharing behaviours, rather than individualism and "looking out for number one". This finds expression in policies, public life and people's pursuits. For example, traditional African jurisprudence seeks to resolve the issue, redress the harm and prevent its reoccurence.[2] Financial rules discourage profiting at the expense of the poor.[3]

Youths have become agents for national political reform based on the strengthening of traditional socio-cultural and political institutions. Leadership skills are grounded, as in earlier times, in family and communal roots where priority is placed on environmental stewardship, accountability, knowledge-sharing for community development and rebuilding trans-generational bonds.

But these principles can also be interpreted for ulterior interests, whatever the motive. In some hands, the baggage of the past can come with the rhetoric of moral regeneration and "family values": social conservatism, patriarchy, prejudice and discrimination, such as on the grounds of sexual orientation. "Street justice" may condemn someone on the basis of social norms, rather than on the rules of evidence.

Far from being nostalgic for an obsolete tradition, the invocation of the ubuntu human rights philosophy is a credible challenge to the deadly logic of the pursuit of profit at the expense of preserving human life.[1]

Professor Mogobe Ramose, Discipline of Philosophy, University of South Africa

THE TRADITIONAL FINDS ITS WAY INTO NEW POLICY GOALS

Quality of life

With industrialisation, quality of life became associated with material conditions, especially income and consumption; by the 21st Century the connection was proving tenuous. Now, a country's Gross National Happiness Index (GNHI) shows where policy changes are most needed, at individual, community or country level.[4]

The evolution from the GDP era to the wellbeing era has continued, with evidence of the objective benefits of subjective wellbeing mounting up. Happy people are healthier, more productive, better members of society and need less state support. Finance ministries have embraced ideas that reduce pressure on public finances. Many African countries are implementing policies designed to increase their GNHI and other measures of quality of life.

It has long been assumed that economic growth is a continuous process that will continue indefinitely. However, the notion of a no-growth economy calls attention to this assumption, and questions whether the economic growth of the last 250 years has been a trend or a unique episodic event in human history. Before 1750 there was almost no economic growth. While the rate of economic growth increased, peaking in the middle of the 20th Century, it has slowed down ever since. Some writers have suggested that rather than trying to stimulate the economy, it is time to accept that we may have reached a tipping point in economic history. Are we are now in a no-growth economy?[5, 6, 7]

Not all citizens are happy with a state driving policy in the "national interest". It is the current cohort of voters who decide the fate of politicians, and there have been policy u-turns where voters were dissatisfied. Some have concerns about social engineering, or feel their personal choices should not be shepherded by a "nanny state". Others are unwilling to be expected to compromise lifestyles in the present for the sake of future generations' wellbeing, for example in countries where more sustainable energy policies have led to higher energy prices in the short term.

Photo: Eric Miller

Generations living together.
Photo: EC/ECHO/Anouk Delafortrie for EU Humanitarian Aid and Civil Protection (Ivory Coast)

For less than a few dollars, land-use certificates can be implemented to reduce encroachment and improve soil conservation. For example, Ethiopia's system for community-driven land certification has been one effective way to improve land practices and a potential step toward the much broader reform of land policy that is needed in many African countries.[8]

Calestous Juma

Sustainable Development Goals

> *Even if, by* force majeure, *the population levels off […] the relatively extravagant lifestyle now enjoyed by the middle classes of North America, Western Europe and Japan cannot be attained by most of the rest of the world. The reason is that the impact of each country on the environment is multiplicative. It is dependent, in a complex manner, on a formula called PAT: population size times per capita affluence times a measure of the voracity of the technology used in sustaining consumption. The magnitude of PAT can be usefully visualised by the "ecological footprint" of productive land needed to support each member of the society with existing technology.*[9]
>
> E.O. Wilson, American biologist and proponent of sociobiology

Production and consumption patterns of the last century were unsustainable. The world population is close to 9 billion, and Africa's population has nearly doubled since the early 2000s to about 2 billion. If people aspired to a 20th Century Western standard of living, the planet's ability to support life and social systems would collapse. Freshwater must be carefully stewarded, land must be looked after to keep producing food, and fish stocks must be safeguarded in a manner that ensures equitable enjoyment of resources. Africa is getting it right.

The 2012 United Nations Conference on Environment and Development (Rio+20) set up a process to develop up to 12 goals akin to the MDGs. The Sustainable Development Goals (SDGs) process took much longer than expected, stalled by countries pursuing narrow national interests, postponing the target year to 2040. With poor Africans being hardest hit by climate change, large parts of Africa being water stressed, and Africa's ecological assets being threatened by over-exploitation from within and without the continent, many countries started taking action ahead of the SDGs being settled. Working with a principle debated at SDG forums, they have set themselves an Ecological Budget[10] and are driving policies to remain within budget, such as:

GOING BACK TO THE BASICS TO FIND KNOWLEDGE

Historically handed down orally and learned experientially, African traditional knowledge (TK) and its related practices were previously undervalued, even sometimes by practitioners – perhaps because it was neither privately owned nor commercially monetised. Now its value is recognised in both urban and rural applications, in a time when sustainable development is imperative. The resilience of African TK systems and innovation is redemptive. There is a strong push for protection of TK against external exploitation, and knowledge-sharing under customary norms is thriving.

> *Examples show that urban Africa is already adapting traditional values and knowledge to practical schemes for credit, land distribution, health delivery, education, sanitation, combating HIV/AIDS and a number of other issues. The irony is that urban Africa, faced with survival strategies to cope with a milliard of challenges, as it moves toward sustainability, is learning from traditional Africa so that local authorities re-learn communal values, indigenous knowledge and the importance of good urban governance and community solidarity.*[11]
>
> From an African Ministerial Conference on Housing and Urban Development, hosted by UN-Habitat in 2008

Where there is value, there might be misappropriation. Poorer communities might sell their birthright to private companies, settling for immediate upliftment and not having been informed that others will profit long into the future from their knowledge, now privatised.

Photo: Jan Hoffmann

- *Sustainable finance criteria*: Financial institutions are required to include sustainability criteria in their lending and investment conditions, at a minimum the performance standards of the World Bank's International Finance Corporation. Besides regulation, business incentives include cost savings from using resources efficiently, avoiding reputational and other risks, and better access to markets.[12]
- *African Land Log*: All large-scale land deals have to be recorded on this online database.[13]
- *Rural land-use planning*: There is growing realisation that resilient environments do not arise spontaneously or organically, but need to be robustly planned upfront. Better social and ecological outcomes – particularly water and food security – need a systematic approach, which considers freshwater and terrestrial resources, and unfolding climate change impacts. This requires integration across sectors such as conservation, agriculture and forestry, and involves co-operation and regulation in managing the transition. Some governments have begun to plan and manage rural, agricultural and wild land use at the level of an environmentally coherent landscape (which could be a biome, or a water catchment area, or a coastal/oceanic interface).

In some cases, integrated land-use programmes have been bungled or the trade-offs proved unmanageable. Land-use decisions are complex and involve many stakeholders with different priorities. Land may be simultaneously in demand by communities (as homelands or sacred sites), or for food or biofuel production, forest products, biodiversity conservation, urban development or carbon storage. This is further complicated by the interdependence between the production and consumption of key resources such as food, fibre, energy and water. Agriculture requires land, water and energy; water extraction and distribution require energy; and energy production often requires water.[14]

These policies have not been evenly effective. Integrated planning requires a strong, long-term vision and interdisciplinary thinking. This is not always politically expedient.

> *"Africa has abundant arable land and labor which, with sound policies, could be translated into increased production, incomes, and food security. This has not materialized because of lack of consistent policies and effective implementation strategies arising from the neglect of the sector.*[15]
>
> Calestous Juma

POLICIES PLAYING OUT IN AGRICULTURE

African agricultural systems are vindicating analysts' expectations that "[t]he only agricultural system that will be able to confront future challenges is one that will exhibit

> *[T]he US has substantially raised incomes over the course of several decades without raising subjective measures of happiness.*[16]
>
> Jeffrey Sachs, Director of the Earth Institute, Columbia University

Terrace farming promotes conservation techniques that increase productivity of key crops.
Photo: Bill and Melinda Gates Foundation (Rwanda)

Transporting agricultural products. Photo: Jan Hoffmann

high levels of diversity, productivity and efficiency".[17]

> *While we busy ourselves awarding honours to city corporate captains, we have failed to recognise that a lot of creativity goes on in the villages, for example via food preservations using traditional methods, yam banks, new methods of farming and preservation of genetic diversity.*
>
> Nobert Young, Nollywood actor, Lagos (Open A.I.R. interview)

Africa is leveraging its resilience to meet the need for sustainable management of biodiversity for food and agriculture, and to mitigate the effects of global mismanagement of agricultural biotechnology. Genetically modified organisms (GMOs) introduced to Africa accidentally or by intervention, such as external agriculture support measures or food aid, have proved vulnerable to even slight fluctuations in temperature and weather patterns.[18] Instead, farmers are cultivating plants and animals that are more resilient. These were preserved by smallholders in the hinterlands, but in fields they are threatened by disease, pests, natural disaster and civil conflicts. Gene banks are designed to hold major African food crops in trust for humanity under the auspices of the United Nations.[19]

Agricultural methods based on African TK are more sustainable than industrial agriculture, and absorb more labour. Large-scale commercial farms creating artificial environments are less flexible in the face of erratic climatic patterns, in contrast with generations of local farmers who had to come to grips with the vagaries of nature. Traditional practices include planting multiple crops simultaneously with deeper roots and different characteristics, so ensuring that whatever the conditions there would be some food.

Subsistence farming has fed humanity for centuries, and smallholder agriculture provides greater food security. Globalisation has resulted in "the somewhat ironic twist of stimulating preferences for locally traditional dietary items",[20] which has expanded the internal markets within regions in Africa. In the modern context of an economic geography with concentrated and high populations which require production and distribution on a mass scale, government and agricultural associations support experiments in hybrid agricultural models.

> *In agriculture, commercial has become a shorthand for "big". Commercial farmers are generally assumed to be "largeholders" – typically, the big estates in Egypt, Kenya, South Africa or Zimbabwe. This is wrong. In purely economic terms, medium-scale farms are the hardest pressed to generate returns on investment: they require mechanised farming, without scope for significant economies of scale. In contrast, smallholders who labour by hand can be competitive – provided they secure access to markets. Tens of thousands of smallholders, for example, can achieve massive economies of scale by coordinating their crops and harvests.*[21]
>
> Mark Ashurst and Stephen Mbithi, African Research Institute

COMMONS-BASED RESOURCE MANAGEMENT

Increasingly relevant for resilience and sustainability are time-honoured commons systems of

Left:
Traditional no-till agriculture retains more soil carbon and moisture than ploughing.
Photo: UN/B. Wolff (Tanzania)

Far left:
A canal built by the community.
Photo: Kelly Ramundo/ USAID (Ethiopia)

resource management, utilising collective organisational structures fashioned locally. Examples of commons resources include fishing grounds, grazing lands, forests, and groundwater basins. Management of these requires collective effort, for example managing waste, clearing unwanted growth and repairing fences. Local African communities with a shared history of stewardship of resources are proving to be well-suited to effectively managing the complexities of commons systems.

In a patchwork of different models to govern the commons and distribute resources, there are cases where management of commons structures has been ineffective, due to several dynamics:[22]

- a lack of collectively agreed shared rules and defined boundaries, so that "no one knows what is being managed and by whom"
- overuse by too many people taking more from a resource that is already at its limit of sustainability
- free-riding and opportunism by some who take advantage of the collective for personal gain: "local appropriators face the risk that any benefits they produce will be reaped by others who have not contributed to it."

CO-OPERATIVE OWNERSHIP

In 2013, the International Co-operative Alliance (established in 1895) met in Africa for the first time and African countries played a leading role. The conference adopted a programme to take co-operatives to a position of being the preferred model and, as a result, the fastest-growing form of enterprise by 2020. This found ready synergy on the continent, with its many indigenous models of co-operatives with values of self-help, equality and solidarity, and efforts in the early independence era to rebuild co-operatives as part of "village socialism" (Senghor of Senegal) or "African socialism" (Nyerere of Tanzania) and for higher productivity in agriculture (Houphouët-Boigny of Côte d'Ivoire).

The co-operative phenomenon

An autonomous association of persons united voluntarily to meet their common economic, social and cultural needs and aspirations, through a jointly-owned and democratically-controlled enterprise.[24]

Definition from International Co-operative Alliance

In the early 21st Century, approximately 7% of Africans were members of co-operatives, and even in countries where some collapsed, such as Uganda and Rwanda, the numbers continued to grow. In 1995, there were only 554 co-operatives registered in Uganda; in the second decade of the 21st Century, there were nearly 7,500. In the early 2000s, community organisations and producer co-operatives were at the heart of expansion of organic export production in East Africa. Savings and credit co-operatives grew in many parts of Africa, eventually serving almost 10% of the population. Between 2007 and 2010, savings in such co-operatives grew by 34% and loans grew by 37%.[24]

PUSH AND PULL TO THE COUNTRYSIDE

The United Nations estimated that by 2050, two out of every three people will live in a city.[25] In Africa, there are interesting ebbs and flows between urban centres and rural communities. In most countries, migration to cities has slowed and in some even reversed, continuing a trend which emerged in the 2010s.[26] This is due to diverse factors in different countries.

EXAMPLES OF RURAL IN-MIGRATION
Level of urbanisation as % of total population

COUNTRY	2001	2010	DROP
Kenya	34%	22%	12%
Tanzania	33%	26%	7%
Mauritania	59%	41%	18%
Senegal	48%	43%	5%

Source: UN-Habitat Urban Indicators[27]

In some cases, municipalities are unable to keep pace with service delivery, demands for water, and sewage systems, all which have been overloaded. The city is effectively gridlocked and job creation is

Youth will have tremendous impact but they have to be empowered with knowledge on how to protect their innovation. Atypical thinking will be required for them to succeed, for example, training and retaining "non-poachable" human resources in small-scale businesses may mean recruiting under-performing [school graduates], drawing out and developing their innate skills.

Ada Ordor, Centre for Comparative Law in Africa, University of Cape Town (Open A.I.R. interview)

turgid. This can to some extent be attributed to structural adjustment programmes in Africa from the late 1970s, which led to job losses in the formal sector and the removal of public subsidies for food, housing, health and education.[28] The erosion of urban standards of living and livelihood opportunities, and at times conflict over limited resources or against local government, has pushed many people back to ancestral lands where one can more easily feed and house oneself without cash and enjoy the safety net of traditional social networks. For some, agrarian ethnic identity is a comfort in a chaotic world.

People are choosing to move or return to rural areas because of economic vibrance and unforeseen opportunities. The support of extended family and the appeal of a rural quality of life stand in contrast to the compromises of city living.

YOUTH MOBILITY

A notable feature of these migrations is that it is mostly youth who are mobile, being both less tethered and more responsive to the pushes and pulls back to the countryside. This has resulted in an invigoration of trans-generational interaction, with increasing adaptation and experimentation with TK.

In the world of the 2030s, the youth of Africa are at the intersection of multiple possibilities, a product of the dialogic interactions between their formal education[29] and the inherited knowledge being passed across generations. Youths are agents for facilitating pragmatic, even if accidental, combinations of formal science and technology with TK, especially in agricultural, medicinal and other spheres. They are experimenting with adaptation or inversion at the interface of new technologies and indigenous knowledge insights for solutions to local problems. A component of this creativity of youth is their interest in local entrepreneurship.[30] This is a modern incarnation of Africa's historic innovation credentials.

However, youthful energy with no constructive outlet can turn sour, and some countries are witnessing the most destabilising and negative manifestations. The youth bulge entering the labour market means competition for jobs is felt particularly sharply amongst this demographic, and they do not often have capital for entrepreneurship initiatives. Youth displacement, unemployment and underemployment are at an historic high in countries with a disconnect between empowered youth and job creation, and sound governance. Some youth are further disgruntled with corruption or low-growth policies, which deny them the potential for lifestyles long enjoyed by the developed world. Some youth in such circumstances have become agents of social tension and insecurity, and political instability.

Adding appeals to tribalism, religious fundamentalism or political extremism leads to a dangerous mix. Segments of the youth readily perceive themselves as victims of "foreign invasion", skewed government FDI strategies and endemic corruption. They are prone to xenophobic and unpredictable ventures aimed at reclaiming what they perceive as their national entitlement. According to one analysis, "grievances among the young are more likely to be expressed violently".[31]

INTRA-AFRICAN DYNAMICS

Some regions have good endowments of water, reliable renewable energy potential, and arable land; in others, people are increasingly water stressed, food insecure and reliant on wood for fuel, leading to further deforestation. People tend to leave places of scarcity or conflict, wanting to move somewhere else. Governance is critical to how successfully countries are managing the challenges. For example, how are encounters between nomadic cattle-rearing communities from the Sahara, seeking water and grazing grounds in the savannah, and their sedentary crop-farming counterparts to be managed?

Boundaries are needed to manage large-scale commons resources, but climate change knows no borders. Lines drawn during colonisation lacked underlying geophysical or social rationales. Within some regions, countries have adopted an approach of human solidarity across borders, planning together for the movement of people, dropping visa requirements for fellow Africans and working together to tackle

Photo opposite page left: USAID Africa Bureau/Wikimedia Commons (Nigeria)

Photo opposite page right: Kirsz Marcin/Shutterstock (Senegal)

Photo left: Jeffrey Attaway

xenophobia.[32] Biocapacity trade-offs are negotiated through regional economic communities – one country's water for another's arable land – in the absence of which there is the threat of cross-border resource-control alliances.

A SCRAMBLE FOR AFRICA AGAIN

> *"The resources over which we fight in the future will not be oil, gold and diamonds: the wars of the future will be fought over water, food and land.*
>
> Ali Bongo Ondimba, President of Gabon, at 2012 Lancaster House Conference on Climate and Security

The prices paid for Africa's fossil fuel exports are plateauing, as international regimes for climate change mitigation impose targets on the long-industrialised world.[33] However, Africa also offers vast solar, wind, hydro and gas energy resources, and both traditional and green energy multinationals seek to explore and exploit them.[34] More essential, Africa has greater biocapacity reserves relative to other continents. External investors are scrambling to secure access to water catchments and rivers and to agricultural land for food production. Even if these assets were to be in public hands, whose commons are they – the nation's or all of humanity's?

> *"We can do without computers, we can do without automobiles, we can, if we have to, do without underpants. But we can't do without food.*
>
> Delegate at 2012 conference on Feeding the World

There are instances where "the resource curse" (primary resource-rich states characterised by a toxic combination of poor economic performance and low human development) persists; only the resources being exploited have changed. African governments and elites seeing opportunities to extract further rents have perpetuated the economic model that prevailed for primary resource exports. Western governments shop for discriminatory alliances, choosing their "friends" and "foes" and pitting African countries against each other in appeasing Western patrons. These governments' uncritical courting of FDI in natural resources, in less than transparent circumstances, has expanded the trust gap and pitted citizens against political elites.[35] A festering of these trends feeds disaffection, which may flare up into conflict where populists stoke ethnic, religious and xenophobic feelings. Asymmetrical economic and political instability threatens pan-Africanism.

An area estimated as almost the size of Western Europe was transferred in land allocation deals from the mid-2000s to the 2010s. Deals reported as approved or under negotiation worldwide amounted to a total of 203 million hectares: 134 million hectares of this total in Africa, 43 million hectares in Asia and 19 million hectares in Latin America. Researchers cross-checking these reports confirm the unprecedented scale of the land rush over the past decade.

The best agricultural land is often targeted for this acquisition. The rural poor are frequently being dispossessed of land and water resources they have held under customary tenure. Many cases show how the resource base of rural livelihoods is being squeezed through the loss of access to grasslands, forests and marshlands that are customarily held as common property. The poor are bearing disproportionate costs, but reaping few benefits, largely because of poor governance. The land rush is also leading to extensive conversion of natural ecosystems, with accompanying losses of ecosystem services and biodiversity.[36]

AFRICA BECOMES MORE PROTECTIONIST

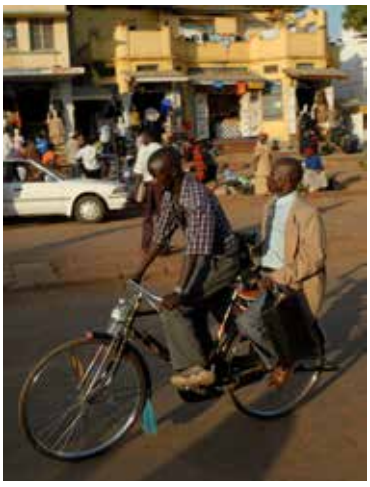
> *If we are culturally prepared to adapt again, we must ask what opportunity we are going to give it, how we will activate a new awareness of survival, what is the degree of resilience that we have …*[37]
>
> Nuria Sanz, Co-ordinator of UNESCO's HEADS Thematic World Heritage Programme

Under globalisation, there were some winners and many losers. Africa was not, initially, one of the winners and globalisation did not lift Africa from its sobering socio-economic status. Africa was, in the 1990s and early 2000s, still the continent with the most least-developed countries, and home to the most vulnerable populations lacking basic necessities of life. At the start of the 21st Century, Africa had over 1 billion people, yet controlled only 2% of the global economy, in contrast to China, the world's second-largest economy with a population of 1.3 billion people.[38] Economic liberalisation under globalisation was foisted on Africa "before most governments had moved beyond the earliest stages of establishing an industrial and manufacturing base".[39] Unlike Asia, Africa had lacked the industrial, infrastructural and human capital base for sustainable competitiveness in a globalised economy.[40]

Africa is no longer so receptive to multinationals who see Africa as simply an "emerging market". This may be motivated by the same drivers of the new African policy regimes, or by politicians' sensitivity to the negative sentiments of their constituencies toward foreign business interests. The "losers" in Africa, unable to make a difference at a global level, have pushed their governments for change at local and national levels. Environmental pressures too have made African countries question economic openness, and many have put FDI controls and trade barriers in place.

For example, companies which do not conform to stewardship, sustainability or fair trade standards are turned away.[41] Similar criteria apply in awarding government contracts. In some cases, foreigners are not allowed to own land, water basins may not be disrupted by invasive and polluting activities such as mining, and land earmarked for agriculture or grazing may not be used for other purposes.

The effectiveness of environmental certification programmes has not been proven over the longer term. Some argue that they perpetuate exploitation of ecological resources, merely under new rules of the game, which are easy to observe in the



Photos: Eric Miller/iAfrika Photos (top left Sudan, top right and right South Africa)

The first meeting of the BRICS Business Council in August 2013.
Photo: Kopano Tlape/ GovernmentZA

letter. For example, allowing for sustainable harvesting nevertheless implies deforestation, which takes threatened species over the brink and ultimately destroys local livelihoods. There are also criticisms of the low standards, lack of regulations or penalties, and how the certification organisations are run.

> *"Africa needs to be selective in choices arising from the global network exposures. … But if we have qualitative education … we can be more discerning and creatively selective regarding how we participate in the new networked society. … [W]e should recognise that we are also vehicles for cultural export, capable of influencing the new global village.*
>
> Charles Okafor, Nollywood actor, Lagos (Open A.I.R. interview)

There are a few cases where it would seem polities have become so inward-looking that there is a re-emergence of city states, semi-dislocated from dependence on national infrastructure and systems. Renewable energy technologies (including waste-to-energy) have allowed cities to get off the national energy grid. Some of the most successful communities in the new context are those previously insulated from outside inputs and subtraction. In these new "walled" cities, there is a shift to using non-monetised forms of barter, such as the exchange of "talents".[42]

What about the rest of the world?

HOW ARE SOUTH-SOUTH RELATIONSHIPS PANNING OUT?

Does it make any difference whether an opportunistic investor is from a developed, declining or developing country? When is a helping hand a masked fist? Does nationality determine when business competition is "healthy" and when it is "unfair"?

Alliances, such as BRICS, hoped to share access to markets and investments, technologies and learnings, and to stand together on common interests in the international arena. Certainly, trade volumes have grown in quantum leaps. Advances made on the other goals perhaps depend upon where one stands, politically and economically.

"Barefoot" entrepreneurs and innovators from developing countries who have similarly solved local challenges with rudimentary resources may benefit from interaction and informal technology transfer. This may happen by accident as workers from different countries encounter each other in Africa, or through study tours arranged government-to-government.

In some cases there are historical ties which find resonance in a world reclaiming roots. Afro-Brazilian connections provide an example – many Brazilians' ancestors were of West African origin, shipped out as slaves, and large populations have chosen to migrate back particularly to Nigeria; and Lusophone Africa shared experiences of Portuguese colonialism with Brazil.[43] This colours the nature of Brazilian engagements in Africa.

In contrast, some are suspicious of China's motives or modes of operation in Africa. Afro-Chinese relations lack cultural bridging, and the Chinese diaspora in Africa is segregated linguistically and socially, both by itself and by host communities.[44] Are China's stated intentions of an exchange between equals – infrastructure for resources – genuine or opportunistic? Chinese workers are used on construction contracts, not locals. Regulation aims at the restriction of Chinese business operations,[45] and Chinese businesses are accused of various underhand strategies.[46]

GLOBALISATION SPUTTERS

> *"Globalisation today is not working for many of the world's poor. It is not working for much of the environment. It is not working for the stability of the global economy.*[47]
>
> Joseph z, 2001 recipient of the Nobel Memorial Prize in Economic Sciences

Initially, the success of free market capitalism that accompanied globalisation was so dominant that it appeared to be the only route to progress and development. However,

Photo: International Rivers (DRC)

as the 21st Century progressed, globalisation's successes are no longer so assured. One of the main problems was that "capital is more footloose across national borders than products, which are in turn more footloose than people".[48] The result: massive inflows and outflows of capital, which led to global financial instabilities and unemployment. Countervailing forces are at work in the 2030s, and we see signs of a reversal of globalisation and a "post-growth economy" in the West.[49]

In the ICT sphere, there are increasing threats to the openness of the internet as governments reassert their sovereignty, potentially creating new geographic boundaries online.[50]

INNOVATION AND IP IMPLICATIONS

Sustaining communities in a world of scarcity

In this *Sincerely Africa* world, there is growing acceptance of resource constraints and the pressing need for reorganisation in order to achieve sustainable development. This paradigm encourages policymakers to look within for novel solutions to re-learn communal values, tap into indigenous knowledge and explore ways to achieve community solidarity. The result is much experimentation around new forms of governance and decentralised kinds of policymaking tools and processes. Centralised control is too far removed from the nuances of resources and their carrying capacity, and also the strategies used by the many people who rely on the resources, to be able to make any meaningful representation and enable the necessary co-operation.

The focus here is on subsidiarity. This is the principle whereby the most local, least centralised, smallest or lowest authority capable of making policy has policymaking and decision-making powers, constrained only by the impacts of its decisions and policies on others. Conflicts require formal resolution through agreed conflict-resolution mechanisms such as negotiation, collaboration and consensus, and fairness and equity are key skill sets. Transformation is required

Photo: africa924/Shutterstock (Zambia)

Key uncertainties

- How to overcome historic or emerging racial, ethnic and religious differences for co-operation across communities?
- How to collectively manage shared environmental resources while avoiding a tragedy of the commons?
- Is it possible to successfully create or redefine new kinds of wealth in an economic era of low or no growth?
- Can commons-based systems stop outsiders from misappropriating genetic resources, cultural heritage and traditional knowledge?

from a competitive winner-takes-all mode to a world where humans acknowledge their reliance on others and on a single shared planet. Regardless of how many people there are on the planet, the earth's capacity to meet the needs of its inhabitants is finite: with few exceptions, there is a fixed amount of stuff to consume and share.

In the *Sincerely Africa* world, with its requirement for prosperity without growth, Africa has the opportunity to thrive. Lacking the legacy costs, obsolete systems and unsustainable behaviours of most of the rest of the world, Africa has the potential to leapfrog into an uncharted, sustainable future. Africa's diaspora has a critical role to play here. Many foreign-trained graduates who have acquired academic knowledge and professional experience abroad, return to Africa (physically or virtually) to reconnect with their cultural and spiritual roots. What they have learned – particularly what not to do – enables them to bring comparative advantage and to bridge different worlds. This knowledge stands African communities in good stead. Combined with the democratic dividend provided by Africa's youth at a time of transformational change, there are new opportunities for innovation at every level. Ultimately, Africa's transition to increased sustainable development is led by its young people.

Bioprospecting, cultural heritage and benefit sharing

Sincerely Africa sees the continent once again subject to resource grabs by foreigners. This time, it is not Africa's precious natural resources or its people that others are after; it is the continent's biodiversity. In a world of scarcity and ecological sensitivity, African biodiversity has become one of its biggest assets. African communities are able to leverage traditional ecological, agricultural and medicinal knowledge to build long-term sustainable communities. But in plant, animal and human genetic resources also lie the keys to solving some of the world's most pressing challenges, from population health to food security. Companies and countries outside of Africa engage in extensive "bioprospecting" of African genetic resources. In some cases, foreigners engage in blatant "biopiracy", while in other cases, access is provided on mutually agreed terms with benefit sharing.

How genetic resources and associated TK are controlled – through careful stewardship or commercial exploitation – depends largely on international legal frameworks. While community customs and social norms are powerful sources of authority, only those people who share similar values respect these rules. Community values are based more on identity than locale, though the two features are often, but not always, intertwined. Outsiders who do *not* share the same values do not respect spiritual or cultural traditions. They must be coerced by laws that mandate prior informed consent to explore and exploit Africa's biodiversity.

One such legal rule requires any patent applicant for a biotechnological innovation to provide proof of consent to use the genetic resources or TK, and a promise to equitably share benefits with the source community. This obligation becomes binding on foreign multinational companies through sustainable development agreements.

Similar challenges exist regarding the misappropriation of cultural heritage. In the case of folklore, for example, the challenge is to stop community outsiders from taking African cultures or traditions and marketing them without permission, especially to African diaspora, researchers and users in major foreign markets. Adequate protection against this practice exists only in countries that have implemented the new legal rules governing TK.

TK and the commons

Traditional knowledge (also called indigenous knowledge), which includes traditional medicinal, ecological and other knowledge, as well as folklore and traditional cultural expressions (e.g. beadwork, music, designs), is not, as is so often assumed, in the public domain. Indigenous and local communities are the custodians of such knowledge, and have in

Photo: Gino Cocchiaro, Natural Justice: Lawyers for Communities and the Environment

place customs to ensure that the transmission of knowledge is not freely available to all, yet that it is passed on from one generation to the next. In short, generally, most types of TK are "kept within the custody of a selected few, to the exclusion of all others."[51] The policy challenge is therefore twofold: to limit situations where TK commercialisation takes place without prior informed consent and benefit sharing; and to ensure TK is preserved for future generations.

One approach to overcoming these challenges – a TK "commons" structure – has both a positive and defensive function, i.e. it enables commonly held TK to be more formally shared and preserved, but also enforced, by the indigenous and local community in question. In India, for example, the Council of Scientific and Industrial Research maintains the Traditional Knowledge Digital Library, a digital database which not only captures the TK information, but also enables it to be checked against patent applications.[53] Based on this model, a successful initiative to document TK took off in Kenya. It involved trying to capture the TK of the Kenyan Maasai community in Laikipia, under the auspices of the Digitising Traditional Culture in Kenya project, as part of WIPO's Creative Heritage Project.[54] Similar initiatives spread throughout the continent during the two and half decades since 2010.

The Kukula Healers in South Africa

The Kukula Healers – a grouping of traditional medicinal practitioners in rural Bushbuckridge, South Africa – take a "commons" approach to their TK. The Healers have a bio-cultural community protocol (BCP), through which they protect their shared knowledge and regulate collaborations with outsiders.

> *"In 2011, in line with the provisions of the BCP, the Kukula Healers negotiated a non-disclosure agreement and agreed to share plant material with the South African cosmetics and bedding company Godding and Godding.*[52]
>
> Gino Cocchiaro, Johan Lorenzen, Bernard Maister and Britta Rutert, Open A.I.R. researchers

Thus, the Kukula Healers are managing to look both inwards and outwards. They are strongly bound to their local conditions and customary law, but at the same time, are open to doing business, on their own terms, with outsiders who see untapped potential in the Healers' local knowledge.

Groupings such as the Kukula Healers are ubiquitous, and increasingly powerful in the *Sincerely Africa* world.

Valuable knowledge

Sustainability in this world requires a holistic understanding of the complex relationships and interdependencies between natural systems. A key focus is on *slow variables*: long-term variations that take decades or centuries to evolve, and upon which ecosystems of all types rely – and which, unlike fast variables, are difficult to quantify and discern.

Solutions to sustainability challenges apply TK in new contexts: they depend on the physical and human resources available at a particular time and place. The knowledge must serve the community from which it emerges, and must be visible to the community as a whole. Communities are collectively, collaboratively organised. Intergenerational knowledge is woven together in novel ways, and perhaps combined with contributions of global knowledge from a diaspora that increasingly values Africa's rich endowments.

The bases for thinking and knowledge are customary beliefs and world views. There is seldom a distinction between the individual and the collective. Collective values underpin individuals' customary practices, traditions and stewardship of local resources and ecosystems, and these same collective values govern what can and cannot be done with local knowledge.

Innovation and creativity

Innovation in this world centres on finding innovative ways to make do, and do more, with less – on finding labour-intensive, non-materials-intensive ways to survive and thrive on a communal, shared basis. Innovations tend to rely on traditional, proven methods and processes, or new solutions created from within the community to address local problems. Innovations in this world link knowledge from multiple sources to find unique community successes. There is a constant search and experimentation for new technologies to provide novel solutions to shared human problems, within the particular context of place and community.

The innovations in this world are context-specific: what matters is not *what* you are making but *how* you are doing it, and *how* sustainable what you are doing is in the medium to long term. Central to innovation is a need for reduced energy reliance coupled with improving productivity. African innovators' long experience of low-energy-consumption livelihood development puts them at an advantage relative to innovators on other continents, but the challenge is where the boundaries are drawn and how to avoid free-riding and gaming of the system.

Intellectual property

The paradox this world presents is that while knowledge and ideas are abundant, natural resources are not. The notion of private property can be particularly alluring in this world of scarcity. IP and knowledge governance systems thus need to be driven more by moral, ethical, spiritual and cultural values than by economic principles if they are to maximise collaboration and shared benefit.

This world's knowledge governance is grounded in specific solutions necessary to manage the commons-based resource systems. There is a tendency to respect traditional values and customs, and to agree to formal conflict-resolution mechanism, such as adjudication or arbitration by a neutral party, that will be honoured by all parties. Sometimes these mechanisms are legal; other times they are cultural.

With regard to IP rights, it is clear that many "Western" IP laws are unsuitable in this scenario. Patents, based on novelty, an identifiable inventor and other contextually insensitive requirements, or copyrights, also requiring authorship and manifestation in material form, cannot capture the social, cultural or economic value of collective innovation and creativity in this world. Worse, patents and copyrights can be used as tools for community outsiders to misappropriate the benefits of African knowledge.

However, there are *sui generis* IP possibilities, including establishment of TK commons arrangements, with digital TK databases and libraries, to simultaneously protect communal TK and allow access to it on terms beneficial to the innovating community,[55] or setting up of legal trusts to manage TK locally while ensuring that any use by outsiders complies with their norms and values, and provides benefits to the community.

Insights and analysis

Within each scenario, the range of possibilities varies on a continuum from mild to extreme, depending on the unit of analysis. Aspects of different scenarios are likely to be observable simultaneously in particular regions, countries and cities, or in particular sectors, industries and innovative activities. Certain features of one scenario may exist to a greater or lesser extent in others as well. It is also possible that these features may recombine in unanticipated ways, leading to unimagined scenarios. However, through our extensive research, wide consultation and creative process, we have constructed a set of three scenarios that we believe are internally coherent, comparatively rich, and tell the three dominant stories of African innovation and development. How do they compare?

A world where ...

Wireless engagement

Enterprises are interconnected with the global, service-oriented economy, young business leaders from a vocal middle class and citizens hold governments accountable

Except for ...

Uneducated or under-resourced individuals who cannot conform to homogenous technical, legal and socio-economic standards

Informal – the new normal

Dynamic informalities cross societies, and ideas recombine within social networks built on interpersonal trust, triggering innovations adapted to relentless change

Except for ...

Those people unable to establish local grassroots relationships, who fail to build thriving businesses or wield social influence

Sincerely Africa

Communities reinterpret traditional knowledge systems, and sustainably manage biological resource riches in response to global instabilities and external pressures

Except for ...

Outsiders lacking community roots or shared identities, who lose the ability to participate socially, politically and economically

Challenges are ...	Uncertainties about ...
Building inclusive education systems, maintaining technological infrastructure, and regulating market competition **Measured by ...** Short-term return on investment, and outputs that capture efficiency, accountability, transparency and interoperability	How to narrow the digital divide, ensuring that better governance translates into inclusive development?
	How to design education systems that teach standard skills but also encourage experimentation and critical thinking?
	Is a "silicon savannah" simply modelled on geographic clusters in the developed world, or are African innovation hubs distinct?
	Can tensions between proprietary and open business models and associated policy frameworks be resolved in Africa's favour?
Transparently managing revenue and taxation, enforcing safety and security standards, and supporting intersectoral connections **Measured by ...** Social networks that promote both self-interest and collective opportunity, often invisible to those looking at output-related indicators	How to avoid dysfunction while managing the "organised chaos" that exploits instead of suppresses the informal sector's virtues?
	How to determine the level of government best suited to deliver essential public goods and services?
	Is there a digital or formalised equivalent to the face-to-face interpersonal networks of trust based on proximity?
	Can any intellectual property protections be enforced if informal strategies don't ensure fair competition?
Ensuring population health, food security and environmental sustainability in a no or low-growth economy **Measured by ...** Stewardship of valuable resources over time, considering whether an identified community can sustain a thriving self-contained unit	How to overcome historic or emerging racial, ethnic and religious differences for co-operation across communities?
	How to collectively manage shared environmental resources while avoiding a tragedy of the commons?
	Is it possible to successfully create or redefine new kinds of wealth in an economic era of low or no growth?
	Can commons-based systems stop outsiders from misappropriating genetic resources, cultural heritage and traditional knowledge?

Comparing scenarios

The three scenarios described in this document encapsulate many, but not all, of the issues facing Africa today. As there is no single Africa, there is no single shared future. So the key is to understand, or at least consider, several distinct, but equally plausible scenarios.

As you read these comparisons, remember, scenarios are stories about the future that help us make better decisions about the present. They challenge our implicit assumptions and beliefs to promote explicit strategic conversations about new ways of thinking. Turbulence is inevitable, and creates either threats or opportunities for those willing and able to anticipate and adapt – or not, as the case may be. Ideally, the scenarios will trigger a shift from a reactive approach to road mapping a path for a sustainable future.

THE SCENARIOS		
WIRELESS ENGAGEMENT	INFORMAL – THE NEW NORMAL	SINCERELY AFRICA
Countries in Africa have strong international roles, and African enterprise is interconnected with the global service-oriented economy. Savvy, young, educated and mobile business leaders are forming a new and vocal middle class. Engaged citizens are able to participate both politically and economically, so holding their governments accountable. Uneducated or under-resourced individuals are excluded by their inability to conform to homogenous technical, legal and socio-economic standards.	Dynamic informalities cross every aspect of African societies – economically, politically and socially. Increasingly diverse regions of the continent are constantly changing, impacting and impacted by the endless ways in which people pursue their livelihoods. Ideas constantly recombine within communities built upon interpersonal trust, triggering innovations adapted to this relentless change. *Who* you know matters more than *what* you know. Those people unable to establish local grassroots relationships will fail to build thriving businesses or social influence.	Global instabilities and external pressures allow Africans to focus inward, building strength by exploiting for themselves valuable endowments including a youthful population and natural resource riches. With scarcity threatening the rest of the world, African societies ensure sustainability by re-engaging and reinterpreting their traditional knowledge systems and socio-cultural institutions. Who you *are* matters most. Outsiders lacking community roots lose the ability to participate socially, politically and economically.

CONVERGING AND DIVERGING DRIVING FORCES

Our research has identified five major forces simultaneously driving Africa in multiple, uncertain directions. Driving forces will impact the perception of progress, the shape of innovation systems and the governance of knowledge. How these forces converge or diverge will determine which scenario will dominate the future in specific places at specific times. The five driving forces are:

Global relationships: the countless interconnections and interdependencies that span the globe to unite its people – or distance them.

Will these relationships be collaborative, competitive or coercive – and who benefits?

Statehood and governance: the role of the state in relation to citizens, balancing the innate tension between individual rights and freedoms and state power.

Will African governance be cohesive, challenging or communal – and to serve whose interests?

Photo: Jan Hoffmann

Identities and differences: the values that evolve in the face of social, political and economic changes taking place at global, local and personal levels.

Will multiplicity, fluidity or stability hold sway as African identities and values evolve?

Infrastructure and technology: disruptive enablers to leapfrog conventional structures, and methods to create new economic, social and political development and disrupt the status quo.

Will infrastructure and technology investment be inclusive, strained or reconceived?

Employment and livelihoods: the ability to create opportunities for a growing workforce, so providing the means to reduce poverty and create economic growth, social empowerment or even social cohesion.

Will African economies diversify, informalise or reconfigure to meet the needs of the increasingly youthful population?

In addition to these driving forces, there are several possible wild cards or shocks that would catapult Africa into a different future at present entirely unforeseen. These include violence, military action and terrorism; major clashes of civilisations or religions; epic natural disasters or climate changes beyond predicted extremes; or human, animal or agricultural pandemics.

RATIONALES

Every scenario is dominated by an implicit set of rationales, a logical basis for a course of action or a particular belief. This creates the lens through which the world is perceived, the definitions and milestones of success, and the metrics that are chosen to measure progress. What are the predominant paradigms underpinning each scenario?

MILESTONES AND METRICS		
WIRELESS ENGAGEMENT	INFORMAL – THE NEW NORMAL	SINCERELY AFRICA
The rationale of the interconnected market economy that underpins this world is based on efficiency and return on investment. Success depends on a combination of skill and opportunity, of which standardised education is the key determinant. The metrics that matter here focus on outputs and capture efficiency, accountability, transparency and interoperability.	A vibrant, informal economy depends on networks that simultaneously promote self-interest and community opportunity. Many successful actors are likely to be invisible to observers looking at output-related indicators, although some who scale their activities will gain profile. Surveys of the formal sector, national statistics and financial metrics under-represent the richness of informality.	This paradigm involves stewardship of valuable resources by intergenerational communities, linked by space, time and identity. Behaviours are co-ordinated, collectively monitored and enforced by social norms that implicitly acknowledge the long-term nature of systemic interactions. Prosperity will be measured over time, considering whether an identified community can sustain a thriving yet self-contained unit.

Climate change

What happens in relation to climate change? The following attitudes could prevail:

- *Wireless engagement*: Climate change is perceived as a great new market opportunity – those with money and ability stand to gain.
- *Informal the new normal*: Responses will depend on synergies between the formal and informal economy and the strength of informal network ties.
- *Sincerely Africa*: Without entrenched legacy costs and vested interests that hobble other continents, climate change is met with a new, sustainable road map.

TECHNOLOGICAL AND SOCIAL NORMS

Trust is both the glue that binds groups of people together and the lubricant that enables them to undertake collective action without transaction costs or a thicket of inflexible rules and regulations. It is built upon three interrelated components: efficiency, fairness and consistency. Without these components, coercion is required to get results.

TRUST		
WIRELESS ENGAGEMENT	**INFORMAL – THE NEW NORMAL**	**SINCERELY AFRICA**
In a rule-based wireless world, online verification provides access to those with the same skill sets and interests, so enabling the emerging middle class and civil society to create a strong government. Trust is impersonal and facilitated via digital intermediaries, most likely transnational corporations. There will be a strong drive for interoperability that comes with shared standards, and there is likely to be growing demand for open standards that are globally recognised. This creates an inclusive world, but only for a small minority with the potential, skills and networks of access. The relative size of this "insider" minority depends on the size of the middle, and the extent to which advancement is based on individual ability or achievement. What matters for society as a whole are relationships with the "outsiders", i.e. the mass of excluded and disengaged Africans.	In an informal world based on interpersonal relations, trust is socially and economically determined, "because I know someone you know". A handshake is the main method of contract, and for the many Africans who are illiterate or lack formal education, tacit and social norms work well. There is no middle, and the formal and informal are separate, yet interdependent, systems. They exist in parallel universes until some mutual benefit becomes apparent, at which point a pragmatic symbiotic relationship materialises. Trust is personal but also intra-group, not interspersed across society at large. Reputation matters a great deal, as competition is fierce within groups and between groups. The size of the community of trust is constantly evolving in this world, and among the greatest uncertainties is whether and how interpersonal networks may be affected by impersonal ICTs.	There are no standardised responses in this world, as it is based on local context; every case is unique and geographically and socially determined. There is no "right" way to do things, simply ways that work within a given context. Trust here is two-way based on independent and interdependent co-operative associations of individuals voluntarily committed to meeting shared economic, social and cultural needs and wants. They will have a set of values and norms determined collectively and in common for the benefit of the fair sharing of resources. Where the group is able, there will be strong sanctions against those that flout social norms. Group size will depend on its ability to maintain a strong boundary and protect its assets. Where the group is large it is likely to have a nested structure of rules within rules. Stigma and shame are likely to be used to enforce co-operative behaviour.

TENSIONS		
WIRELESS ENGAGEMENT	**INFORMAL THE NEW NORMAL**	**SINCERELY AFRICA**
In a world of wireless engagement, tensions exist between the silos of knowledge embedded in the hierarchical industrial-bureaucratic rule-based impersonal logic, and the faster, networked and interdependent knowledge-interactive modes of social production. The tensions are likely to be most marked along the interface between the individualised knowledge workers dealing with contextual specificity and the global, impersonal system, with stresses across dimensions of speed and geography. Multinationals may require interoperability to optimise global value chains. Knowledge-interactive entrepreneurs may find ample opportunities in global value chains, if they can interoperate with dominate technological, economic and legal standards.	With informality being normal, tensions are likely to be most marked along the interface between the formal rule-based bureaucracy and its fluid, informal counterpart. Stresses lie in the very nature of knowledge of value and its governance, and the polarised interdependent modes of production, each with its own tools, work roles, relationships and organisations. For the formal sector workers, employment provides certainty, rules are known and knowledge is generally universally applicable and stable. For their counterparts in the informal sector, there is no certainty of employment – everything is dynamic and constantly changing. Knowledge of value is immediate and tacit, based on individual intuition and hunches shared between the informal networks of trust.	Tensions may be less dramatic, as both craft-independent and knowledge-interactive modes of production are more individualised, sharing a learned logic based on experimentation and experience. This form of knowledge is likely to be anathema to the industrial-bureaucrat, as it emphasises a holistic independent approach, often unstructured and fluid, responding to external stimuli and valuing independence of thought, rather than a discrete rules-based universalised solution attempting to command and control the situation. Modes of knowledge distribution are self-organised and context specific, dependent on natural and human resources, the needs and organisation of the group, and the geographic scale in question.

WINNERS AND LOSERS IN EVERY SCENARIO		
WIRELESS ENGAGEMENT	**INFORMAL THE NEW NORMAL**	**SINCERELY AFRICA**
Transnational standard-setting corporations, supported locally by favourable business and education policies, dominate the globally interconnected marketplace. The winners in the world of wireless engagement are international investors, national policymakers, and local entrepreneurs with the skills and connections necessary to access opportunities that arise in this open, networked, digital world. The losers are those with insufficient education, skills or access to affordable technology to interconnect, or those whose skills become obsolete overnight.	Power lies with people operating beyond the effective reach of state control. Although urban settings reflect the most vibrant kaleidoscope of relationships, traders circulate goods as well as knowledge throughout rural communities and across borders. The winners are those who can use interpersonal networks to adapt to constantly shifting circumstances. They are relatively insulated from the instability of the formal economy around them. Those people who lack trusting interpersonal relationships, or who are ejected from a shrinking formal sector, lose opportunities.	Community-based social and economic systems, often with strong rural ties, are where most opportunities for sustainable development lie. Winners in this scenario have access to natural and social capital, and are able to impose boundaries to protect and control their resources. Outsiders lacking community ties are marginalised. The same fate befalls people in communities without resources, perhaps due to the after-effects of conflict, or those in temporarily successful enclaves who cannot protect their limited resources against exploitation by outsiders.

Gender dynamics

In the gender dynamic, both men and women are the poorer when gender and sexuality are rendered one-dimensional. For some, life itself is threatened.

As an issue for development and equality, there are three dimensions of gender imbalance, namely the ability to accumulate endowments such as education, health and physical assets; the ability to gain access to economic opportunities; and agency, the capacity to make personal choices. In general, women experience inequalities in all three dimensions. All too often, women lack formal education, so hampering their economic opportunities. In many countries, there are differences in terms of rights to land tenure, thereby reducing not only women's economic security but also their ability to access credit.[4] In Southern Africa, many countries have a high HIV/AIDS prevalence rate that increases mortality risks for adults, particularly for women who have less power over their reproductive rights, and in conflict areas the impacts on society also have a long reach into the future.

- *Wireless engagement*: Open development has the potential to minimise gender disparities by giving women virtual access, provided they have the qualifications and resources.
- *Informal the new normal*: Women could play an increasingly important role, in part because the requirements for formal education and the costs of participation are low.
- *Sincerely Africa*: Reclaiming traditional social mores could lead to relationships based on greater respect, or reinforce the notion that women belong in a subordinate role.

KNOWLEDGE PRODUCTION

Knowledge governance is intertwined with the social, economic, political and technological contexts shaping innovation systems, including dominant economic modes of production. Our historical contextual analysis reveals that for every period in Africa's history, there is a dominant approach to knowledge that forms the basis of innovation. How this knowledge is governed, owned and shared impacts progress within that period of time. Conflicting and co-existing modes of knowledge production can be divided along three general themes:[1]

Craft-independent: Historically, craft production required the use of physical tools, apprenticeship training, and guild or association membership. While the tools may have changed, many modern industries and professions retain the model of knowledge production and transfer through practical skills training and interpersonal relationships.

Industrial-bureaucratic: Scale and efficiency in many contexts depend on hierarchical relationships and standardised individual outputs. Workers must follow rules in formatted roles, so productivity can be categorised, defined and measured. Valuable knowledge is discrete, replicable and homogenous, because interoperability is paramount.

Knowledge-interactive: Information and communications technologies have created a new mode of production, based on constant revision, reinterpretation and reinvention. ICTs facilitate continuous learning, and enable groups previously atomised to interact across disciplines and functions, simultaneously interacting, collaborating and co-creating with stakeholders to innovate and improve. Valuable knowledge is likely to be time- and context-bound.

In each of the Open A.I.R. scenarios, there are predominantly two modes of production competing for dominance, each characterised by different and conflicting tools, work roles, relationships and organisations. This competition will usually be very fierce, as each mode of production is linked to different interest groups, each with their own ethos and a firm belief in their way as being the only *modus operandi*.

However, what is of particular importance for this document is that each mode of production will have different attitudes to what knowledge has value and therefore also the issues of openness, development and intellectual property.

MODE OF PRODUCTION		
WIRELESS ENGAGEMENT	INFORMAL – THE NEW NORMAL	SINCERELY AFRICA
Industrial-bureaucratic and Knowledge-interactive	Industrial-bureaucratic and Craft-independent	Craft-independent and Knowledge-interactive

Photos: Eric Miller

Photos: Eric Miller

KNOWLEDGE GOVERNANCE

As we reflected on knowledge governance in each of our scenarios, we identified four dimensions to consider. The Knowledge Appropriation Matrix diagram illuminates the conception.

The first dynamic is the specificity of knowledge. Some knowledge is context-specific, rooted to a particular place or subject, while other knowledge is generalisable and therefore more easily scalable.

A second lens is the object of knowledge: who, how, what, and why.

We can also examine the extent of legal formality, which can range anywhere from extremely informal to semi-formal to fully formal protection, the last of which is typically considered as intellectual property. Fourth and finally, there are variations between the more informal tacit knowledge on one hand, and formalised, codified knowledge on the other.

According to philosopher Baumann,[2] living in times of change, such as today, means that one of the most important skills is that of *forgetting* knowledge no longer relevant – the ability to delete rather than simply accumulate. Forgetting knowledge as an individual is hard enough; for societies with extensive sunk costs and vested interests of stakeholders, the challenge is of a different order. This trait might be one of the deciding factors for the future.

KNOWLEDGE OF VALUE		
WIRELESS ENGAGEMENT	INFORMAL THE NEW NORMAL	SINCERELY AFRICA
Here, valuable knowledge is *globally generalisable* and thus removed from its context. The emphasis is on knowledge which can be commoditised for commercial applications. *Codified* knowledge is valued over *tacit* knowledge, because the former is much easier to acquire or distribute online. There is growing *convergence* between local and imported knowledge. Digital learning resources are among the most valuable sources of codified acontexual knowledge. Without access to this knowledge it is not possible to participate in this world.	Valuable knowledge is related to *know-who* – highly contextualised, tacit knowledge. Know-what and know-why are of little use without crucial social networks and trusted relationships to exploit knowledge for social or economic gain. This knowledge is acquired by informal *learning* rather than formal *education*. Apprenticeships, or informal learning systems, are integral to the fabric of the informal sector and provide the primary avenue for gaining entry to that sector. Formal education does not equip graduates with appropriate skills, knowledge and attitudes.	The value of knowledge is judged by its ability to contribute to human social, economic and environmental sustainability. A key focus is on *slow variables*: long-term variations that are difficult to quantify and discern. Knowledge is context-specific, dependent on the physical and human resources available at a particular time and place, and also communal, serving the community from which it emerges. Intergenerational knowledge is woven together in novel ways, and combined with contributions of global knowledge from a diaspora that values Africa's endowments.

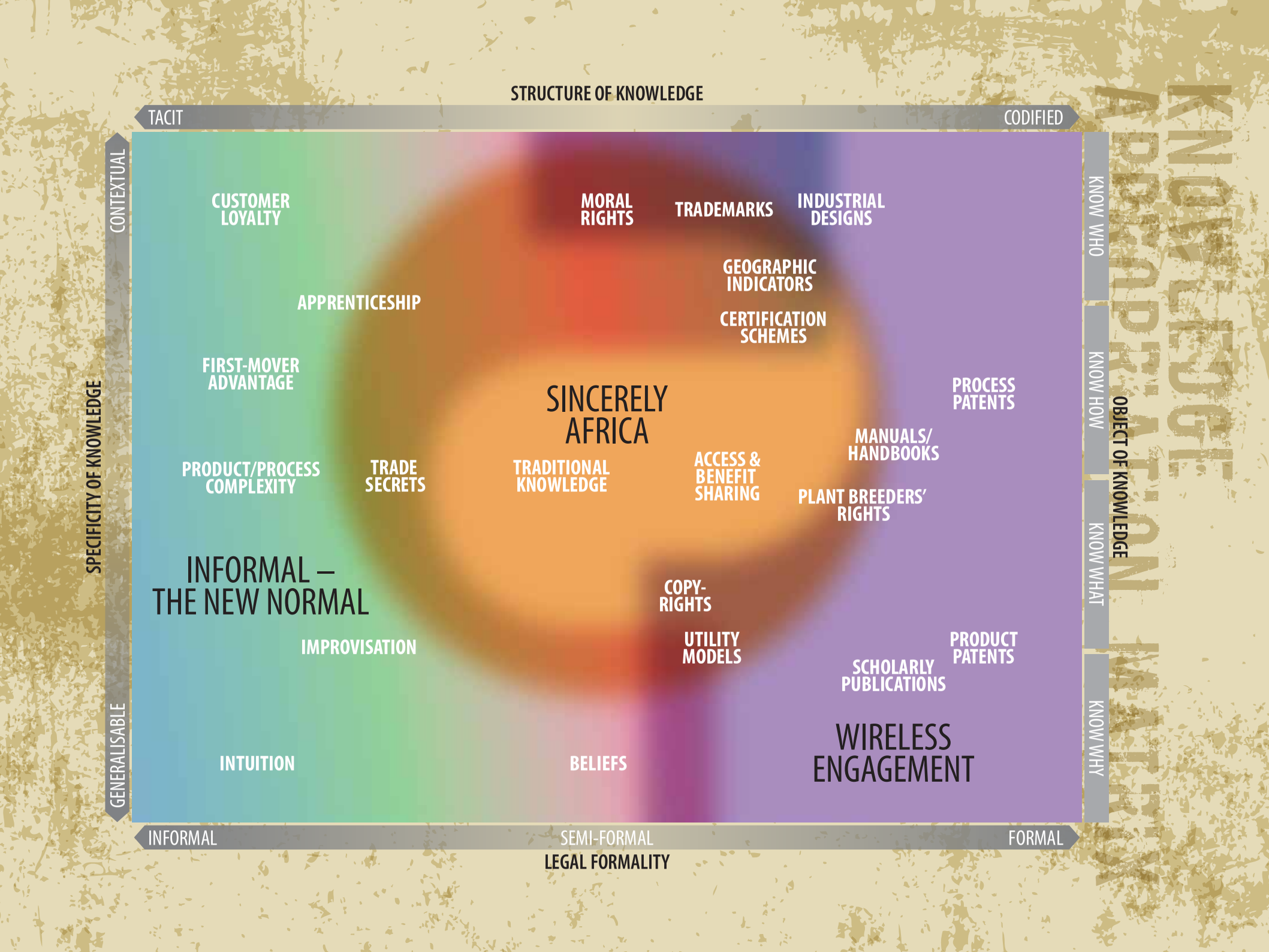

KNOWLEDGE APPROPRIATION MATRIX
STRUCTURE OF KNOWLEDGE
TACIT
CODIFIED
SPECIFICITY OF KNOWLEDGE
CONTEXTUAL
GENERALISABLE
OBJECT OF KNOWLEDGE
KNOW WHO
KNOW HOW
KNOW WHAT
KNOW WHY
LEGAL FORMALITY
INFORMAL
SEMI-FORMAL
FORMAL
CUSTOMER LOYALTY
MORAL RIGHTS
TRADEMARKS
INDUSTRIAL DESIGNS
GEOGRAPHIC INDICATORS
APPRENTICESHIP
CERTIFICATION SCHEMES
FIRST-MOVER ADVANTAGE
PROCESS PATENTS
SINCERELY AFRICA
MANUALS/ HANDBOOKS
PRODUCT/PROCESS COMPLEXITY
TRADE SECRETS
TRADITIONAL KNOWLEDGE
ACCESS & BENEFIT SHARING
PLANT BREEDERS' RIGHTS
INFORMAL – THE NEW NORMAL
COPY-RIGHTS
IMPROVISATION
UTILITY MODELS
PRODUCT PATENTS
SCHOLARLY PUBLICATIONS
INTUITION
BELIEFS
WIRELESS ENGAGEMENT

Photo: coloursinmylife/Shutterstock

Mining is so 19th Century, digging holes underground […] The real gold is walking in the streets of Johannesburg. How do you tap into the human capital? How do you unleash it? How do you define the curriculum, the syllabus for them and our future circumstances?

Ravi Naidoo, Founder and Managing Director of Design Indaba in South Africa (Open A.I.R. interview)

SO WHAT?

We cannot overemphasise that there is no single Africa and no single future. Let alone countries, even individuals and firms in the same geographic space may find their particular future different to that of their neighbours. Our analysis showed that conceptions of development, progress and knowledge are all rooted in a particular context.

REFLECTIONS

This project has surveyed Africa's long history. Stretching back over several millennia, Africa has seen humankind both at it's most glorious and abject; it has seen civilizations, empires and kingdoms come and go; it has witnessed disruptions time and time again. Africa's past has been formed by countless different contexts – experiences that have undoubtedly shaped the continent and its people.

Our analysis also showed that conceptions of development, progress and knowledge are all rooted in a particular context. The world is changing, and the signals are evident. In rapidly changing contexts, Africa's innate adaptability to respond to hardships may paradoxically position it with competitive advantage.

Innovation is one of the most fundamental processes underpinning economic growth and it is also the basis for finding new solutions to key economic, social and environmental problems for the future. For most African countries, it is important to examine local capacity and capabilities as well as past causes of underdevelopment before accepting well-meaning, but potentially obsolete, advice in a race to find new socio-economic policies and incentives to support innovation.

POINTERS FOR ACTION

> *"One cannot be prepared for something while secretly believing it will not happen.*[3]
>
> Nelson Mandela, South Africa's first democratically elected President

Today's decisions create tomorrow's future. So what might government policymakers, business leaders, scholarly researchers, civil society advocates or other innovation system stakeholders *do* in response to indications that one or another of these scenarios is becoming their reality?

The first insight is to be attuned to the faint signals of change that might previously have passed by unnoticed. Armed with awareness of the key drivers of change identified in this document – those factors that will inevitably push or pull the African continent simultaneously in different directions – readers are likely to find themselves noticing patterns that weren't apparent before.

COMPLEX COMBINATIONS – AND POTENTIAL

But what if the reality is a combination of these three scenarios, as so often is the case? The challenge will then be a policymaking environment that combines awareness and adaptability. There will have to be acceptance that in turbulent environments or times of disruptive change, the rules need to be regularly assessed and potentially recalibrated in order to find an acceptable balance that reflects the optimal outcome for the greatest number of stakeholders.

The scenarios set out in this document take an Africa-wide focus, a useful starting point for more focused scenarios dealing with more specific issues or regions at hand. Armed with foresight, it is easier to detect and respond to the key uncertainties and faint signals of change that the future might present.

The purpose of this set of Open A.I.R. scenarios is to provide a useful framework that enables readers to examine their assumptions about the future and to explore how the forces of change, both inside and outside Africa, might be harnessed to move Africa towards a brighter future. Our hope is that these scenarios, together with the research underpinning them, stimulate wider thinking about African innovation and creativity and that they enable policymakers and those interested to articulate a collective vision of innovation and creativity in Africa that is sustainably vibrant, properly valued, democratically participatory, collaboratively shared, widely accessible and justly distributed throughout society.

WIRELESS ENGAGEMENT

Witnessing signals of this scenario should lead stakeholders to worry about complex and controversial debates over the protection of codified knowledge through copyrights, patents and similarly formal legal mechanisms. One must understand the global knowledge governance systems embedded within international law and administered via institutions such as the WTO and WIPO. Tensions among those seeking maximum IP protection and others arguing for greater access to knowledge are unlikely to subside. Policymakers will be pressured by multinational firms to address persistent problems like patent thickets dragging down efficiency in the ICT sector. Meanwhile, business interests in creative industries like publishing, music and film, and online webcasting will push for increasing minimum standards of protection, online and off. Many people will resist this paradigm, cleverly making the best of the situation by adopting and promoting open-source licensing protocols if they are unable to change the system itself.

If this sounds like the *status quo*, it isn't. The key difference is that African nations will have learned and embraced the rules of the global knowledge game. Key countries will have shifted from IP importers to exporters, at least in certain industries – Nollywood is one plausible example – where promoting protection is or is perceived to be in their own domestic interests. Policymakers will need to appreciate that not everyone benefits equally in this world, and to mediate tensions among different interest groups. As the digital divide grows, governments that want to leave a positive legacy will have to find ways to ensure that formal IP systems, in particular copyright and patent policies, function for the whole of society, not just for those who know what they need to conform to the standard economic, legal and technological prerequisites for success.

INFORMAL – THE NEW NORMAL

In circumstances foreshadowing this world, stakeholders might seriously reconsider whether investing scarce resources into building countries' capacity to process multinational patent applications or adjudicate formal copyright disputes is worthwhile. Formal modes of IP protection will be mostly irrelevant to local actors in innovative, entrepreneurial communities and micro-enterprises. Even multinational businesses will need local know-how and networks of trusted partners to succeed. The legal strength of formal IP protection will be irrelevant for firms focused more on adapting quickly to dynamic and diverse local opportunities.

There will, however, be important roles for relatively less formal modes of protection to play. Trade secrets and confidentiality agreements are good examples. Whether these appropriation mechanisms are formally enforceable by contract law (doubtful) or bolstered by the risk of being ostracised for breaching community norms (likely), they are underpinned by trust. Also, because tacit knowledge becomes far more important than codified, social networks are key to any IP-related outreach and training that is relevant "on the ground".

Policymakers should spend what little time and money they might have on building IP structures that facilitate symbiotic interactions. Perhaps there is a place for protecting utility models and industrial designs, which are easier to obtain although no cheaper to enforce. Moral rights, such as the right to attribution and the protection of a work's "integrity", may also be valuable. Branding – trusted marks that certify the attributes of goods and services – will become increasingly important in this scenario. In particular, collective forms of protection, such as "fair trade" or "organic" certification schemes or geographic indications of origin, are probably most relevant.

SINCERELY AFRICA

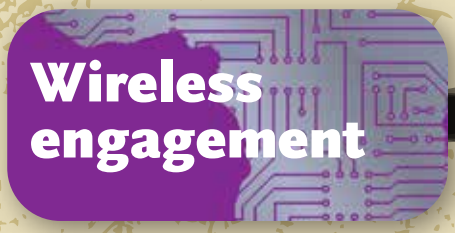
When signs of this reality appear, stakeholders should focus on the formalised rules that govern traditional knowledge. Success will depend on understanding and embracing ecological, spiritual, social and customary values. Legal frameworks, including IP frameworks, must reflect these values to be meaningful and legitimate.

International instruments like the Convention on Biological Diversity, and its Nagoya Protocol on Access and Benefit Sharing, will become profoundly important in this future. Local leaders will need to prioritise any potentially unfinished work on related issues of international protection for traditional cultural expressions and folklore.

Such formal instruments can help to prevent the misappropriation of traditional culture and knowledge by community outsiders seeking to exploit Africa's cultural and biologically rich heritage without fairly sharing the benefits.

At the national and community level, policymakers will need to engage with traditional leaders around policies and programmes that help to codify tacit knowledge. The point, however, will not be to commodify and commercialise traditional knowledge, but to validate and preserve it.

Digitisation projects that identify, catalogue and communicate traditional knowledge can be useful, both to enhance access to a repository of African cultural, genetic and ecological heritage, and to ensure that financial and non-financial benefits that may be realised are shared fairly throughout the societies responsible for stewarding this knowledge into the future.



Valuable knowledge

Wireless engagement

Potential for ...
Globally generalisable, codified, and commodifiable data in a digitally standardised, interconnected world

Depends on ...
What you know

Skills are ...
Technical, legal and managerial ability to plug into global electronic commerce

Obtained from ...
Formal education systems and self-teaching using online tools

Informal – the new normal

Potential for ...
Contextualised, tacit and contingent instincts in trusted relationships at the base of the pyramid

Depends on ...
Who you know

Skills are ...
Social and interpersonal skills to understand, anticipate and adapt to group dynamics

Obtained from ...
Apprenticeships, vocational training and learning-by-doing

Sincerely Africa

Potential for ...
Sustainable, resource-dependent and principled ideas serving communities with common interests

Depends on ...
Who you are

Skills are ...
Intergenerational awareness, ecological, spiritual and scientific skills to do more with less

Obtained from ...
Intergenerational lessons, spiritual beliefs and ecological sensitivity

Innovation systems

Based on ...
Products and services that leverage widely used technological platforms and tap into global markets

Driven by ...
Large or medium-sized transnational corporations.

Modelled on ...
Proprietary or open innovation in industrial research and development

Open if ...
You set dominant technological, economic and legal standards, or are sophisticated enough to comply

Based on ...
Improvisational, small-scale solutions adapting existing or foreign strategies to new or local problems

Driven by ...
Users, individual entrepreneurs and micro-enterprises

Modelled on ...
Grassroots and user innovation at the base of the pyramid

Open if ...
You have trusted social networks in close physical proximity and a reliable reputation

Based on ...
Holistic appreciation of long-term social, cultural, economic and ecological actions and reactions

Driven by ...
Ethnocentric partnerships and co-operative ventures

Modelled on ...
Gradual and sustainable innovation among well-established communities

Open if ...
You belong to a group sharing common cultural, spiritual, ethnic or other identities and values

Knowledge governance

Reference section

Appendix: A primer on innovation and intellectual property

Innovation has, in recent years, become a hot buzzword for government policymakers, industry lobbyists, civil society advocates and researchers in general. The term is used especially often in the context of intellectual property policy, with proponents of different viewpoints all arguing why certain measures will help or hinder innovators. Despite the hype, too few people appreciate the well-established scholarly research and extensive empirical work that has been done during the past three-quarters of a century around the concept of innovation, and its links to IP.

In order to support policymakers and researchers in confronting and solving complex problems concerning IP and innovation, this primer:[1]

- provides an overview of key terms and expert consensus on what innovation is, why it happens and how it is changing
- offers a basic explanation of how IPRs and innovation are related, without making assumptions or drawing conclusions about positive or negative causal effects
- identifies, summarises and synthesises the essential materials and most recent insights on innovation and IP, and sets out the basic concepts, consensus points and lingering uncertainties.

UNDERSTANDING THE CONCEPT OF INNOVATION

Definition: innovation

> *The implementation of a new or significantly improved product (good or service), or process, a new marketing method, or a new organisational method in business practices, workplace organisation or external relations.*
>
> Organisation for Economic Cooperation and Development[2]

The *Oslo Manual*, a joint publication of the Organisation for Economic Co-operation and Development (OECD) and Eurostat, provides the agreed definition for innovation and guidelines for researchers and statisticians collecting and interpreting data regarding indicators of technological innovation in countries around the world. An innovation can be a new technological product or service offering, production process, marketing method or organisational practice, as well as significantly improved products, processes, methods and practices. However, to qualify as an innovation, the new product or process must be implemented, not merely abstract. Implementation usually refers to market availability, i.e. commercialisation, but the market is understood broadly so that public sector as well as social innovations may be included.

A process innovation is not the same as an innovation process. An innovation process is the series of steps taken to research, develop and bring something new to market, i.e. *the process of innovating*. A process innovation is an innovation *in the process* of producing innovations.

VARYING DEGREES OF INNOVATIVENESS

There is a subtle, but important, distinction between innovation and innovativeness. Innovations are frequently classified into typologies according to degrees of innovativeness. The labels used

in classification schemes vary widely across empirical studies. An innovation may be "radical", "really new", "discontinuous", "breakthrough", "generational", "incremental", "evolutionary", "imitative" and so on. The most popular distinction is between incremental versus disruptive innovations, a dichotomy often attributed to Christensen.[3]

Various other studies may characterise these degrees of innovativeness according to whether an innovation disrupts a particular product or firm, or an entire industry or the world generally. The steam engine and the world wide web are examples of "highly radically" innovative products that caused discontinuity *in the world*. The Sony Walkman and Apple Computer, in contrast, created discontinuity *in an industry*. Some studies break down innovations according to market or technological factors. Some studies treat innovativeness as a spectrum; others are categorical.

At least one well-known review of the literature has revealed some common ground. Innovativeness commonly refers to the degree of potential discontinuity or paradigm shift between an innovation and previously implemented products or processes.[4] Notably, the taxonomy proposed in Garcia and Calantone's study is relative *to the firm* implementing the innovation, not to the innovation itself. So an innovation may be radical to one firm, but incremental to another. According to Garcia and Calantone:

> *"Incremental innovations" incorporate product improvements (features, benefits, price, manufacturing, process) into innovations using existing technologies, targeted towards existing markets. […] Really new products include new technologies to existing markets (product line extensions or new product lines) or existing technologies to new markets (also new product lines). […] On rare occasion, a radical innovation will […] result in discontinuities in both the existing market structure and the existing technology structure.*[5]

The direction of change is also important. Continuous innovations follow in sequence from the *status quo*; discontinuous innovations break patterns to move in significantly new directions.[6]

There is no normative hierarchy of preferable forms of innovation. Experts do not generally distinguish between kinds of innovation based on economic, social, moral or other kinds of value. Doing so would be empirically difficult and theoretically controversial.

DISTINGUISHING INVENTION FROM INNOVATION

The relationship between an "invention" and an "innovation" is a common point of confusion. These terms are often wrongly conflated, but they are not synonymous. The term "innovation" carries certain connotations in management, engineering and related disciplines, which lawyers and legal scholars may not appreciate.

In every country that is a member of the World Trade Organisation, and thus legally bound by the 1994 Agreement on Trade-Related Aspects of Intellectual Property Rights (TRIPS), a patentable invention is, by legal definition, new, applicable and inventive. A new invention means new to the whole world, unlike an innovation, which may be new merely to the firm, industry or country concerned. Applicable means capable of industrial application, but not necessarily applied, i.e. not necessarily used. An innovation, in contrast, exists only once a product or process is put into practice outside a laboratory. And to be inventive, at least in the context of patents, an invention must have been previously unobvious to experts in the field. No such qualification applies to an innovation. In sum, many inventions are not innovative, and many innovations are not inventive. Indeed, the gap between these concepts is much wider than often assumed.

INNOVATION FOR INDUSTRIAL AND ECONOMIC DEVELOPMENT

Dating back to the work of Adam Smith,[7] classical economists have tried to explain how competitive markets facilitate invention and innovation. Neoclassical economists, such as Alfred Marshall,[8] began in the 20th Century to posit links between innovation and local economic development. But innovation was not a subject of specialised study until Joseph Schumpeter[9] first suggested that abrupt and uneven adjustments in capitalist economies happen sporadically, displacing old equilibriums and creating radically new and more efficient socio-economic conditions through "creative destruction".

By the late 1950s and early 1960s, economists were suggesting that technological development is the stimulus that pushes countries along the path of modernisation.[10] A revolutionary growth model was presented, which focused on the role of technological development to explain economic growth that could not be accounted for by capital accumulation or labour productivity.[11] Such ideas informed economic development policy for decades following.[12] Modernisation theories informed by insights from sociology,[13] psychology[14] and political science[15] helped to explain connections between industrialisation, innovation, economic growth and positive socio-cultural change.

It is now well accepted that innovation is a desirable public policy objective. Indeed, by the 1970s, researchers were relatively less interested in what innovation does than in how it happens.

INNOVATION SYSTEMS APPROACHES

Neoclassical economists' preoccupation with profit maximisation and market equilibrium overlooked the uncertainties of innovation and the variety of institutions that support innovation across sectors. Accordingly, Nelson and Winter[16] developed an evolutionary theory

of innovation modelled on biology. Other key scholars broadened the field of evolutionary economics later in the 1980s by explaining the importance of national systems of innovation.[17] The most recent edition of the *Oslo Manual* explains systems approaches to innovation as follows:

> *Systems approaches to innovation shift the focus of policy towards an emphasis on the interplay of institutions and the interactive processes at work in the creation of knowledge and in its diffusion and application. The term "national innovation system" has been coined to represent this set of institutions and these knowledge flows.*[18]

INNOVATION FOR INTERNATIONAL DEVELOPMENT

Early thinking about innovation in the context of development was oriented around industrialisation and economic growth. As our understanding of development has become more sophisticated, however, so has thinking about how innovation evolved. Work by Nobel prize-winning economist Amartya Sen[19] and renowned philosopher Martha Nussbaum[20] has been especially influential in reframing the objectives of development and, toward that end, innovation policy. Economic growth is no longer viewed as the sole or dominant goal of development, but rather as a means to the end of facilitating human freedom[21] and creating human capabilities.[22] Innovation is instrumental in promoting freedom and capabilities.

Consequently, literature that links innovation to development has become more nuanced, with many experts studying distinct features of innovation systems in less developed countries. In this context, innovation scholars highlight the importance of nurturing indigenous knowledge and capabilities rather than relying on technology transfer.[23] Those working on IP and global knowledge governance have, independently, reached similar conclusions about indigenous peoples' innovation and development.[24]

There is no doubt that promoting innovation is a high priority for policymakers seeking solutions to global development challenges.[25] One significant challenge, however, is measuring innovation in developing countries, particularly in informal economic sectors.[26] Another is ensuring that innovation benefits not just elites, but all segments of society, through the emerging concept of "inclusive innovation".[27]

OPEN, USER AND OTHER EMERGING INNOVATION PARADIGMS

The notion of inclusive innovation for development is linked to parallel evolutions in innovation systems thinking more generally. Among the most popular labels coined in the past decade is "open innovation", which according to Chesbrough is "a paradigm that assumes that firms can and should use external ideas as well as internal ideas, and internal and external paths to market, as the firms look to advance their technology".[28] Several recent literature reviews show how openness has entered the mainstream innovation discourse.[29]

"User innovation" is another emerging paradigm, popularised through Eric von Hippel's *Democratizing Innovation*.[30] While open innovation starts from the perspective of firms supplying innovation, user innovation tends to highlight the nature and motives of end-users or intermediaries involved in innovation processes. This parallels cutting-edge thinking about the dynamics of "peer production" in the transformation from a hierarchical industrial economy to a networked information economy.[31] Benkler, Chesbrough and Von Hippel's work also connects to mainstream literature on "crowdsourcing".[32]

Open and user innovation are not synonymous with each other or with inclusive innovation. Inclusive innovation may be more closely connected with the concept of "grassroots" innovation, also referred to as innovation "for the poor, by the poor" or "base of the pyramid" innovation.[33] The latter terms connote research and policymaking concerned not only with why and how innovation happens, but also with its socio-economic and human impacts.

RELEVANT FORMS OF INTELLECTUAL PROPERTY

Patents are the IPRs most often discussed in the context of innovation, but they are not the only relevant form of legal protection. There are two broad categories and many more subcategories of formal IPRs, namely (i) copyright and related rights and (ii) industrial property. Industrial property includes trade secrets, patents, trademarks, geographical indications and designs.

What is copyright?

Copyright protects a whole range of works, which are the expression of ideas such as literary works, artistic works and dramatic works. It gives its holder (the owner, who is often not the author) the right to exclude others from exploiting the protected work commercially through copying, adapting, distributing and other means. It also gives the author of the work the "moral rights" to be identified as the author of the work and the right to object to the distortion of the work.

Copyright is regulated by legislation in each country. It is extended automatically, without registration, to certain works if they are original and recorded in a permanent form (such as writing, a picture or an audio clip). In addition, to benefit from automatic protection in most foreign countries, the work must have been created by a person who is a citizen or resident of a country that is party to the Berne Convention, the key international treaty governing cross-border copyright issues since 1886.

What is a trademark?

Trademarks protect marks that distinguish a person's or a business's goods and services from those of others. Examples of registrable marks include made-up words

such as "Kodak", existing words used in unconventional ways, such as "Blackberry" for smartphones, and logos consisting of shapes and colours, such as the three stripes used by Adidas.

An application has to be made for a trademark registration, and marks that are not distinctive or that are deceptively similar to other marks will not be registered. An application to register a mark from someone who is not legitimately entitled to the mark will also be rejected. In some countries, protection is provided for unregistered or common law trademarks through the law of unlawful competition.

Geographic indications can be understood as a particular kind of trademark. They are brands that capture and convey the value of products or processes associated with specific geographic regions, such as Darjeeling tea. Similarly, certification marks protect products or processes that comply with particular quality assurance standards, such as Certified Organic or Fair Trade.

What is a patent?

Patents are regulated by legislation in each country. They protect inventions, which could be products or processes. Patents are granted by individual states for inventions that are new, have inventive step (are not obvious to a person with knowledge of the field) and have industrial applicability. Unlike copyright, a formal application has to be made for a patent. This application must fully detail or disclose the invention for which the patent is being sought. Some countries then examine the patent application to ascertain whether the invention is new, has inventive step and is industrially applicable. Other countries do not examine patents and simply register them. This approach is known as the registration or depository patent system.

Patents are supposed to encourage the full disclosure of technical information about an invention to the public, so that when protection expires after twenty years, the public may know precisely how to make and use it. Trade secrets (not to be confused with trade*marks*), on the other hand, are the opposite: they protect firms that choose *not* to disclose information to the public. Competition laws or other regulations may prohibit firms from accessing or using competitors' confidential data or other information, while contract laws establish rules for non-disclosure agreements.

Some countries offer a shorter duration of protection for "utility models", which typically have less stringent application requirements better suited for minor or incremental innovations.

Informal appropriation mechanisms

Informal modes of appropriation, like trade secrecy, confidentiality agreements, first-mover advantage and technological complexity play crucial roles in innovation systems. In some circumstances, these appropriation mechanisms are based on statutes or legal precedents, and establish rights that are enforceable in courts. More often, however, these mechanisms reflect commercial realities or conventional practices. For example, products and processes that depend on know-how, instead of know-what, are in reality difficult to reverse engineer, which itself provides a measure of exclusivity to the innovator. Similarly, formal IPRs cannot effectively protect tacit rather than codified knowledge, so "who you know" matters more than "what you know".

In many regions of Africa and the rest of the world, and in particular sectors and industries, conventional business practices and social norms, and the risk of being ostracised by customers, suppliers or other important connections, are more powerful appropriation mechanisms than formal IPRs ever could be. Traditional ecological, agricultural or medicinal knowledge related to genetic resources, and traditional expressions of folklore or cultural heritage, are likewise enforced more by social and spiritual norms than by legal norms. A growing number of countries, however, are implementing legislative reforms to implement international frameworks for protection.

THE ROLES OF INTELLECTUAL PROPERTY RIGHTS IN INNOVATION SYSTEMS

The relationships between IP and innovation are complex, variable and dynamic. But, in general, IP can sometimes be (i) an indicator of innovation, (ii) an incentive for innovation, and/or (iii) an impediment to innovation.

Intellectual property as an indicator

Researchers use many different metrics to measure innovation, including IP statistics. In this context, patent statistics dominate, partly because they are among the most readily available data, and partly because of the orthodox (but incorrect) view that they are the form of protection most relevant or important for innovation. By far the most widely cited measure of patent protection in cross-country economic analyses of IP is the Ginarte-Park (GP) index, introduced in an article by Juan Ginarte and Walter Park[34] and updated in Park's subsequent work.[35] It measures select aspects of the strength of countries' patent legislation in five-year intervals between 1960 and 2005. Similar indexes were developed to measure copyright and trademark protection.[36] These indexes, though incomplete, are used for modelling relationships between IP and innovation, R&D, GDP, technology transfer and other variables.

Intellectual property indicators are not only a tool for econometric analyses but also influential in various organisations' rankings of innovation performance, by country and by firm. The two most notable indexes are the Global Innovation Index (GII), jointly produced by Cornell University, INSEAD and the World Intellectual Property Organization,[37] and the innovation sub-index of the Global Competitiveness Report, produced by the World Economic Forum.[38] Such indices consider IPRs, specifically certain kinds of patents

and trademarks, as outputs of the process of innovation. These are weighted with other outputs, such as scientific publications, as well as inputs, like R&D expenditures, to create a consolidated measure of countries' innovative activity.

Intellectual property as an incentive

As a matter of public policy, the exclusive rights protected by IP are predominantly justified as an incentive to invest in innovation through research, development and commercialisation of new products and processes. The basic economic theory, well explained by experts such as Greenhalgh and Rogers,[39] Landes and Posner,[40] and Scotchmer,[41] is that without the guarantee of exclusivity that IP provides, the world would have less creativity and fewer inventions. Because knowledge and ideas are intangible, one person cannot physically exclude another from the possession of ideas, as one could with land or goods. Intellectual property rights create artificial scarcity through laws establishing the temporal, geographic and substantive boundaries of exclusivity. The promise of even temporary market exclusivity should motivate firms to invest in the inherently uncertain activity of innovation.

Empirical evidence proving this theory in practice, however, is scarce. Maskus[42] offers among the most recent and authoritative reviews of econometric analyses of IP's impact on innovation and/or technology transfer. "[T]here are no clear and universal relationships," he explains, "between policy reforms to strengthen IPRs and subsequent innovation or R&D investments."[43] While IP can and does stimulate activity in advanced markets, especially by multinational firms, patent law reforms have little if any impact on domestic innovation in poor countries. Also, even in developed countries, almost every economic study Maskus reviews fails to resolve the reverse causality problem: patent reforms could increase R&D and innovation, or innovative countries might simply introduce more patent reforms. All we really know is that stronger patent laws are likely to lead to more patents.

Evidence also suggests that IP is more important to large firms in industries such as pharmaceuticals and semiconductors. In the semiconductor industry, large firms use IPRs more to cross-license portfolios and defensively preserve freedom to operate than to incentivise or recoup R&D investments, while smaller firms use IP mainly to signal commercialisation potential to venture capitalists.[44] A recent global statistical and economic policy analysis by the World Intellectual Property Organisation[45] explains how economists have refined their view of IP systems, especially the patent system, to pay greater attention to cumulative innovation and collaboration as opposed to market exclusivity.

In theory, IP protection also leads to technology transfer by reducing the threat of imitation in other countries, increasing the availability of technical information, and facilitating cross-border licensing transactions. Studies reviewed by Maskus[46] show that patent reforms have positive effects on inward technology transfer, attract foreign patents and expand the activities of multinationals through local sales, investment, R&D and licensing. These effects, however, are generally only found in large and middle-income countries, not the smallest and poorest countries. Moreover, Maskus cautions, these international activities may threaten local firms or undermine learning from abroad through non-market channels, meaning that international technology may not increase overall welfare.[47] In general, however,

> *available economic evidence supports the claim that transparent and enforced IPRs facilitate international transactions in technology, at least among emerging-market countries. In turn, this enhanced access to global information materially contributes to domestic structural transformation and industrial growth in countries with conducive complementary economic and regulatory conditions.*[48]

Experts outside the discipline of economics agree with Maskus that IP reforms such as TRIPs are doing the job they were designed to do. But some scholars from political science, international relations and law see that job differently to many economists. This group of experts explains how radical changes in the global governance of IP, although ostensibly about trade and economics, were really designed to – and did – fundamentally alter geopolitical power dynamics in anticipation of controlling the future of the knowledge society.[49] Dominant narratives of IP incentives are incomplete without recognising these important political economic perspectives.

Intellectual property as an impediment

Knowledge is not only non-excludable without legal intervention; it is also non-rivalrous, meaning multiple people can hold the same idea simultaneously without damaging or "using up" the knowledge itself. Indeed, the value of knowledge often increases through network effects: the more people that share an idea, the more valuable it becomes. This fact leads to the insight that exclusive IPRs can sometimes frustrate rather than facilitate innovation. Too much IP protection can be a problem, especially for sequential innovations that build upon earlier technologies,[50] and especially if rights are fragmented among multiple owners.[51]

Issues include market hold-ups, where one owner of an essential technology is unwilling to license it to others, and transaction costs, which increase the more complex the IP landscape becomes. The resulting gridlock has been called a "tragedy of the anti-commons" by the theory's leading proponent,[52] mirroring seminal work on the "tragedy of the commons" that posits private property as a solution to underinvestment in public goods.[53] Later, Shapiro[54] coined

the term "thickets" to describe the phenomenon of overlapping IPRs that may impede, not induce, innovation.

Clear and universal econometric evidence of the thicket theory operating in practice is, however, not widely available. Brownwyn Hall and her co-authors[55] usefully summarise the limited empirical evidence regarding thickets and R&D investments. Existing studies do show that thicket exists in specific technology areas, and patent density is associated with reduced entry into those areas.

THE COMMONS

The "commons" is another way of governing knowledge.

> *[T]he analysis of knowledge as a commons has its roots in the broad, interdisciplinary study of shared natural resources, such as water resources, forests, fisheries, and wildlife. Commons is a general term that refers to a resource shared by a group of people. In a commons, the resource can be small and serve a tiny group (the family refrigerator), it can be community-level (sidewalks, playgrounds, libraries, and so on), or it can extend to international and global levels (deep seas, the atmosphere, the Internet, and scientific knowledge). The commons can be well bounded (a community park or library); transboundary (the Danube River, migrating wildlife, the Internet); or without clear boundaries (knowledge, the ozone layer).*[56]

Sometimes, a false dichotomy is constructed between commons systems and the private marketplace. In reality, many kinds of "commons" systems depend on property rights to function properly. The Creative Commons system of copyright licensing is a good example. This system enables certain kinds of sharing by licensing protected works for the use of other people who are willing to accept the copyright owners' conditions. "Open source" approaches to software licensing, and patents that are put into a "pool" together for common use and exploitation by a group of firms, are also examples of systems that are common to group insiders but private to group outsiders.

Furthermore, solid commons systems support the private marketplace through contributing to economic opportunity, as well as a healthy and educated population. In the 1960s, Garrett Hardin argued that the lack of individual ownership and inability to restrict usage in the commons would eventually lead to overuse and depletion of commons-pool resources, resulting in irreversible environmental degradation. Subsequently, however, experts in the field refuted his claim. Most notably, Nobel-prize winner Elinor Ostrom's work on the topic demonstrated that if done correctly, a self-governed system of organising and sustainably managing commons resources could sufficiently protect these resources from overuse and degradation, and thus safeguard their long-term use.[57] A comparison between tangible and intangible resources reveals, moreover, that these resources are configured quite differently, as knowledge is non-rivalrous and its value is enhanced by network effects.

Nevertheless, it is in the public interest to have workable governance approaches for sustainable commons systems for both tangible and intangible goods. But while the focus in relation to tangible goods is on avoiding overuse and destruction, it appears that from a public policy perspective the key risk for commons systems comprising of intangible goods currently is the privatisation or overprotection of knowledge by means of IP laws. Grassroots initiatives have found ways to safeguard free access to knowledge material, for example by using open licences, but more work is required to tackle the issue holistically, and to adapt Hess and Ostrom's work on management of tangible resources to the management of intangible commons resources.

Photos taken during launch of Open A.I.R. scenarios at the *Open A.I.R. Conference on Innovation and IP in Africa* (9-11 December 2014)

Appendix: Building and using the Open A.I.R. scenarios

Open A.I.R. scenarios try to make sense of uncharted territory and, though incomplete, they have the potential to help navigate our way into an uncertain future.

The success of any system, nation, organisation or community depends as much on the decisions it makes today about tomorrow as it does on the resources it has available to it. In an uncertain world there is little point in trying to predict the future. What matters is finding a framework for thinking about possible futures and their implications.

WHAT ARE SCENARIOS?

Scenarios are maps of the future and, like any maps, they link the world, our existing knowledge, to new terrain – new experiences, ideas and thought processes. Scenarios describe a particular context and record a specific way of perceiving how the future might unfold.[1] When the context and the landscape change, so too must the map. However, mapmaking takes time and, when the environment is turbulent or rapidly changing, time is a commodity in short supply.

Scenarios are useful when the context of an organisation or system is rapidly changing, or when the issues are complex or uncertain. Perhaps the data cannot be quantified or analysed, or there are conflicting perceptions and opinions on a subject. Instead of analysing individual, isolated components and issues, scenarios look at the system as a whole, seeking to understand interconnectedness, complexity and whole systems in relationship with one another. The whole is greater than the sum of the parts.

Scenarios fill a void by creating a series of imaginary "memories of the future". They don't make predictions, but rather create mental scaffolding[2] to link existing constructions – our current mental models – to new ones, in this case three possible futures. In this way, they extend our range of thought. Like scaffolding, they are temporary and easily dismantled and re-erected when necessary. They are not preferences about the world we want, but plausible and challenging stories of how the future might unfold in ways over which we may have little or no control.

Scenarios work as a set. Their insights come as much from comparing and contrasting them as from exploring the implications of each in depth. Collectively, they provide a framework for examining the system as a whole and highlighting the key driving forces that are likely to influence the evolution of the patent and IP system, irrespective of which future unfolds. With these maps, policymakers, communities and indeed anyone with an interest in how the future might unfold can take steps to rehearse the future and explore how these three diverse worlds might impact upon their actions or policies.

USING SCENARIOS

Scenario planning is simply the beginning of a process. Scenarios are a flexible, adaptable tool with as many uses as imagination allows. These uses will depend on the requirements of the users and the context that they are exploring. Like any other tool, without use they are simply a waste of resources. Foresight is expensive, but hindsight much more so. With a small investment of time, as well as the courage to ask awkward questions such as "what if?", the user can avoid "if only" – those unintended consequences that often come in the wake of decisions and actions.

The power of scenarios lies is the shared language they impart, which allows differences to be explored as an asset instead of a liability. They can be used to create and offer information and insights, as a strategic tool, and can be communicated as a shared language for exploring multiple possible futures. It is up to the user community – participants, stakeholders, decision-makers, businesspeople, planners, strategists and interested parties – to put them to use.

Using scenarios is usually a collaborative process, as the power of scenarios lies in forming the common ground, finding shared values, exploring diversity and turning differences into a source of strength. This usually takes place in workshops and seminars, but it is not essential.

	WIRELESS ENGAGEMENT	INFORMAL THE NEW NORMAL	SINCERELY AFRICA
IP civil society	*Economic and legal policy advocacy*: Competing with industry to lobby for policies in the public interest.	*Trusted broker*: Industrial liaison broker and trusted intermediary that can help to moderate debate.	*Humanitarian protectionist*: Advocates for different policies, with emphasis on protecting and policing the commons.
Transnational corporations	*Rule makers and standard setters*: Success comes from creating standards and leveraging global advantages of scale. High investment in research and development.	*Sleeping partners*: Success comes from operating through local partners. High marginal and transaction costs mean less investment in research, development and innovation.	*Operating by proxy*: Growing focus on shared values creates more respectful relationships with communities, or dealings by proxy through tax havens and third parties.

The roles of both IP civil society and transnational corporations are likely to change

Here are some ways that they could be useful:

- Dialogue: Talking and exploring differences allows stakeholders with diverse perspectives and interests to find common ground. The aim is not to find a single answer, but to have strategic conversations that open possibilities and enable participants to acknowledge different worldviews and perspectives. The process increases fairness, if not in the outcomes, then at least in the procedure, as all are given a voice.[3]
- "What if?" is much cheaper than "if only". Using scenarios allows strategists and policymakers to anticipate events and prevent mistakes and their consequences. At national, regional or local level, try to find ways to link scenarios into existing decision-making processes so that they can help inform vision and strategy.
- Another scenario? A useful conversation is whether there might be a missing scenario, a world that is currently not on the radar of policymaking.
- In turbulent environments, it is essential to continually scan the horizon and assess how the situation is changing. Determine the early warning signals of an unfolding scenario and update your thinking accordingly.
- Who else? Future success in changing environments requires co-operation and collaboration. Start a strategic conversation and determine who else to involve, who else you need to co-create the future.
- What happens to…? Stakeholders are likely to react differently in the different scenarios. Their priorities and interests are unlikely to stay the same. In an exercise we undertook, we found that the roles of both civil society and transnational corporations were likely to change. (See table above.)

Photos taken in the scenario rooms during launch of Open A.I.R. scenarios at the *Open A.I.R. Conference on Innovation and IP in Africa* (9-11 December 2014)

Endnotes

A KALEIDOSCOPE OF AFRICA

1 United Nations, 2011. World population prospects: the 2010 revision. New York: UN Department of Economic and Social Affairs, Population Division.
2 There are six major language families globally, four of which are in Africa, a greater diversity than anywhere else. There are 2,146 living languages in Africa, 30% of the world's linguistic total, yet 12.7% of the world's speakers. See www.ethnologue.com/world [Accessed on 1 November 2013].
3 Data for 2009: IBRD/WB, 2011. World Bank Africa development indicators 2011. Washington DC: International Bank for Reconstruction and Development/ The World Bank.
4 Data for 2009: IBRD/WB, 2011. World Bank Africa development indicators 2011.
5 IBRD/WB, 2011. World Bank Africa development indicators 2011.
6 15 years and older, 2009.
7 Data for 2005: 30 million Africans – about 3% of the population – have migrated across borders and out of the continent. World Bank, 2011. Leveraging migration for Africa: remittances, skills, and investments. Washington DC: The International Bank for Reconstruction and Development/The World Bank. Using data from IBRD/WB, 2011. World Bank Africa development indicators 2011.
8 Data for 2009: IBRD/WB, 2011. World Bank Africa development indicators 2011.
9 Of the 49 countries classified globally as least developed countries, 34 are in Africa. These are low-income countries that are also vulnerable economically and in terms of human resources. See www.unohrlls.org/ [Accessed on 1 November 2013].
10 IBRD/WB, 2011. World Bank Africa development indicators 2011.
11 Data for 2009: IBRD/WB, 2011. World Bank Africa development indicators 2011.
12 Data for 2009: from Table 2.1 in World Bank, 2011. Leveraging migration for Africa.
13 Data for 2009: IBRD/WB, 2011. World Bank Africa development indicators 2011.
14 Data for 2008: IBRD/WB, 2011. World Bank Africa development indicators 2011.
15 Corruption Perceptions Index 2012, ranking countries based on how corrupt their public sector is perceived to be. A country or territory is scored on a scale of 0–100, where 0 means that a country is perceived as highly corrupt and 100 means it is perceived as very "clean". See www.transparency.org/cpi2012/results [Accessed on 1 November 2013].
16 Yale's Environmental Performance Index 2012. Switzerland scores highest with 77, Iraq lowest with 25 (rounded). Available at: epi.yale.edu/epi2012/rankings [Accessed on 31 October 2013].
17 By "sustainable access" is meant reasonable access to an adequate amount of water from an improved source, such as a household connection, public standpipe, borehole, protected well or spring, or rainwater collection. Reasonable access is defined as the availability of at least 20 litres a person a day from a source within one kilometre of the user's dwelling. A similar situation applies for sanitation.
18 ITU, 2013. ICT facts and figures: the world in 2013. Geneva: International Telecommunication Union. There are currently 93 million subscriptions in Africa, a figure that is rapidly growing. Mobile phone subscribers were 2% of the population in 2010, but this figure had jumped to 11% by 2013.
19 IBRD/WB, 2011. World Bank Africa development indicators 2011.
20 IBRD/WB, 2011. World Bank Africa development indicators 2011.

WHAT ARE THE QUESTIONS?

1 Landes, D., 1998. *The wealth and poverty of nations*. London: Little, Brown and Company; Easterly, W., 2001. *The elusive quest of growth: economists' adventures and misadventures in the tropics*. Cambridge, Mass.: MIT Press; Seligson, M.A. and Passe-Smith, J.T. eds., 2003. *Development and underdevelopment: the political economy of global inequity*. 3rd ed. Boulder, Co.: Lynne Rienner Publishers; Todaro, M.P. and Smith, S.C., 2009. *Economic development*. 10th ed. Harlow, England: Addison-Wesley.
2 UN General Assembly, 1986. *41/128. Declaration on the right to development*. 97th plenary meeting, 4 December. Available at: www.un.org/documents/ga/res/41/a41r128.htm [Accessed on 26 October 2013].
3 Pronk, J., 2011. The quest for sustainability: some reflections. *Development*, 54(2), pp.155-160.
4 The World Bank, 2012. *Poverty and equity: Sub-Saharan Africa*. Available at: povertydata.worldbank.org/poverty/region/SSA [Accessed on 26 October 2013].
5 Castells, M., 2004. Informationalism, networks, and

the network society: a theoretical blueprint. In: M. Castells, ed. *The network society: a cross-cultural perspective*. Northampton, MA: Edward Elgar.
6 De Soto, H., 2000. *The mystery of capital: why capitalism triumphs in the West and fails everywhere else*. London: Bantam Press.
7 Nussbaum, M., 2004. Beyond the social contract: capabilities and global justice. *Oxford Development Studies*, 32(1), p.15.
8 World Commission on Environment and Development, 1987. *Report of the World Commission on Environment and Development: our common future*. Published as Annex to General Assembly document A/42/427, *Development and international co-operation: environment*. Available at: www.un-documents.net/wced-ocf.htm [Accessed on 26 October 2013].
9 Sen, A., 2001. *Development as freedom*. Oxford: Oxford University Press.
10 Smith, M.L., Elder, L. and Emdon, H., 2011. Open development: a new theory for ICT4D. *Information Technologies & International Development*. 7(1), Spring, pp.iii–ix.
11 Romer, P., 1986. Increasing returns and long run growth. *Journal of Political Economy*, 94, pp.1002-1038; Hand, J. and Lev, B., 2003. *Intangible assets: values, measures and risks*. Oxford: Oxford University Press.
12 Christensen, C., 1997. *The innovator's dilemma*. Cambridge, MA: Harvard Business School Press; Christensen, C. and Raynor, M., 2003. *The innovator's solution*. Cambridge, MA: Harvard Business School Press.
13 Schumpeter, J.A., [1942]1976. *Can capitalism survive? Creative destruction and the future of the global economy*. New York: Harper Perennial Modern Thought.
14 OECD, 2005. *Oslo manual: guidelines for collecting and interpreting innovation data*. 3rd ed. Paris: OECD Publishing. p.46.
15 Baumol, H., 2002. *The free-market innovation machine: analysing the growth miracle of capitalism*. Princeton: Princeton University Press.
16 Chesbrough, H., 2003. *Open innovation: the new imperative for creating and profiting from technology*. Cambridge, MA: Harvard Business School Press; Chesbrough, H., Vanhaverbeke, W. and West, J. eds., 2006. *Open innovation: researching a new paradigm*. Oxford: Oxford University Press.
17 Von Hippel, E., 1986. Lead users: a source of novel product concepts. *Management Science*, 32 (7), 791-805; Von Hippel, E., 2005. *Democratizing innovation*. Cambridge, Mass.: MIT Press.
18 Prahalad, C.K. and Hart, S.L., 1998. The fortune at the bottom of the pyramid. *Strategy+Business*, 26, pp.54-67; Prahalad, C.K., 2004. *The fortune at the bottom of the pyramid*. Wharton School Publishing; Hart, S.L., 2005. *Capitalism at the crossroads*. Wharton School Publishing.
19 Refer to Gupta and the Honey Bee Network. Available at: www.Sristi.org and www.nif.org.in [Both accessed 26 October 2013].
20 Yunus, M., 2003. *Banker to the poor*. New York: Public Affairs; Yunus, M., Moingeon, B. and Lehmann-Ortega, L., 2010. Building social business models: lessons from the Grameen experience. *Long Range Planning*, 43, pp.308-325.
21 OECD, 2013. *Innovation and inclusive development*. Paris: OECD.
22 Mashelkar, R. and Goel, V., 2010. Inclusive innovation: more from less for more. Draft.
23 Oxford English Dictionary. Available at www.oxforddictionaries.com/definition/english/knowledge?q=knowledge [Accessed on 28 October 2013].
24 Lundvall, B.-A. and Johnson, B., 1994. The learning economy. *Journal of Industry Studies*, 1(2), pp.23-42.

PERSPECTIVE

1 Refer to www.theparisreview.org/interviews/1720/the-art-of-fiction-no-139-chinua-achebe.
2 Coppens, Y., 2012. Outstanding universal value of human evolution in Africa. In: UNESCO, 2012. *Human origin sites and the World Heritage Convention in Africa*. World Heritage Papers, 33. Paris: United Nations Educational, Scientific and Cultural Organisation. pp.14-17.
3 See for example archaeologyinfo.com/homo-sapiens/.
4 UNESCO, 2012. *Human origin sites and the World Heritage Convention in Africa*. World Heritage Papers, 33. Paris: UNESCO.
5 *Age of ancient humans reassessed*. Available at: news.bbc.co.uk/2/hi/science/nature/4269299.stm [Accessed on 25 October 2013].
6 Coppens, 2012. Outstanding universal value. pp.14-17.
7 Whitehouse, D., 2003. *When humans faced extinction*. BBC News, 9 June. Available at: news.bbc.co.uk/1/hi/sci/tech/2975862.stm [Accessed on 25 October 2013].
8 Diamond, J., 1997. *Guns, germs, and steel: the fates of human societies*. New York: W.W. Norton & Company.
9 Refer to https://genographic.nationalgeographic.com/.
10 Brooks, L., 1971. *Great civilizations of Ancient Africa*. New York: Four Winds Press. p.32.
11 Brooks, 1971. *Great civilizations*. p.8.
12 Atwood, R., 2011. The NOK of Nigeria. *Archaeology* July/August, pp.34-38.
13 Davidson, B., 1991. *Africa in history: themes and outlines*. New York: Simon & Schuster.
14 Giday, B., 1992. *Ethiopian civilization*. Addis Ababa: Belai Giday.
15 Etherington, N., 2010. Historians, archaeologists and the legacy of the discredited short Iron-Age chronology. *African Studies,* 69(2), August, p.370.
16 Guyer, J.I. and Belinga, S.M., 1995. Wealth in people as wealth in knowledge: accumulation and composition in Equatorial Africa. *The Journal of African History*, 36(1), p.106. In: P. de Maret, 2012. From kingship to kinship: an African journey into complexity. *Azania: Archaeological Research in Africa*, 47(3), September, pp.314-326.
17 Africanus, L., 1600. *History and description of Africa*. Translated by J. Pory, 1896. London: Hakluyt Society.
18 Refer to whc.unesco.org/en/list/364.
19 en.wikipedia.org/wiki/File:Mansa_Musa.jpg; ccfr.bnf.fr/portailccfr/.
20 See for example Davidson, B., 1998. *West Africa before the colonial era: a history to 1850*. London and New York: Longman.
21 Al-Bakri, A.U., 1068. *The book of routes and realms*. Cordoba.
22 Refer to www.geocities.ws/pderideaux/chou_chu_fei.html, sourced from Friedrich Hirth; *Journal of the American Oriental Society* Vol XXX, Gabriel Ferrand; Journal Asiatique and Chao-yu-kua: Hirth & Rockhill. "Camel crane" is a transliteration of the Persian name "shutur-murgh" meaning camel bird.
23 Mansa Musa, his successor, described the incident to a contemporary Syrian scholar, Al-Umari.
24 Refer to whc.unesco.org/en/list/170.

25 Refer to www.bbc.co.uk/worldservice/africa/features/storyofafrica/index.shtml and www.pbs.org/wonders/fr_rt.htm.
26 Davidson, B., 1998. *West Africa before the colonial era: a history to 1850*. Harlow, Essex: Addison Wesley Longman. pp.19,53
27 Davidson, 1998. *West Africa before the colonial era*. p.13.
28 King, L., 2001. State and ethnicity in precolonial Northern Nigeria. *Journal of Asian and African Studies*, 36(4), January, p.344.
29 *The story of Africa*. Available at: www.bbc.co.uk/worldservice/africa/features/storyofafrica/index.shtml [Accessed on 25 October 2013].
30 Noted by the great American Africanist, Melville Herskovits, at the Wellesley College Symposium on Africa, Wellesley College, Mass., 1960, described in Mazrui, A., 1986. *The Africans: a triple heritage*. London: BBC Publications. p.33.3
31 Pakenham, T., 1991. *The scramble for Africa: 1876-1912*. Johannesburg: Jonathan Ball.
32 *The story of Africa*. Available at: www.bbc.co.uk/worldservice/africa/features/storyofafrica/4chapter3.shtml [Accessed on 25 October 2013].
33 Bennett, N.R., 1984. *Africa and Europe: from Roman times to national independence*. 2nd ed. New York: Africana Publishing Co. (Holmes and Meier Publishers).
34 See endnote 29.
35 Diamond, 1997. *Guns, germs, and steel*.
36 Kusimba, C.M., 2004. Archaeology of slavery in East Africa. *African Archaeological Review*, 21(2), June, p.65.
37 Pakenham, 1991. *The scramble for Africa*.
38 Williams, E., 2007. Capitalism and slavery. In: T. Das Gupta, C. James, G.E. Galabuzi, R. Maaka and C. Andersen, eds. *Race and racialisation: essential readings*. Toronto: Canadian Scholars' Press. p.149.
39 Kusimba, 2004. *Archaeology of slavery*. p.61.
40 Hochschild, A., 1998. *King Leopold's ghost: a story of greed, terror, and heroism in colonial Africa*. New York: Houghton Mifflin.
41 Thomas, H., 1997. *The slave trade: the story of the Atlantic slave trade, 1440-1870*. New York: Simon and Schuster. p.109.
42 Refer to 2i2l.fr/spip.php?article32 [Accessed 29 September 2013]
43 Diamond, 1997. *Guns, germs, and steel*.
44 Hakansson, N.T., 2004. The human ecology of world systems in East Africa: the impact of the ivory trade. *Human Ecology*, 32(5), October, p.579.
45 Davidson, 1998. *West Africa before the colonial era*.
46 Vandervort, B., 1998. *Wars of imperial conquest in Africa 1830-1914*. London: UCL Press.
47 Fredrickse, J., 1982. *None but ourselves: masses vs media in the making of Zimbabwe*. Harare, Zimbabwe: Mazongororo Paper Converters. p.9.
48 Vandewoude, E., 1976. De Aardrijkskkundinge Conferentie (1976) vanuit het koninklijk Paleis genzein. In: *La Conference de Geographie de 1876: Recueil d'etudes*. Brussels: Academie Royale des Sciences d'Ouetre-Mer. p.410. In: Pakenham, 1991. *The scramble for Africa*. pp.21,22.
49 Robinson, D., 1985. *The holy war of Umar Tal: the Western Sudan in the mid-nineteenth century*. Oxford: Clarendon Press. p.330. In: Vandervort, 1998. *Wars of imperial conquest*.
50 Pakenham, 1991. *The scramble for Africa*.
51 Myers, G.A., 1998. Intellectual of empire: Eric Dutton and hegemony in British Africa. *Annals of the Association of American Geographers*, 88(1), March, p.2.
52 Misuno, N. and Okazawa, R. 2009. Colonial experience and postcolonial underdevelopment in Africa. *Public Choice*, 141(3), December, p.407.
53 Myers, 1998. Intellectual of empire. p.2.
54 Fredrickse, J., 1982. *None but ourselves: masses vs media in the making of Zimbabwe*.
55 Notable polygenists were Voltaire, David Hume and Georges Cuvier.
56 Harris, C., 2004. How did colonialism dispossess? Comments from an edge of empire. *Annals of the Association of American Geographers*, 94(1), p.165.
57 Vandervort, 1998. *Wars of imperial conquest*.
58 Winchester, S., 2001. *The map that changed the world*. London: Penguin Books.
59 Mazrui, 1986. *The Africans: a triple heritage*. p.15.
60 See Frequently Asked Questions at The World Bank, Economic Policy and Debt. Available at: Refer to web.worldbank.org/WBSITE/EXTERNAL/TOPICS/EXTDEBTDEPT/0,,contentMDK:20259564~pagePK:64166689~piPK:64166646~theSitePK:469043,00.html [Accessed on 25 October 2013].
61 UNCTAD, 2004. *Economic development in Africa: debt sustainability: oasis or mirage?* Geneva: United Nations.
62 NEPAD, 2010. *External debt in Africa*. Policy Brief no. 3, October. NEPAD-OECD Africa Investment Initiative. Available at: www.un.org/africa/osaa/reports/2010_Debtbrief.pdf [Accessed on 25 October 2013].
63 See endnote 59.
64 World Bank, 2005. *Balancing the development agenda: the transformation of the World Bank under James D. Wolfensohn, 1995–2005*. Washington DC: The World Bank. p.13.
65 Organisation for the Prohibition of Chemical Weapons, 2010. *The chemical weapons ban: facts and figures*, Available at: www.opcw.org/news-publications/publications/facts-and-figures/ [Accessed on 25 October 2013].
66 Mytton, G., n.d. *A brief history of radio broadcasting in Africa*. Available at: www.transculturalwriting.com/radiophonics/contents/usr/downloads/radiophonics/A_Brief_History.pdf [Accessed on 25 October 2013]; and Bourgault, L.M., 1995. *Mass media in Sub-Saharan Africa*. Bloomington, IN: Indiana University Press.
67 Refer to africanmediainitiative.org/about.
68 Pronk, J., 2011. The quest for sustainability: some reflections. *Development*, 54(2), pp.155-160.
69 Refer to www.un.org/en/aboutun/index.shtml.
70 Adichie, C.N., 2009. "The danger of a single story" talk. Oxford: TED Global.
71 Zalk, N., 2013. *Blueprint for industrialisation can uplift Africa*. Available at: www.iol.co.za/business/opinion/blueprint-for-industrialisation-can-uplift-africa-1.1576331 [Accessed on 25 October 2013].
72 Ramo, J.C., 2004. T*he Beijing Consensus: notes on the new physics of Chinese power*. London: Foreign Policy Centre.
73 World Bank, 2005. *Balancing the development agenda*.
74 Auletta, K., 2011. The Dictator Index: A billionaire battles a continent's legacy of misrule. *The New Yorker*, volume 87, issue 3, 7 March.
75 Annan, K., 2012. Foreword. In: Africa Progress Panel. *African*

progress report 2012: jobs, justice and equity: seizing opportunities in times of global change. Geneva: Africa Progress Panel.

76 See the work of Research ICT Africa (RIA), www.researchictafrica.net, and Balancing Act, www.balancingact-africa.com..

77 Bibel, W. ed., 2004. *Converging technologies and the natural, social and cultural world*. Special Interest Group Report for the European Commission. Available at: ec.europa.eu/research/social-sciences/pdf/ntw-sig4_en.pdf [Accessed on 25 October 2013]; National Science Foundation, 2002. *Converging technologies for improving human performance*. Available at: www.wtec.org/ConvergingTechnologies/Report/NBIC_report.pdf [Accessed on 25 October 2013]; Anton, P.S., Silberglitt, R. and Schneider, J., 2001. *The global technology revolution*. Prepared for the National Intelligence Council. Available at: www.rand.org/content/dam/rand/pubs/monograph_reports/2005/MR1307.pdf [Accessed on 25 October 2013].

78 Rubin, W., 1994. *Studies in modern art 3*. New York: Museum of Modern Art.

79 Sahara's abrupt desertification started by changes in Earth's orbit, accelerated by atmospheric and vegetation feedbacks. Science Daily, 12 July 1999. Available at: www.sciencedaily.com/releases/1999/07/990712080500.htm [Accessed on 25 October 2013].

DRIVERS OF CHANGE

1 African Development Bank, OECD and UNDP, 2013. *African Economic Outlook 2013: Structural transformation and natural resources*. p.11. Available at: www.africaneconomicoutlook.org/fileadmin/uploads/aeo/PDF/Pocket%20Edition%20AEO2013-EN.web.pdf [Accessed on 24 October 2013].

2 International Monetary Fund, 2013. *Sub-Saharan Africa: building momentum in a multi-speed world*. Available at: www.imf.org/external/pubs/ft/reo/2013/afr/eng/sreo0513.pdf [Accessed on 24 October 2013].

3 The Lions comprise Algeria, Botswana, Egypt, Libya, Mauritius, Morocco, South Africa and Tunisia and their GDP per capita exceeds that of the BRIC nations of Brazil, Russia, India, China, according to Boston Consulting Group, 2010. *The African challengers: global competitors emerge from the overlooked continent*. Available at: www.bcg.com/documents/file44610.pdf [Accessed on 24 October 2013]. McKinsey Global Institute, 2010. *Lions on the move: the progress and potential of African economies*. Available at: www.mckinsey.com/insights/africa/lions_on_the_move [Accessed on 24 October 2013].

4 World Economic Forum, 2013. *The Africa competitiveness report 2013*. p.12. Available at: www3.weforum.org/docs/WEF_Africa_Competitiveness_Report_2013.pdf [Accessed on 24 October 2013].

5 United States Government Accountability Office, 2013. *Sub-Saharan Africa: trends in U.S and Chinese economic engagement*. Report to Congressional Requesters. Available at: http://www.gao.gov/assets/660/652041.pdf [Accessed on 24 October 2013].

6 Africa Progress Panel, 2013. *Africa progress report 2013*. p.50. Available at: www.africaprogresspanel.org/wp-content/uploads/2013/08/2013_APR_Equity_in_ Extractives_25062013_ENG_HR.pdf [Accessed on 24 October 2013].

7 Elephants and tigers: Chinese businessmen in Africa get the attention but Indians are not far behind. *The Economist*, 26 October 2012. Available at: www.economist.com/news/middle-east-and-africa/21588378-chinese-businessmen-africa-get-attention-indians-are-not-far.

8 Ernst & Young, 2013. *Ernst & Young's attractiveness survey: Africa 2013: getting down to business*. p.19. Available at: www.ey.com/Publication/vwLUAssets/Africa_Attract_2013_-_Getting_down_to_business/$FILE/Africa_attractiveness_2013_web.pdf [Accessed on 24 October 2013].

9 McKinsey Global Institute, 2010. *Lions on the move*.

10 McKinsey Global Institute, 2010. *Lions on the move*.

11 Landes, D., 1998. *The wealth and poverty of nations*. London: Little, Brown and Company.

12 UNCTAD, 2013. The rise of BRICS FDI and Africa. *Global Investment Trends Monitor*, Special Edition 25 March. Available at: http://unctad.org/en/PublicationsLibrary/webdiaeia2013d6_en.pdf [Accessed on 24 October 2013].

13 UNCTAD, 2011. *World investment report 2011: non-equity modes of international production and development*. New York and Geneva: United Nations Conference on Trade and Development.

14 UNCTAD, 2013. *World investment report 2013: global value chains: investment and trade for development*. New York and Geneva: United Nations Conference on Trade and Development.

15 UNCTAD, 2013. *World investment report 2013*. p.xiv.

16 Baldwin, R., 2011. *Trade and industrialisation after globalisation's 2nd unbundling: how building and joining a supply chain are different and why it matters*. NBER Working Paper No. 17716. Available at: http://www.nber.org/papers/w17716.pdf?new_window=1 [Accessed on 24 October 2013].

17 UNCTAD, 2013. *World investment report 2013: global value chains: investment and trade for development*.

18 Refer to the *Doing Business* annual performance indicators of business regulations for local firms taken from the World Bank Enterprise Surveys. Available at: www.doingbusiness.org/ [Accessed on 24 October 2013].

19 African Commission on Human and Peoples' Rights, 2013. 236: *Resolution on illicit capital flight from Africa*. 53rd Ordinary Session held from 9 to 23 April in Banjul, The Gambia. Available at: www.achpr.org/sessions/53rd/resolutions/236/ [Accessed on 24 October 2013].

20 Boyce, J.K. and Ndikumana, L., 2012. *Capital flight from Sub-Saharan African countries: updated estimates, 1970-2010*. Political Economy Research Institute, University of Massachusetts Amherst. p.7.

21 Boyce and Ndikumana, 2012. *Capital flight from Sub-Saharan African countries*. p.8.

22 United Nations Economic and Social Council/Economic Commission for Africa, 2013. *The state of governance in Africa: the dimension of illicit financial flows as a governance challenge*. Third Meeting of the Committee on Governance and Popular Participation, Addis Ababa, Ethiopia, 20-21 February. E/ECA/CGPP/3/2. Available at: http://www.uneca.org/sites/default/files/uploaded-documents/CGPP/cgpp-3_illicit-financial-flow-english_final.pdf [Accessed on 24 October 2013].

23 United Nations Economic and Social Council/Economic Commission for Africa, 2013. *The state of governance*

in Africa: the dimension of illicit financial flows as a governance challenge.
24 Smith, D., 2013. Africa 'ripped off big time' by foreign resource firms, says bank chief. *The Guardian*, 18 June. Available at: www.guardian.co.uk/global-development/ 2013/jun/18/africa-ripped-off-foreign-resource-firms [Accessed on 24 October 2013].
25 Africa Progress Panel, 2013. *Africa progress report 2013*. p.46.
26 African Development Bank, OECD and UNDP, 2013. A*frican Economic Outlook 2013*. p.11.
27 UNCTAD, 2004. *Economic development in Africa: debt sustainability: oasis or mirage?* Geneva: United Nations.
28 IMF, 2012. A*nnual report of the Executive Board for the financial year ended April 30, 2012. Appendix I: international reserves*. Available at: www.imf.org/external/pubs/ft/ar/2012/eng/pdf/a1.pdf [Accessed on 24 October 2013].
29 Refer to www.imf.org/external/np/exr/facts/hipc.htm and www.imf.org/external/np/exr/facts/mdri.htm.
30 BBC News, 2004. *Africa 'should not pay its debts'*. 6 July. Available at: http://news.bbc.co.uk/2/hi/business/3869081.stm [Accessed on 24 October 2013].
31 Dunning, J. and Lundan, S., 2008. *Multinational enterprises and the global economy*. 2nd ed. Cheltenham: Edward Elgar Publishing Ltd.
32 The Economist, 2012. *African democracy: a glass half-full*. Available at: www.economist.com/node/21551494 [Accessed 24 October 2013]; Mo Ibrahim Foundation, 2012. *2012 Ibrahim Index of African Governance: data report*. Available at: www.moibrahimfoundation.org.
33 Good Governance Africa, 2012-13. Struggling in the shadow: Africa's opposition parties. *Africa in Fact: The Journal of Good Governance Africa*. Available at: http://gga.org/publications/africa-in-fact-december-2012-january-2013-africas-opposition-parties [Accessed on 24 October 2013].
34 Boyce and Ndikumana, 2012. *Capital flight from Sub-Saharan African countries*. p.38.
35 African Development Bank, 2012. *The civil society engagement framework*. Available at: www.afdb.org/fileadmin/uploads/afdb/Documents/Policy-Documents/CSO%20Framework %20Web%20consultation%20EN.pdf [Accessed on 24 October 2013].
36 Devarajan, S., Khemani, S. and Walton, M., 2011. *Civil society, public action, and accountability in Africa*. Washington DC: The World Bank.
37 Moyo, S., 2011. *The power of African civil society*. ONE blog. Available at: www.one.org/africa/blog/the-power-of-african-civil-society/ [Accessed on 24 October 2013]./
38 Africa Progress Panel, 2012. *African progress report 2012: jobs, justice and equity: seizing opportunities in times of global change*. p.55. Available at: www.africaprogresspanel.org.
39 A comparison of African countries' scores on the 2012 World Bank's Human Development Index against the 2012 Ibrahim Index of African Governance demonstrates a positive correlation between the two.
40 Edwards, M., 2009. *Civil society*. 2nd ed. Cambridge: Polity Press.
41 Freedom House, 2013. *Freedom in the world 2013: democratic breakthroughs in the balance*. p.4. Available at: www.freedomhouse.org/report/freedom-world/freedom-world-2013 [Accessed on 24 October 2013].
42 UNCTAD, 2011. *World investment report 201*1. p.1.
43 McKinsey Global Institute, 2010. *Lions on the move*. p.11.
44 Good Governance Africa, 2012. Teetering towards democracy. *Africa in Fact: The Journal of Good Governance Africa*. Available at: http://gga.org/publications/africa-in-fact-june-2012 [Accessed on 24 October 2013].
45 Mo Ibrahim Foundation, *2012. 2012 Ibrahim Index of African Governance: summary*. p.20.
46 See Muethel, M. and Bond, M.H., 2013. National context and individual employees' trust of the out-group: the role of societal trust. *Journal of International Business Studies*, 44, pp.312-333.
47 African Commission on Human and Peoples' Rights, 2013. 236: *Resolution on illicit capital flight from Africa*.
48 African Commission on Human and Peoples' Rights, 2013. 236: *Resolution on illicit capital flight from Africa*.
49 Fukuyama, F., 1999. Social capital and civil society. Paper prepared for IMF Conference on Second Generation Reforms, 8-9 November, IMF Headquarters, Washington, DC. Available at: http://www.imf.org/external/pubs/ft/seminar/1999/reforms/fukuyama.htm [Accessed on 24 October 2013].
50 World Economic Forum, 2013. *The future role of civil society*. Available at: www3.weforum.org/docs/WEF_FutureRoleCivilSociety_Report_2013.pdf [Accessed on 24 October 2013].
51 Refer to thepolitic.org/female-leadership-in-africa/.
52 Juma, C., 2013. Africa's economic growth prospects. T*echnology+Policy | Innovation@Work*. Available at: www.technologyandpolicy.org/2013/02/15/africas-economic-growth-prospects/ [Accessed on 24 October 2013].
53 Spickard, P., 2005. *Race and nation, identity and power: thinking comparatively about ethnic systems*. In: P. Spickard, ed. *Race and nation: ethnic systems in the modern world*. London: Routledge. p.2.
54 Irele, F.A., 2002. Francophone African philosophy. In: P.H. Coetzee and A.P.J. Roux, eds. *Philosophy from Africa*. 2nd ed. Cape Town: Oxford University Press. p.112.
55 Sachs, I., 1971. *La Découverte du Tiers Monde*. Paris: Flammarion. p.342.
56 Spickard, 2005. *Race and nation*. p.2.
57 Eze, E.C., 1997. Towards a critical theory of postcolonial identities. In: E.C. Eze, ed. *Postcolonial African philosophy: a critical reader*. Oxford: Blackwell Publishers. p.343.
58 Achenbach, J., 2009. Africans have world's highest genetic diversity, study finds. *The Washington Post*, 1 May. Available at: http://articles.washingtonpost.com/2009-05-01/news/36836404_1_genetic-makeup-sarah-tishkoff-africans [Accessed on 24 October 2013].
59 Tishkoff, S. et al., 2009. The genetic structure and history of Africans and African Americans. Science, 324(5930), pp.1035-1044. Available at: http://in-africa.org/wp-content/uploads/2012/12/Tishkoff-et-al-2009-Science-African-genomics.pdf [Accessed on 24 October 2013]. For details of language diversity refer to www.ethnologue.com/world.
60 Mazrui, A.A., 1986. T*he Africans: a triple heritage*. London: BBC Publications.
61 Steinberg, J., 2008. *Three letter plague: a young man's journey through a great epidemic*. London: Vintage Books.
62 Appiah, K.A., 2002. *Race, culture, identity: misundertsood connections*. In Coetzee, P.H. and Roux, A.P.J., eds. *Philosophy from Africa*, 2nd edition. Cape Town: Oxford University Press Southern Africa. p.337.
63 Magesa, L., 2010. *African religion in the dialogue debate: from intolerance to coexistence*. London: Transaction Publishers. p.118.

64 Pew Forum on Religion and Public Life, 2012. *The global religious landscape*. Available at: www.pewforum.org/2012/12/18/global-religious-landscape-exec/ [Accessed on 24 October 2013].

65 Magesa, L., 2010. *African religion in the dialogue debate: from intolerance to coexistence*.

66 United Nations Department of Economic and Social Affairs, 2010. *The World's Women 2010: Trends and Statistics*. New York: United Nations, Figure 5, p.3. Available at unstats.un.org/unsd/demographic/products/Worldswomen/WW_full%20report_color.pdf.

67 UNDP, 1995. *Human Development Report: Gender and Human Development*. New York: Oxford University Press. Available at hdr.undp.org/en/reports/global/hdr1995.

68 United Nations Economic Commission for Africa (UNECA), 2004. *The African Gender and Development Index*. Addis Ababa: UNECA; UNECA, 2011. *Gender and Development Index 2011: Promoting Gender Equality In Africa*. Addis Ababa: UNECA. Available at www.uneca.org/sites/default/files/publications/agdi_2011_eng_fin.pdf

69 World Health Organization, London School of Tropical Medicine and the South African Medical Research Council (2013) *Global and regional estimates of violence against women: prevalence and health effects of intimate partner violence and non-partner sexual violence*. Geneva: World Health Organization. p.18. Note that North African data is part of the larger Middle East and North Africa WHO region.

70 Women in National Parliaments, situation on 1 October 1 2013. Refer to www.ipu.org/wmn-e/classif.htm.

71 Buskens, I. and Webb, A., eds, 2009. *African Women and ICTs: Investigating Technology, Gender and Empowerment*. New York: Zed Books Ltd./International Development Research Centre. p.207.

72 Foster, V. and Briceno-Garmendia, C., 2010. A*frica's infrastructure: a time for transformation*. Washington DC: The World Bank. p.135.

73 Austin, G., 2010. African economic development and colonial legacies. *International Development Policy | Revue internationale de politique de développement*. Available at: http://poldev.revues.org/78 [Accessed on 24 October 2013].

74 Yepes, T., Pierce, J. and Foster, V., 2009. *Making sense of Africa's infrastructure endowment: a benchmarking approach*. World Bank Policy Research Working Paper No. 4912. Washington DC: The World Bank. Available at: http://ssrn.com/abstract=1401218 [Accessed on 24 October 2013]

75 Yepes, T., Pierce, J. and Foster, V., 2008. *Making sense of Sub-Saharan Africa's infrastructure endowment: a benchmarking approach*. Working Paper 1, Africa Infrastructure Country Diagnostic. Washington DC: The World Bank. Cited in UN-HABITAT, 2011. *Infrastructure for economic development and poverty reduction in Africa*. Nairobi: UN-HABITAT.

76 Yepes, Pierce and Foster, 2008. *Making sense of Sub-Saharan Africa's infrastructure endowment*.

77 Eberhard, A., Foster, V., Briceño-Garmendia, C., Ouedraogo, F., Camos, D. and Shkaratan, M., 2008. *Underpowered: the state of the power sector in Sub-Saharan Africa*. Background Paper 6, Africa Infrastructure Sector Diagnostic. Washington DC: The World Bank.

78 World Bank Enterprise Surveys for 2006–09 indicate that 15.2% of managers consider electricity the most serious constraint, while 15.68% consider access to finance the most serious (www.enterprisesurveys.org).

79 Although it is important not to forget that Africa still lags far behind most of the rest of the world. See International Telecommunication Union, 2013. *The world in 2013: ICT facts and figures*. Available at: http://www.itu.int/en/ITU-D/Statistics/Documents/facts/ICTFactsFigures2013.pdf [Accessed on 24 October 2013].

80 Elder, L., 2013. In: Elder, L., Emdon, H., Fuchs, R., and Petrazzini, B., *Connecting ICTs to Development: The IDRC Experience*. London, UK: Anthem Press, pp. 279, 81.

81 Udo, G. and Edoho, F., 2000. Information technology transfer to African nations: an economic development mandate. *Journal of Technology Transfer*, 25(3), pp.329-342.

82 International Labour Organization, 2013. *Global employment trends 2013: recovering from a second jobs dip*. Geneva: International Labour Office.

83 Weil, D., 2007. Accounting for the effects of health on economic growth. *The Quarterly Journal of Economics*, 122(3), pp.1265-1306.

84 Research has shown that electrification of rural areas can lead to a 9% increase in labour force participation in South Africa. African Development Bank, OECD and UNDP, 2013. *African Economic Outlook 2013*. p.30.

85 International Labour Organization, 2012. *Global employment outlook: global spill-overs from advanced to emerging economies worsen the situation for young jobseekers*. p.1. Available at: http://www.ilo.org/wcmsp5/groups/public/---dgreports/---dcomm/documents/publication/wcms_188810.pdf [Accessed on 24 October 2013].

86 International Labour Organization, 2012. *Global employment outlook*. p.127.

87 ILO, 2013. *Global Employment Trends 2013: Recovering from a second jobs dip*. Geneva: International Labour Organisation. p.92.

88 African Development Bank, OECD and UNDP, 2013. *African Economic Outlook 2013*. p.104.

89 Page, J., 2012. *Youth, jobs, and structural change: confronting Africa's 'employment problem'*. Working Paper Series No. 155. Tunis: African Development Bank.

90 African Development Bank, OECD and UNDP, 2013. *African Economic Outlook 2013*. p.5.

91 ILO, 2013. *Global Employment Trends 2013: Recovering from a second jobs dip*. p.92.

92 ILO (2013) *Global Employment Trends 2013: Recovering from a second jobs dip*. p.92

93 African Development Bank, OECD and UNDP, 2013. *African Economic Outlook 2013*. p.58.

94 For a more detailed analysis of entrepreneurship and its relationship with the informal economy, refer to de Beer, J, Sowa, I and Holman, K (2013) Conceptual Frameworks for Analysing African Innovation: Entrepreneurship, the Informal Economy, Intellectual Property, in in De Beer, J., Armstrong, C., Oguamanam, C. and Schonwetter, T. (Eds.) *Innovation and Intellectual Property: Collaborative Dynamics in Africa*, UCT Press, Cape Town.

95 McMillan, M. and Rodrik, D., 2011. *Globalization, structural change and productivity Growth*. NBER Working Paper No. w17143. Available at: http://ssrn.com/abstract=1866102 [Accessed on 24 October 2013]; see also Figure 1.5 in African Development Bank, OECD and UNDP, 2013. African Economic Outlook 2013. p.55.

96 ILO, 2013. *Global Employment*

Trends 2013: Recovering from a second jobs dip. p.92
97 See for example Peter, N. and Ekeopara, C., 2012. 'Brain drain': implication for economic growth in Nigeria. *American Journal of Social Issues and Humanities*, 2(2), pp.41-47.
98 The massive disparity in employment prospects between Zimbabwe and South Africa (among other factors) has created a flood of economic migrants that fuelled increases in xenophobic sentiment in South Africa. See Crush, J. ed., 2008. *The perfect storm: the realities of xenophobia in contemporary South Africa*. The Southern African Migration Project, Migration Policy Series No. 50. Cape Town: Idasa.
99 Crush, ed., 2008. *The perfect storm*.
100 Africa Progress Panel, 2012. *African progress report 2012*. p.20.
101 ILO, 2013. *Global Employment Trends 2013: Recovering from a second jobs dip*. p.87; Page, J., 2012. *Youth, jobs, and structural change: confronting Africa's 'employment problem'*.
102 African Union–New Partnership for Africa's Development (AU-NEPAD) (2010), *African Innovation Outlook 2010*, AU-NEPAD, Pretoria, pp 28 available online at: www.nepad.org/system/files/June2011_NEPAD_AIO_2010_English.pdf
103 See Coetzee, J., 2013. *Is 3D printing the key to Africa's dire manufacturing sector?* Available at: http://ventureburn.com/2013/06/is-3d-printing-the-key-to-africas-dire-manufacturing-industry/ [Accessed on 24 October 2013].
104 See Part III of Rifkin, J., 2011. *The third industrial revolution: how lateral power is transforming energy, the economy, and the world*. New York: Palgrave MacMillan.
105 Hattingh, D., Russo, B., Sun-Basorun, A. and Van Wamelen, A., 2012. T*he rise of the African consumer: a report from McKinsey's Africa Consumer Insights Center*. McKinsey & Company. Available at: www.mckinsey.com/global_locations/africa/south_africa/en/rise_of_the_african_consumer [Accessed on 24 October 2013].
106 Roxburgh, C., Dörr, N., Leke, A., Tazi-Riffi, A., van Wamelen, A., Lund, S., Chironga, M., Alatovik, T., Atkins, C., Terfous, N. and Zeino-Mahmalat, T., 2010. *Lions on the move: the progress and potential of African economies*. McKinsey & Company. Available at: www.mckinsey.com/insights/africa/lions_on_the_move [Accessed on 24 October 2013].
107 Boko, M., I. Niang, A. Nyong, C. Vogel, A. Githeko, M. Medany, B. Osman-Elasha, R. Tabo and P. Yanda, 2007: Africa. *Climate Change 2007: Impacts, Adaptation and Vulnerability. Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change*, M.L. Parry, O.F. Canziani, J.P. Palutikof, P.J. van der Linden and C.E. Hanson, Eds., Cambridge University Press, Cambridge UK, 433-467 Available at: http://www.ipcc.ch/pdf/assessment-report/ar4/wg2/ar4-wg2-chapter9.pdf [Accessed on 24 October 2013].

WIRELESS ENGAGEMENT

1 Hersman, E., 2012. *From Kenya to Madagascar: the African tech-hub boom*. Available at: www.bbc.co.uk/news/business-18878585 [Accessed on 1 November 2013].
2 Sulaiman, T., 2012. *Foreign direct investment into Africa to double by 2014: UN*. Available at: www.reuters.com/article/2012/07/06/ozatp-africa-investment-idAFJOE86501J20120706 [Accessed on 1 November 2013].
3 Information Office of the State Council (2013) China-Africa Economic and Trade Cooperation. White Paper. The People's Republic of China, Beijing Available at: www.safpi.org/sites/default/files/publications/China-AfricaEconomicandTradeCooperation.pdf
4 Schaefer, B.D., Kim, A.B. and Florance, C., 2013. *Congress should pave the way for a US–Africa free trade agreement*. Available at: www.heritage.org/research/reports/2013/08/congress-should-pave-the-way-for-a-usafrica-free-trade-agreement [Accessed on 1 November 2013].
5 Cowen, T., 2013. Emerging markets, hitting a wall. *The New York Times*, 22 June.
6 www.au.int/en/about/nutshell [Accessed on 1 November 2013].
7 UN Economic Commission for Africa and the African Union, 2006. *Assessing regional integration in Africa II: rationalizing regional economic communities*. Available at: www.uneca.org/sites/default/files/publications/aria2_eng.pdf [Accessed on 1 November 2013].
8 UN Economic Commission for Africa, 2013. *Africa: technical experts to consult on implementing boosting intra-African trade and the continental free trade area initiative*. Available at: allafrica.com/stories/201310080894.html [Accessed on 1 November 2013].
9 AEC = African Economic Community, GZALE = Grande Zone Arabe de Libre Echange, UMA = Union du Maghreb Arabe, CEN-SAD = Community of Sahel-Saharan States, IGAD = Intergovernmental Authority for Development (in the Horn of Africa), ECCAS = Economic Community of Central African States, ECOWAS = Economic Community of West African States, WAEMU = West African Economic and Monetary Union, EAC = East African Community, COMESA = Common Market for Eastern and Southern Africa, SADC = Southern African Development Community, SACU = Southern African Customs Union.
10 See the theory of new economic geography (NEG) in Gilpin, R., 2001. *Global political economy: understanding the international economic order*. Princeton and Oxford: Princeton University Press. pp. 103-127.
11 UNCTAD, 2012. *Regional trends in FDI: Chapter 2*. Available at: www.unctad-docs.org/files/UNCTAD-WIR2012-Chapter-II-en.pdf [accessed on 1 November 2013]. According to UNCTAD, projected average FDI flows of US$55–65 billion in 2012 will grow to US$70–85 billion a year later and US$75–100 billion by 2014 (p.40).
12 See www.ushahidi.com/products/crowdmap. Founded in Kenya in 2008, the platform can be used to map any statistical dimension that a user chooses and the public is invited to submit relevant data. For example, it was used to map post-election unrest using inputs from individuals on the spot.
13 Mahdavy, H., 1970. The patterns and problems of economic development in rentier states. In: M. Cook, ed. *Studies in the economic history of the Middle East*. London: Oxford University Press.
14 Di John, J., 2010. *The "resource curse": theory and evidence (ARI)*. Available at: www.realinstitutoelcano.org/wps/portal/rielcano_eng/Content?WCM_GLOBAL_CONTEXT=/elcano/elcano_in/zonas_in/ari172-2010 [Accessed on 1 November 2013].
15 Basedau, M. and Lay, J., 2009. Resource curse or rentier peace? The ambiguous effects of oil wealth and oil dependence on violent conflict.

Journal of Peace Research, 46(6), pp.757-776. Available at: jpr.sagepub.com/content/46/6/757 [Accessed on 1 November 2013].

16 Yates, D., 2009. *Enhancing the governance of Africa's oil sector*. Occasional Paper No. 51. Governance of Africa's Resources Programme. Available at: dspace.cigilibrary.org/jspui/bitstream/123456789/29588/1/SAIIA%20Occasional%20Paper%2051.pdf?1 [Accessed on 1 November 2013].

17 For example, Botswana's renegotiation of natural resource contracts was a major reason for its growth in the last four decades. See Stiglitz, J., 2012. *From resource curse to blessing*. Available at: www.project-syndicate.org/commentary/from-resource-curse-to-blessing-by-joseph-e--stiglitz [Accessed on 1 November 2013].

18 Marchal, V, Dellink, R, van Vuuren, D, Clapp, C, Château, J, Lanzi, E, Magné, B, van Vliet, J (2011) *OECD Environmental Outlook to 2050. Climate Change Chapter*. OECD Environment Directorate (ENV) and the PBL Netherlands Environmental Assessment Agency (PBL), Paris. Available at www.oecd.org/environment/outlookto2050

19 Heinrich Böll Stiftung Southern Africa, 2010. *Climate change, resources, migration: securing Africa in an uncertain climate*. Conference report. Available at: www.za.boell.org/web/foreign-and-security-affairs-505.html [Accessed on 1 November 2013]; Magrin, G. and Van Vliet, G., 2009. *The use of oil revenues in Africa*. Available at: www.ifri.org/files/Energie/MAGRIN.pdf [Accessed on 1 November 2013].

20 Africa Progress Panel, 2013. *Equity in extractives: stewarding Africa's natural resources for all*. Available at: www.africaprogresspanel.org/wp-content/uploads/2013/08/2013_APR_Equity_in_Extractives_25062013_ENG_HR.pdf [Accessed on 1 November 2013].

21 Stiglitz, 2012. *From resource curse to blessing*.

22 Mayorga-Alba, E., 2009. *Extractive industries value chain*. Africa Region Working Paper series 125. The World Bank. Available at: siteresources.worldbank.org/INTOGMC/Resources/ei_for_development_3.pdf [Accessed on 1 November 2013].

23 Cali, M., Ellis, K. and te Velde, D.W., 2008. *The contribution of services to development: the role of regulation and trade liberalisation*. Overseas Development Institute. Available at: www.odi.org.uk/sites/odi.org.uk/files/odi-assets/publications-opinion-files/3484.pdf [Accessed on 1 November 2013].

24 Odugbemi, S., 2013. *The growing anger of the merely, barely middle class*. Available at: www.howwemadeitinafrica.com/the-growing-anger-of-the-merely-barely-middle-class/28918 [Accessed on 1 November 2013].

25 See *Internet world stats: usage and population statistics*. Available at www.internetworldstats.com/stats7.htm [Accessed on 1 November 2013]. Copyright @ 2000 2010, Miniwatts Marketing Group. Estimated internet users at the time were 1,966,514,816 on 20 June 2010.

26 Ayittey, G., 2010. *Why Africa needs 'cheetahs,' not 'hippos'*. Available at: www.cnn.com/2010/OPINION/08/25/ayittey.cheetahs.hippos [Accessed on 1 November 2013].

27 In 2013, there were more than 50 technology and innovation hubs, labs, incubators and accelerators in more than 20 African countries. See www.bbc.co.uk/news/business-18878585 and whiteafrican.com/2013/10/15/3-5-years-later-what-the-ihub-has-done [both accessed on 1 November 2013].

28 Cited in Ackerman, E., 2012. *Ethiopian kids hack OLPCs in 5 months with zero instruction*. Available at: www.dvice.com/archives/2012/10/ethiopian_kids.php. See also nazret.com/blog/index.php/2012/11/01/ethiopia-children-master-tablet-pcs; blog.laptop.org/tag/rwanda/#.UV314qvABFI; and www.hackeducation.com/2012/04/09/the-failure-of-olpc, which raises questions about the educational efficacy of the technology [all accessed on 1 November 2013].

29 Castells, M., 2005. *The network society: from knowledge to policy*. In: M. Castells and G. Cardoso, eds. The network society: from knowledge to policy. Washington DC: Center for Transatlantic Relations. p.18.

30 Adams, S., 2010. Intellectual property rights, investment climate and FDI in developing countries. *International Business Research*, 3(3), July, p.202.

31 Heller, M.A., 2008. *The gridlock economy: how too much ownership wrecks markets, stops innovation, and costs lives*. Jackson, TN: Basic Books. p.304.

32 Porter, M.E. and Kramer, M.R., 2011. Creating shared value. *Harvard Business Review*, pp.62-77. Available at: hbr.org/2011/01/the-big-idea-creating-shared-value [Accessed on 2 November 2013].

33 Yu, P.K., 2009. The global intellectual property order and its undetermined future. *The WIPO Journal,* 1(1), p.2. Available at: papers.ssrn.com/sol3/papers.cfm?abstract_id=1485285 [Accessed on 2 November 2013].

34 Maskus, K.E., 2012. *Private rights and public problems: the global economics of intellectual property in the 21st Century*. Washington DC: Peterson Institute for International Economics; Maskus, K.E., 2000. *Intellectual property rights in the global economy*. Washington DC: Institute for International Economics; Mansfield, E., 1994. *Intellectual property protection, foreign direct investment and technology transfer*. Washington DC: World Bank; Mansfield, E., 1993. Unauthorised use of intellectual property: effects on investment, technology transfer and innovation. In: M.B. Wallerstein, M.E. Mogee and R.A. Schoen, eds. *Global dimensions of intellectual property rights in science and technology*. Washington DC: National Academy Press; Lee, J. and Mansfield, E., 1996. Intellectual property protection and US foreign direct investment. *Review of Economics and Statistics*, 78(2), pp.181-186; Javorcik, B.S., 2004. The composition of foreign direct investment and protection of intellectual property rights: evidence from transition economies. *European Economic Review*, 48(1), pp.39-62.

35 Dhar, B. and Joseph, R., 2012. *Foreign direct investment, intellectual property rights and technology transfer: the North-South and South-South dimension*. Background Paper No. 6. UNCTAD. Available at: unctad.org/en/PublicationsLibrary/ecidc2012_bp6.pdf [Accessed on 2 November 2013].

36 See The African Copyright and Access to Knowledge Project (ACA2K) at www.aca2k.org.

37 Armstrong, C., De Beer, J., Kawooya, D., Prabhala, A. and Schonwetter, T. eds., 2010. *Access to knowledge in Africa: the role of copyright*. Cape Town: UCT Press. Available at: www.aca2k.org/attachments/281_ACA2K-2010-Access%20to%20knowledge%20in%20Africa-s.pdf [Accessed on 2 November 2013].

38 Bill Gates interview by Richard Waters in *Financial Times*, 1 November 2013. www.ft.com/cms/s/2/dacd1f84-41bf-11e3-b064-00144feabdc0.html#ixzz2k3rPcZVG.
39 newsroom.fb.com/News/693/Mark-Zuckerberg-Is-Connectivity-a-Human-Right [Accessed on 20 August 2013]; fbcdn-dragon-a.akamaihd.net/hphotos-ak-ash3/851575_228794233937224_51579300_n.pdf, p.4.
40 Christensen, C.M., 1997. *The innovator's dilemma: when new technologies cause great firms to fail*. Boston: Harvard Business School Press.
41 A counter example is Ubuntu, developed under South African e-entrepreneur Mark Shuttleworth. It is a suite of software developed on the open-source Linux operating system, providing a desktop interface, server and cloud services, and applications for phone, tablet and television. It is moot whether this can be considered an "African" product, given that it is developed by coders living anywhere. See www.ubuntu.com [Accessed on 2 November 2013].

INFORMAL – THE NEW NORMAL

1 For a real example of the innate tensions between formal and informal, refer to nextcity.org/informalcity/entry/destroyed-by-fire-a-market-struggles-to-rise-from-the-ashes.
2 Many ideas in this scenario are drawn from Kawooya, D. (2013) Informal-Formal Sector Interactions in Automotive Engineering, Kampala. In De Beer, J. et. al. (2013) *Innovation and Intellectual Property: Collaborative Dynamics in Africa*, UCT Press: Cape Town. Chapter 3, p 59–76; De Beer, J., Fu, K., and Wunch-Vincent, S. (2013). "The Informal Economy, Innovation, and Intellectual Property: Concepts, Metrics and Policy Considerations." WIPO Economic Research Working Paper No. 10; and De Beer, J., Holman, K., and Sowa, I. (2013) Frameworks for Analysing African Innovation: Entrepreneurship, the Informal Economy, and Intellectual Property. In De Beer, J. et. al. (2013) *Innovation and Intellectual Property: Collaborative Dynamics in Africa*, UCT Press: Cape Town. Chapter 2, p 32–58.
3 We note that "Informal is normal" is one of the descriptors for jobs or employment environments listed in the *World Development Report 2013*. See World Bank, 2012. *World development report 2013: jobs*. Washington DC: The World Bank. p.38. Available at: siteresources.worldbank.org/EXTNWDR2013/Resources/8258024-1320950747192/8260293-1322665883147/WDR_2013_Report.pdf [Accessed on 17 November 2013].
4 Gaughan, J.P. and Ferman, L.A., 1987. Toward an understanding of the informal economy. *Annals of the American Academy of Political and Social Science*, 493, pp.15–25.
5 De Soto, H., 2000. *The mystery of capital*. New York: Basic Books.
6 Sparks, D.L. and Barnett, S.T., 2010. The informal sector in Sub-Saharan Africa: out of the shadows to foster sustainable employment and equity? *International Business and Economics Research Journal*, 9(5), pp.1–12.
7 Pieterse, J.N., 2006. Globalisation as hybridization. In: M.G. Durham and D.M. Kellner, eds. *Media and cultural studies: key works*. Malden, MA: Blackwell.
8 Grimm, M., van der Hoeven, R., Lay, J. and Roubaud, F., 2012. *Rethinking the informal sector and entrepreneurship in Sub-Saharan Africa*. DIW Vierteljahrshefte Summary of Bamako conference: Unlocking Potential: Tackling Economic, Institutional and Social Constraints of Informal Entrepreneurship in Sub-Saharan Africa. Berlin: German Institute for Economic Research.
9 Biles, J.J., 2009. Informal work in Latin America: competing perspectives and recent debates. *Geography Compass*, 3(1), pp.214–236.
10 International Labour Organisation, 1972. *Employment, incomes and equity: a strategy for increasing productive employment in Kenya*. Geneva: ILO; International Labour Organisation, 2002. *Decent work and the informal economy*. Report VI presented at the 90th session of the International Labour Conference. Geneva: ILO.
11 International Labour Organisation, 1993. *Resolution concerning statistics of employment in the informal sector*. Adopted by the 15th International Conference of Labour Statisticians. Geneva: ILO. p.2. For more background on the development of the idea of the "informal sector", see: Lewis, W.A., 1954. Economic development with unlimited supplies of labour. In: A.N. Agarwala and S.P. Singh, eds. *The economics of underdevelopment*. London: Oxford University Press; Hart, K., 1973. Informal income opportunities and urban employment in Ghana. *Journal of Modern African Studies*, 11(1), pp.61–89.
12 ILO (2003), *Guidelines concerning a statistical definition of informal employment adopted by the Seventeenth International Conference of Labour Statisticians*. Geneva: ILO, p. 2
13 Hussmanns, R., n.d. *Measurement of informal employment: recent international standards*. Available at: www.statssa.gov.za/commonwealth/presentations/paper_Hussmanns.pdf [Accessed on 17 November 2013].
14 International Labour Organisation, 1972. *Employment, incomes and equity*; Palmer, 2004. *The informal economy in Sub-Saharan Africa*; Tabak, F. 2000. "Introduction: informalization and the long term", in Tabak, F. and Crichlow, M.A. (Eds), Informalization: Process and Structure, John Hopkins University, Baltimore, MD; Daniels, S., 2010. *Making do: innovation in Kenya's informal economy*. Analogue Digital. See analoguedigital.com/makingdo/ [Accessed on 17 November 2013]; International Labour Organisation, 2002. *Women and men in the informal economy: a statistical picture*. Geneva: ILO. p.12.
15 International Labour Organisation, 2003. *Guidelines concerning a statistical definition of informal employment*; Palmer, R., 2004. *The informal economy in Sub-Saharan Africa: unresolved issues of concept, character and measurement*. Occasional Paper No. 98. Edinburgh: Centre of African Studies, University of Edinburgh.
16 International Labour Organisation (ILO) (2002). *Women and Men in the Informal Economy: A Statistical Picture*. Geneva: ILO,p. 12
17 International Labour Organisation, 2002. *Decent work and the informal economy*; International Labour Organisation, 2003. *Guidelines concerning a statistical definition of informal employment*; Palmer, 2004. *The informal economy in Sub-Saharan Africa*; Portes, A., 1983. The informal sector: definition, controversy, and relation to national development. *Review*, 7(1), pp.151–174; Portes, A. and Sassen-Koob, S., 1987. Making it underground: comparative material on the informal sector in Western market economies. *The American*

Journal of Sociology, 93(1), pp.30–61; Skinner, C. and Valodia, I., 2006. Two economies: mistaken idea. *South African Labour Bulletin*, 30(4), pp.57–60.

18 Adapted from de Beer, J., Fu, K. and Wunsch-Vincent, S., 2013. *The informal economy, innovation and intellectual property: concepts, metrics and policy considerations*. WIPO Economic Research Working Paper No. 10. Geneva: WIPO.

19 Lesser, C. and Moisé-Leeman, E., 2009. *Informal cross-border trade and trade facilitation reform in Sub-Saharan Africa*. Trade Policy Working Paper No. 86. TAD/TC/WP(2008)13/FINAL. Paris: OECD. p.5.

20 Giddens, A., 2003. *Runaway world: how globalization is reshaping our lives*. 2nd ed. New York: Routledge. p.13. See also Giddens, A., 1990. *The consequences of modernity*. Stanford, CA: Stanford University Press.

21 Adapted from David, Ulrich, Zelezeck and Majoe, 2012. *Managing informality*.

22 Sparks, L.D. and Barnett, T.S., 2010. The informal sector in Sub-Saharan Africa: out of the shadows to foster sustainable employment and equity? *International Business & Economics Research Journal*, 9(5), pp.1–11.

23 The ILO put it at 2.8% per year, roughly 13.8 million new entrants a year. See International Labour Organisation, 2013. *Global employment trends 2013: recovering from a second jobs dip*. Geneva: ILO.

24 Weil, D., 2007. Accounting for the effects of health on economic growth. *The Quarterly Journal of Economics*, 122(3), pp.1265–1306.

25 Hussmanns, n.d. *Measurement of informal employment*.

26 Statement by a representative of the South African National Traders Alliance at a workshop organised by the World Intellectual Property Organization (WIPO), November 2012, Pretoria, South Africa.

27 David, S., Ulrich, O., Zelezeck, S. and Majoe, N. eds., 2012. *Managing informality: local government practices and approaches towards the informal economy: learning examples from five African countries*. Pretoria: South African LED Network. p.4. Available at: led.co.za/document/managing-informality-local-government-practices-and-approaches-towards-informal-economy-lea [Accessed on 17 November 2013].

28 Chen, M.A., 2007. *Rethinking the informal economy: linkages with the formal economy and the formal regulatory environment*. DESA Working Paper No. 46. p.11. Available at: www.un.org/esa/desa/papers/2007/wp46_2007.pdf [Accessed on 17 November 2013].

29 A global research-policy-action network formed in 1997 to improve the status of women in informal sectors. Refer to wiego.org. See for example the following WIEGO papers: Budlender, D., 2011. *Statistics on informal employment in South Africa*. Statistical Brief No. 3; Heintz, J. and Valodia, I., 2008. *Informality in Africa: a review*. Working Paper No. 3; Wills, G., 2009. *South Africa's informal economy: a statistical profile*. Working Paper No. 6.

30 World Bank, 2012. *World development report 2013*. p.xiii.

31 Portes, A. and Sensenbrenner, J., 1993. Embeddedness and immigration: notes on the social determinants of economic action. *American Journal of Sociology*, 98(6), pp.1320-1350.

32 Skinner, C. and Valodia, I., 2001. Globalisation and women's work in South Africa: national and local approaches to economic transformation. *Agenda: Empowering Women for Gender Equity*, 48, pp.75–89.

33 Pieterse, 2006. *Globalisation as hybridization*. pp.662–663.

34 Kawooya, D., 2013. Informal-formal sector interactions in automotive engineering, Kampala. In: De Beer, J. *et al.*, 2013. *Innovation and intellectual property: collaborative dynamics in Africa*. Cape Town: UCT Press. Chapter 3, p.66.

35 The World Bank, 2010. *Doing business 2010: reforming through difficult times*. Washington DC: The World Bank/IFC. Table 1.1, p.1. See also www.doingbusiness.org.

36 Source is: Kawooya, 2013. Informal-formal sector interactions in automotive engineering, Kampala. pp.59–76.

37 Afrika J.-G. and Ajumbo, G., 2012. Informal cross-border trade in Africa: implications and policy recommendations. *Africa Economic Brief*, 3(10). Available at: www.afdb.org/fileadmin/uploads/afdb/Documents/Publications/Economic%20Brief%20-%20Informal%20Cross%20Border%20Trade%20in%20Africa%20Implications%20and%20Policy%20Recommendations%20-%20Volume%203.pdf [Accessed on 17 November 2013].

38 ???39 Perry, G., Maloney, W., Arias, O., Fajnzylber, P., Mason, A. and Saavedra-Chanduvi, J., 2007. *Informality: exit and exclusion*. Washington DC: The World Bank; OECD, 2009. *Competition policy and the informal economy*. Paper presented at the Global Forum on Competition – Roundtable on Competition Policy and the Informal Economy. Paris: OECD.

40 Lesser and Moisé-Leeman, 2009. *Informal cross-border trade and trade facilitation reform in Sub-Saharan Africa*.

41 Chen, 2007. *Rethinking the informal economy*.

42 In this informal world, the earlier African STI research, policy frameworks and support to researchers which focused on the formal sector, as evidenced by the African Science, Technology and Innovation Indicator (ASTII) initiative of the African Union, has been replaced by a growing emphasis on the informal sector. One of the key proponents is Mammo Muchie of Tshwane University, South Africa. See for example African Union–New Partnership for Africa's Development, 2010. *African innovation outlook 2010*. Pretoria: AU-NEPAD. Available at: www.nepad.org/system/files/June2011_NEPAD_AIO_2010_English.pdf [Accessed on 17 November 2013]; Muchie, M., Lundvall, B. and Gammeltoft, P. eds., 2003. *Putting Africa first: the making of African innovation systems*. Aalborg, Denmark: Aalborg University Press.

43 Godfrey, P.C., 2011. Toward a theory of the informal economy. *Academy of Management Annals*, 5(1), pp.231–277.

SINCERELY AFRICA

1 Ramose, M.B., 2004. Globalisation and ubuntu. In: P.H. Coetzee and A.P.J. Roux, eds. *The African philosophy reader*. 2nd ed. New York: Routledge. p.644.

2 See www.cscsb.org/restorative_justice/retribution_vs_restoration.html [Accessed on 28 October 2013].

3 See www.islamic-finance.com, a website produced by Kreatoc Limited and edited by Tarek El Diwany in London. The company provides research, publishing and trading services to the financial sector, posited within "alternative paradigms in banking and finance".

4 Helliwell, J.F., Layard, R. and Sachs, J. eds., 2013. *World happiness report 2013*. New York: UN Sustainable

Development Solutions Network. Available at www.unsdsn.org and www.earth.columbia.edu.

5 A treatment that would extend someone's life by one year in perfect health adds 1 QALY (Quality Adjusted Life Year). If it adds two years but the quality is only valued by the person at half-way between death (0) and perfect health (1), then it also provides 1 QALY (2 × ½).

6 Pirie, G., 2009. Virtuous mobility: moralizing vs measuring geographic mobility in Africa. *Afrika Focus*, 22(1). Available at: www.gap.ugent.be/africafocus/pdf/2GPirievol22a.pdf [Accessed on 21 November 2013].

7 Kane, L., 2006. Transport problems associated with poverty in South Africa. Paper presented at Southern African Transport Conference. Urban Transport Research Group, Department of Civil Engineering, University of Cape Town.

8 Juma, C. 2011. *The new harvest: agricultural innovation in Africa*. Oxford: Oxford University Press. p.17.

9 Wilson, E.O., 1998. *Consilience: the unity of knowledge*. New York: Alfred A. Knopf. p.282.

10 Extrapolated from the idea of a global carbon budget, allocated between countries using a "common but differentiated" methodology which sees developing countries getting an equity-adjusted share. Höhne, N. and Moltmann, S., 2009. *Sharing the effort under a global carbon budget*. Köln, Germany: Ecofys. Available at: www.ecofys.com/files/files/wwf_ecofyscarbonbudget.pdf [Accessed on 20 November 2013].

11 UN-Habitat, 2008. *Africa on the move: sustainable urbanisation: local action for urban poverty reduction, emphasis on finance and planning.* 2nd African Ministerial Conference on Housing and Urban Development, Abuja, Nigeria, 28–30 July, p.7. Available at: www.unhabitat.org/downloads/docs/amchud/bakg2.pdf [Accessed on 21 November 2013].

12 "The International Finance Corporation (IFC), the private sector branch of the World Bank Group, reports an 11% higher return from companies that demonstrate environmental and social standards." As at 2012, IFC standards were adopted by 70 financial institutions worldwide, and the world's largest agricultural financer, Rabobank, attached similar sustainability conditions to its investments. WWF. 2012. *Living planet report 2012: biodiversity, biocapacity and better choices*. Gland, Switzerland: WWF International. p.118.

13 There is a precedent: the Land Matrix is an online crowdsourced database aimed at promoting transparency and accountability in decisions over land and investment. See www.landportal.info/landmatrix.

14 World Economic Forum 2011. *Global risks 2011: an initiative of the Risk Response Network*. 6th ed. Geneva: World Economic Forum.

15 Juma, 2011. *The new harvest*. p.11.

16 Easterlin, R., 1974. Does economic growth improve the human lot? Some empirical evidence. In: P.A. David and M.W. Reder, eds. *Nations and households in economic growth: essays in honour of Moses Abramovitz*. New York: Academic Press. pp.89-125. Cited in: Sachs, J.D., 2011. *The price of civilization*. New York: Random House.

17 Altieri, M.A., Funes-Monzote, F.R. and Peterson, P., 2012. *Agroecologically efficient agricultural systems for smallholder farmers: contributions to food sovereignty*. Available at: download.springer.com/static/pdf/967/art%253A10.1007%252Fs13593-011-0065-6.pdf?auth66=1385180571_0eef93a326554c43abcc6d42a0bfba71&ext=.pdf [Accessed on 21 November 2013].

18 See Fred Kirschenmann, *The future of agriculture*. Available at: www.youtube.com/watch?v=8TDjIOsWtcA [Accessed on 20 November 2013].

19 See www.iita.org/intellectual-property, and www.worldchanging.com/archives/011597.html?utm_source=feedburner&utm_medium=feed&utm_campaign=Feed:+worldchanging_fulltext+(WorldChanging.com+Full+Text) [Accessed on 3 November 2013].

20 Zimmerer, K.S., 2010. Biological diversity in agriculture and global change. *Annual Review of Environment and Resources* 137.

21 Ashurst, M. and Mbithi, S., 2010. *Why Africa can make it big in agriculture*. Africa Research Institute. Available at: www.africaresearchinstitute.org/files/counterpoints/docs/Why-Africa-can-make-it-big-in-agriculture-IDXLFDDA4P.pdf [Accessed on 21 November 2013].

22 Ostrom, E., 1990. *Governing the commons: the evolution of institutions for collective action*. Cambridge: Cambridge University Press.

23 Refer to the International Co-operative Alliance website at ica.coop/en/what-co-op/co-operative-identity-values-principles.

24 ILO, 2013. *Resilience in a downturn: the power of financial cooperatives*. Geneva: ILO.

25 UN, 2009. *World urbanisation prospects, the 2011 revision*. The Population Division of the Department of Economic and Social Affairs of the United Nations. Available at: esa.un.org/unpd/wup/index.htm [Accessed on 21 November 2013].

26 See Potts, D., 2012. *Whatever happened to Africa's rapid urbanisation?* Africa Research Institute. Available at: www.kcl.ac.uk/sspp/departments/geography/people/academic/potts/PottsAfResInstWhateverHappnedtoAfRapidUrb.pdf [Accessed on 21 November 2013].

27 Cited in Potts, 2012. *Whatever happened to Africa's rapid urbanisation?*

28 See Potts, 2012. *Whatever happened to Africa's rapid urbanisation?*

29 It is projected that 59% of Africans (137 million people) between the ages of 15 and 24 will have high school education by 2030, while an estimated 12 million will have acquired tertiary education. See Promoting youth employment in Africa. Available at: www.africaneconomicoutlook.org/en/in-depth/youth_employment/ [accessed on 20 November 2013].

30 *African youth, technology and the diaspora: an interview with TMS Ruge*. Available at: buildingmarkets.org/blogs/blog/2011/10/19/african-youth-technology-and-the-diaspora-an-interview-with-tms-ruge/ [accessed on 21 November 2013].

31 Africa Development Bank, OECD Development Centre, UNDP and Economic Commission for Africa, 2011. African Economic Outlook: Youth Employment. Available at: www.africaneconomicoutlook.org/en/in-depth/youth_employment.

32 *Climate change resources migration: securing Africa in an uncertain climate* – a 2010 report of a conference called Climate Change, Resources, Migration: Old and New Sources of Conflict in Africa? hosted by the Heinrich Böll Foundation in August 2009 – argues that communities under (climate-

induced) stress can find ways to resolve conflicts without resorting to violence.

33 USAID, 2006. *Fragile States Indicators*. Available at: pdf.usaid.gov/pdf_docs/PNADG262.pdf; OECD, 2009. T*he economics of climate change mitigation: policies and options for global action beyond 2012*. Available at: www.oecd.org/env/cc/theeconomicsofclimatechangemitigationpoliciesandoptionsforglobalactionbeyond2012.htm [Accessed on 21 November 2013].

34 Moyo, D., 2012. *Winner takes all: China's race for resources and what it means for the world*. New York: Basic Books.

35 See *Who's behind the land grabs?* Available at: www.grain.org/article/entries/4576-slideshow-who-s-behind-the-land-grabs.pdf; *A study on land grabbing cases in Uganda*. Available at: reliefweb.int/sites/reliefweb.int/files/resources/Full_Report_3823.pdf [Both accessed on 20 November 2013].

36 Anseeuw, W., Alden Wily, L., Cotula, L. and Taylor, M. 2012. Land rights and the rush for land: findings of the Global Commercial Pressures on Land Research Project. Rome: International Land Coalition. Cited in: WWF, 2012. *Living planet report 2012*. pp.88-89.

37 Sanz, N., 2012. *Africa: the origins of humankind. Towards a better representation of human evolution in the framework of the World Heritage Convention* in: World Heritage Papers no. 33 HEADS 2: *Human Origin Sites and the World Heritage Convention in Africa*. Available at: whc.unesco.org/en/series/33/ [Accessed on 4 November 2013].

38 This is based on data compiled by the IMF which puts China's nominal GDP at $8.250 trillion for the year 2012. Note that China's per capita GDP of $5.184 ranks it 98 out of 183 countries in IMF's global GDP per capita rankings. International Monetary Fund, World Economic Outlook Database, October 2012: Nominal GDP list of countries.

39 See Potts, 2012. *Whatever happened to Africa's rapid urbanisation?* p.12.

40 Potts, 2012. *Whatever happened to Africa's rapid urbanisation?* p.13.

41 See www.msc.org, ic.fsc.org, www.rspo.org [Accessed on 2 November 2013].

42 See *Global trends 2030: alternative worlds*. A publication of the National Intelligence Council. Available at: info.publicintelligence.net/GlobalTrends2030.pdf [Accessed on 21 November 2013].

43 Juma, C., *Africa and Brazil at the dawn of new economic diplomacy*. Available at: belfercenter.ksg.harvard.edu/publication/22793/africa_and_brazil_at_the_dawn_of_new_economic_diplomacy.html [Accessed on 20 November 2013]. For an overview of the status of Brazil in the emerging new African partnership, see *Brazil in Africa: a new Atlantic alliance*. Available at: www.economist.com/news/21566019-brazilian-companies-are-heading-africa-laden-capital-and-expertise-new-atlantic-alliance [Accessed on 20 November 2013].

44 Recent attempts to introduce Chinese languages in public schools in Africa's most populous city state of Lagos, in Nigeria, provoked intense debate in that country's public arena, reflecting a sharply dividend citizenry who not only recognise China's status as an emerging power but who also have a sense of trepidation regarding what it forebodes for social cohesion in Africa. See *Lagos assembly divided over introduction of Chinese language*. Available at: www.osundefender.org/?p=38824 [Accessed on 20 November 2013].

45 See *The end of Igbo business model*. Available at: saharareporters.com/column/end-igbo-business-model-rudolf-ogoo-okonkwo; *70 Chinese arrested in Nigeria freed*. Available at: www.chinadaily.com.cn/cndy/2012-05/25/content_15383341.htm; *45 Chinese arrested in Nigeria for trading*. Available at: english.people.com.cn/90883/7826176.html [All accessed on 20 November 2013].

46 See *Uganda moves to evict Chinese competition in retail business*. Available at: communities.washingtontimes.com/neighborhood/africa-relayed/2012/oct/3/uganda-moves-evict-chinese-competitors-retail-busi/; *Malawi's new law targeting Chinese traders in rural areas draws criticism*. Available at: www.guardian.co.uk/global-development/2012/aug/09/new-law-targets-chinese-traders-malawi; *African entrepreneurs fighting back Chinese invasion*. Available at: atlantablackstar.com/2012/09/16/african-entrepreneurs-fighting-back-chinese-invasion/; *Africa's warm heart, a cold welcome for the Chinese*. Available at: www.reuters.com/article/2012/09/18/uk-africa-china-pushback-idUSLNE88H00F20120918.

47 Stiglitz, J.E., 2002. *Globalisation and its discontents*. London: Allen Lane. p.214.

48 Ghemawat, P., 2011. *World 3.0: global prosperity and how to achieve it*. Boston, Mass.: Harvard Business Review Press. p.30.

49 See *Life after the end of economic growth*. Available at: www.guardian.co.uk/commentisfree/2011/nov/30/end-of-growth [Accessed on 20 November 2013]; Heinberg, R., 2010. T*he end of growth: adapting to our new economic reality*. Gabriola Island, BC: New Society Publishers; Leonard, L. and Barry, J., 2010. *Global ecological politics*. Bingley: Emerald Group Publishing.

50 The future of the internet: a virtual counter-revolution. *The Economist*, 2 September 2010.

51 Ouma, M., 2013. The policy context for a commons-based approach to traditional knowledge in Kenya. In: J. De Beer, C. Armstrong, C. Oguamanam and T. Schonwetter, eds. *Innovation and intellectual property: collaborative dynamics in Africa*. Cape Town: UCT Press. p.136.

52 Cocchiaro, G., Lorenzen, J., Maister, B. and and Rutert, B., 2013. Consideration of a legal "trust" model for the Kukula Healers: TK commons in South Africa. In: De Beer, Armstrong, Oguamanam and Schonwetter, eds. *Innovation and intellectual property*.

53 See www.tkdl.res.in.

54 See www.wipo.int/portal/en/wipo_untv_maasai.html.

55 Ouma, 2013. The policy context for a commons-based approach to traditional knowledge in Kenya.

COMPARING SCENARIOS

1 Maccoby, M., Norman, C., Norman C.J. and Margolies, R., 2013. *Transforming health care leadership: a systems guide to improve patient care, decrease costs, and improve population health*. San Francisco: Jossey-Bass; Maccoby, M., 1995. *Why work? Motivating the new workforce*. 2nd ed. Alexandria: Miles River Press.

2 Baumann, Z., 2007. *Liquid times: living in an age of uncertainty*. Cambridge: Polity Press.

3 Mandela, N., 1995. *Long Walk to Freedom: The Autobiography of Nelson Mandela*. Boston: Little, Brown and Company. p. 374.

4 The World Bank, 2011. *World development report 2012: gender equality and development*.

Washington DC: The International Bank for Reconstruction and Development/The World Bank. Available at: siteresources.worldbank.org/INTWDR2012/Resources/7778105-1299699968583/7786210-1315936222006/Complete-Report.pdf [Accessed on 5 November 2013].

APPENDIX 1: A PRIMER ON INNOVATION AND INTELLECTUAL PROPERTY

1 This primer is drawn from: De Beer, J., 2013. Innovation and intellectual property: a policy primer. Open A.I.R. Working Paper.

2 Organisation for Economic Cooperation and Development, 2005. *Oslo manual: proposed guidelines for collecting and interpreting technological innovation data*. 3rd ed. Paris: Organisation for Economic Cooperation and Development.

3 Christensen, C.M., 1997. *The innovator's dilemma: when new technologies cause great firms to fail*. Boston: Harvard Business School Press.

4 Garcia, R. and Calantone, R., 2003. A critical look at technological innovation typology and innovativeness terminology: a literature review. *The Journal of Product Innovation Management*, 19, pp.110-132.

5 Garcia and Calantone, 2003. A critical look at technological innovation typology. pp. 126-127.

6 McCarthy, I.P., Lawrence, T.B., Gordon, B.R. and Wixted, B., 2010. A multidimensional conceptualization of environmental velocity. *Academy of Management Review*, 35(4), pp.604-626.

7 Smith, A., 1776. *The wealth of nations*. New York: Random House.

8 Marshall, A., 1920. *Principles of economics*. London: Macmillan and Company.

9 Schumpeter, J.A., 1934. *The theory of economic development*. Cambridge: Harvard University Press. doi:10.1080/03085140802357927.

Schumpeter, J.A., 1942. *Capitalism, socialism and democracy*. New York: Harper & Brothers. doi:10.2307/2549943.

10 Rostow, W.W., 1960. *The stages of economic growth: a non-Communist manifesto*. Cambridge: Cambridge University Press.

11 Solow, R., 1957. Technical change and the aggregate production function. *Review of Economics and Statistics*, 39(3), p.312.

12 See also Hirschman, A.O., 1958. *The strategy of economic development*. New Haven: Yale University Press. p.251; Pred, A., 1965. Industrialization, initial advantage, and American metropolitan growth. *Geographical Review*, 55(2), pp.158-185.

13 Hoselitz, B.F., 1960. *Sociological aspects of economic growth*. Glencoe, IL: Free Press; Lipset, S.M., 1959. Some social requisites of democracy: economic development and political legitimacy. *The American Political Science Review*, 53(1), pp.69-105. doi:10.2307/1951731; Parsons, T., 1966. *Societies: evolutionary and comparative perspectives*. Englewood Cliffs: Prentice-Hall. p.120.

14 McClelland, D.C., 1961. *The achieving society*. Princeton: Van Nostrand.

15 Hagen, E.E., 1962. *On the theory of social change: how economic growth begins*. Homewood, IL: Dorsey Press.

16 Nelson, R.R. and Winter, S.G., 1977. In search of useful theory of innovation. *Research Policy*, 6(1), pp.36-76. doi:10.1016/0048-7333(77)90029-4; Nelson, R.R. and Winter, S.G., 1982. *An evolutionary theory of economic change*. Boston: Harvard University Press.

17 Edquist, C., 1997. *Systems of innovation: technologies, institutions, and organizations*. New York: Pinter; Freeman, C., 1987. *Technology policy and economic performance: lessons from Japan*. London: Pinter; Lundvall, B.-Å. ed., 1992. *National systems of innovation: towards a theory of innovation and interactive learning*. London: Pinter.

18 Organisation for Economic Cooperation and Development, 2005. *Oslo manual*. p.15.

19 Sen, A., 1999. *Development as freedom*. Oxford: Oxford University Press.

20 Nussbaum, M.C., 2001. *Women and human development: the capabilities approach*. Cambridge: Cambridge University Press; Nussbaum, M.C., 2011. *Creating capabilities*. Cambridge, Mass.: Belknap Press of Harvard University Press. p.256

21 Sen, 1999. *Development as freedom*.

22 Nussbaum, 2001. *Women and human development*; Nussbaum, 2011. *Creating capabilities*.

23 Ely, A. and Bell, M., 2009. *The original "Sussex manifesto": its past and future relevance*. Brighton: STEPS Centre. pp.1-48; Muchie, M., Lundvall, B.-Å. and Gammeltoft, P. eds., 2003. *Putting Africa first: the making of African innovation systems*. Aalborg: Aalborg University Press. doi:10.1016/j.amjmed.2012.04.013.

24 Drahos, P. and Frankel, S. eds., 2012. *Indigenous peoples' innovation: intellectual property pathways to development*. Canberra: Australian National University E Press.

25 Juma, C. and Yee-Cheong, L., 2005. *Innovation: applying knowledge in development*. London: Earthscan; Kraemer-Mbula, E. and Wamae, W. eds., 2010. *Innovation and the development agenda*. Paris: Organisation for Economic Cooperation and Development.

26 AU-NEPAD, 2010. *African innovation outlook, 2010*. Pretoria: AU-NEPAD; Gault, F., 2010. *Innovation strategies for a global economy*. Ottawa: International Development Research Centre.

27 International Development Research Centre, 2011. *Innovation for inclusive development: program prospectus for 2011-2016*. Ottawa: International Development Research Centre; Organisation for Economic Cooperation and Development, 2012. *Innovation and inclusive development*. Available at: www.oecd.org/sti/inno/oecd-inclusive-innovation.pdf [Accessed on 28 October 2013].

28 Chesbrough, H., 2003. *Open innovation: the new imperative for creating and profiting from technology*. Boston: Harvard Business School Press. p.xxiv.

29 Dahlander, L. and Gann, D.M., 2010. How open is innovation? *Research Policy*, 39(6), pp.699-709; Fredberg, T., Giannopoulou, E., Yström, A., Ollila, S. and Elmquist, M., 2010. Implications of openness: a study into (all) the growing literature on open innovation. *Journal of Technology Management & Innovation*, 5(3), pp.162-180; Huizingh, E.K., 2011. Open innovation: state of the art and future perspectives. *Technovation*, 31(1), pp.2-9; Lichtenthaler, U., 2011. Open innovation: past research, current debates, and future directions. *Academy of Management Perspectives*, 25(1), pp.75-93; Vanhaverbeke, W., Van de Vrande, V., Gassmann, O., Chesbrough, H. and Crowther, A.K., 2010. Broadening the scope of open innovation: past research, current state and future directions. *International Journal of Technology Management*, 52(3), pp.221-235; West, J. and Bogers, M., 2011.

Profiting from external innovation: a review of research on open innovation. Ninth International Open and User Innovation Workshop, Vienna, Austria, 6 July. Available at: papers.ssrn.com/sol3/papers.cfm?abstract_id=1949520 [Accessed on 29 October 2013]; West, J. and Bogers, M., 2013. *Leveraging external sources of innovation: a review of research on open innovation*. Available at: papers.ssrn.com/sol3/papers.cfm?abstract_id=2195675 [Accessed on 29 October 2013]; West, J. and Lakhani, K.R., 2008. Getting clear about the role of communities in open innovation. *Industry and Innovation*, 15(2), pp.223-231.

30 Von Hippel, E., 2005. *Democratizing innovation*. Cambridge, Mass.: MIT Press. doi:10.1111/j.1540-5885.2006.00192_2.x.

31 Benkler, Y., 2006. *The wealth of networks: how social production transforms markets and freedom*. New Haven: Yale University Press.

32 Shirky, C., 2009. *Here comes everybody: the power of organizing without organizations*. Toronto: Penguin Press. p.352.

33 De Beer, J., Fu, K. and Wunch-Vincent, S., 2013. *The informal economy, innovation and intellectual property – concepts, metrics and policy considerations*. WIPO Economics & Statistics Series. Economic Research Working Paper No. 10. Available at: www.wipo.int/export/sites/www/econ_stat/en/economics/pdf/wp10.pdf [Accessed on 28 October 2013]; Gupta, A.K., 2012. Innovations for the poor by the poor. *International Journal of Technological Learning, Innovation and Development*, 5(1/2), pp.28-39.

34 Ginarte, J.C. and Park, W.G., 1997. Determinants of patent rights: a cross-national study. *Research Policy*, 26(3), pp.283-301.

35 Park, W.G., 2008. International patent protection: 1960–2005. *Research Policy*, 37(4), pp.761-766. doi:10.1016/j.respol.2008.01.006.

36 Park, W.G. and Lippoldt, D., 2005. International licensing and the strengthening of intellectual property rights in developing countries during the 1990s. *OECD Economic Studies*, 40(1), pp.7-48; Reynolds, T.W., 2003. Quantifying the evolution of copyright and trademark law. Unpublished PhD thesis, Department of Economics, American University.

37 Dutta, S. and Lanvin, B., 2013. *The global innovation index 2013: the local dynamics of innovation*. Available at: www.globalinnovationindex.org/content.aspx?page=GII-Home [Accessed on 28 October 2013].

38 Schwab, K., 2012. *The global competitiveness report 2011–2012*. Geneva: World Economic Forum.

39 Greenhalgh, C. and Rogers, M., 2010. The nature and importance of innovation. In: C. Greenhalgh and M. Rogers. *Innovation, intellectual property, and economic growth*. Princeton: Princeton University Press.

40 Landes, W.M. and Posner, R.A., 2003. *The economic structure of intellectual property law*. Cambridge, Mass.: Harvard University Press.

41 Scotchmer, S., 2004. *Innovation and incentives*. Cambridge, Mass.: MIT Press.

42 Maskus, K.E., 2012. *Private rights and public problems: the global economics of intellectual property in the 21st Century*. Washington DC: Peterson Institute for International Economics.

43 Maskus, 2012. *Private rights and public problems*. p.63.

44 See for example Hall, B.H. and Ziedonis, R.H., 2001. The patent paradox revisited: an empirical study of patenting in the U.S. semiconductor industry, 1979–1995. *The RAND Journal of Economics*, 32(1), p.101. doi:10.2307/2696400.

45 WIPO, 2011. *World intellectual property report 2011: the changing face of innovation*. World Intellectual Property Organisation. Available at: www.wipo.int/export/sites/www/freepublications/en/intproperty/944/wipo_pub_944_2011.pdf [Accessed on 29 October 2013].

46 Maskus, 2012. *Private rights and public problems*.

47 Maskus, 2012. *Private rights and public problems*. p.81.

48 Maskus, 2012. *Private rights and public problems*. p.91. See also Park, W.G. and Lippoldt, D.C., 2008. *Technology transfer and the economic implications of the strengthening of intellectual property rights in developing countries*. OECD Trade Policy Working Paper No. 62. Available at: nw08.american.edu/~wgp/park_lippoldt08.pdf [Accessed on 28 October 2013].

49 See for example Drahos, P. and Braithwaite, J., 2002. *Information feudalism: who owns the knowledge economy?* London: Earthscan; May, C., 2010. *The political economy of intellectual property rights*. 2nd ed. New York: Routledge; May, C. and Sell, S.K., 2005. *Intellectual property rights: a critical history*. Boulder: Lynne Rienner; Oguamanam, C., 2011. *Intellectual property in global governance*. New York: Routledge; Sell, S.K., 2003. *Private power, public law: the globalization of intellectual property rights*. New York: Cambridge University Press.

50 Bessen, J. and Maskin, E., 2009. Sequential innovation, patents, and imitation. *The RAND Journal of Economics*, 40(4), pp.611-635. doi:10.1111/j.1756-2171.2009.00081.x.

51 Heller, M.A. and Eisenberg, R.S., 1998. Can patents deter innovation? The anticommons in biomedical research. *Science*, 280, pp.698-701.

52 Heller, M.A., 1998. The tragedy of the anticommons: property in the transition from Marx to markets. *Harvard Law Review*, 111(3), pp.621-688; Heller, M.A., 2008. *The gridlock economy*. New York: Basic Books. p.304.

53 Hardin, G., 1968. The tragedy of the commons. *Science*, 162(3859), pp.1243-1248. doi:10.1126/science.162.3859.1243.

54 Shapiro, C., 2001. Navigating the patent thicket: cross licences, patent pools and standard setting. In A.B. Jafffe, J. Lerner and S. Stern, eds. *Innovation policy and the economy*. Cambridge, Mass.: MIT Press.

55 Hall, B., Helmers, C., Von Greevenitz, G. and Rosazza-Bondibene, C., 2012. *A study of patent thickets*. Report prepared for the UK Intellectual Property Office. Available at: elsa.berkeley.edu/~bhhall/papers/HHvGR_Patent_Thickets_FIN_29Oct12.pdf [Accessed on 28 October 2013].

56 Hess, C. & Ostrom, E., 2006. Introduction: an overview of the knowledge commons. In: C. Hess and E. Ostrom, eds. *Understanding knowledge as a commons: from theory to practice*. Cambridge, Mass.: MIT Press. pp.4-5.

57 Ostrom, E., 1990. *Governing the commons: the evolution of institutions for collective action*. Cambridge, UK: Cambridge University Press.

APPENDIX 2: BUILDING AND USING THE OPEN A.I.R. SCENARIOS

1 Ingvar, D., 1985. Memories of the future, an essay on the temporal organisation of conscious awareness. *Human Neuro-biology*, 1985/4, p 127–136. Rumelhart, D.E., 1980. Schemata, the building blocks of

cognition. In: Spiro, R.J., Bruce, B.C. and Rewer, W.F. (eds) *Theoretical Issues in Reading Comprehension*. Erlbaum, Hillsdale NJ. Cited in: K. van der Heijden, 1996. *Scenarios: the art of strategic conversation*. Chichester: John Wiley and Sons. p.116.

2 Vygotsky, L.S., 1986. *Thought and language*. Cambridge, Mass.: MIT Press.

3 Elahi, S., 2008. Conceptions of fairness and forming the common ground. In: R. Ramirez, J.W. Selsky and K. van der Heijden, eds. *Business planning for turbulent times*. London and Sterling, VA: Earthscan. pp.223241.

FURTHER READING ON SCENARIOS

Ramirez, R., 2008. Scenarios providing clarity to address turbulence. In: R. Ramirez, J. Selsky and K. van der Heijden, eds. *Business planning for turbulent times: new methods for applying scenarios*. London and Sterling, VA: Earthscan.

Shell, 2003. *Scenarios: an explorer's guide*. London: Global Business Environment, Shell International Ltd.

Van der Heijden, K., 1996. *Scenarios: the art of strategic conversation*. Chichester: John Wiley and Sons.

Wack, P., 1985. Scenarios: shooting the rapids. *Harvard Business Review*, November. Available at: hbr.org/1985/11/scenarios-shooting-the-rapids/ar/1 [Accessed on 28 October 2013].

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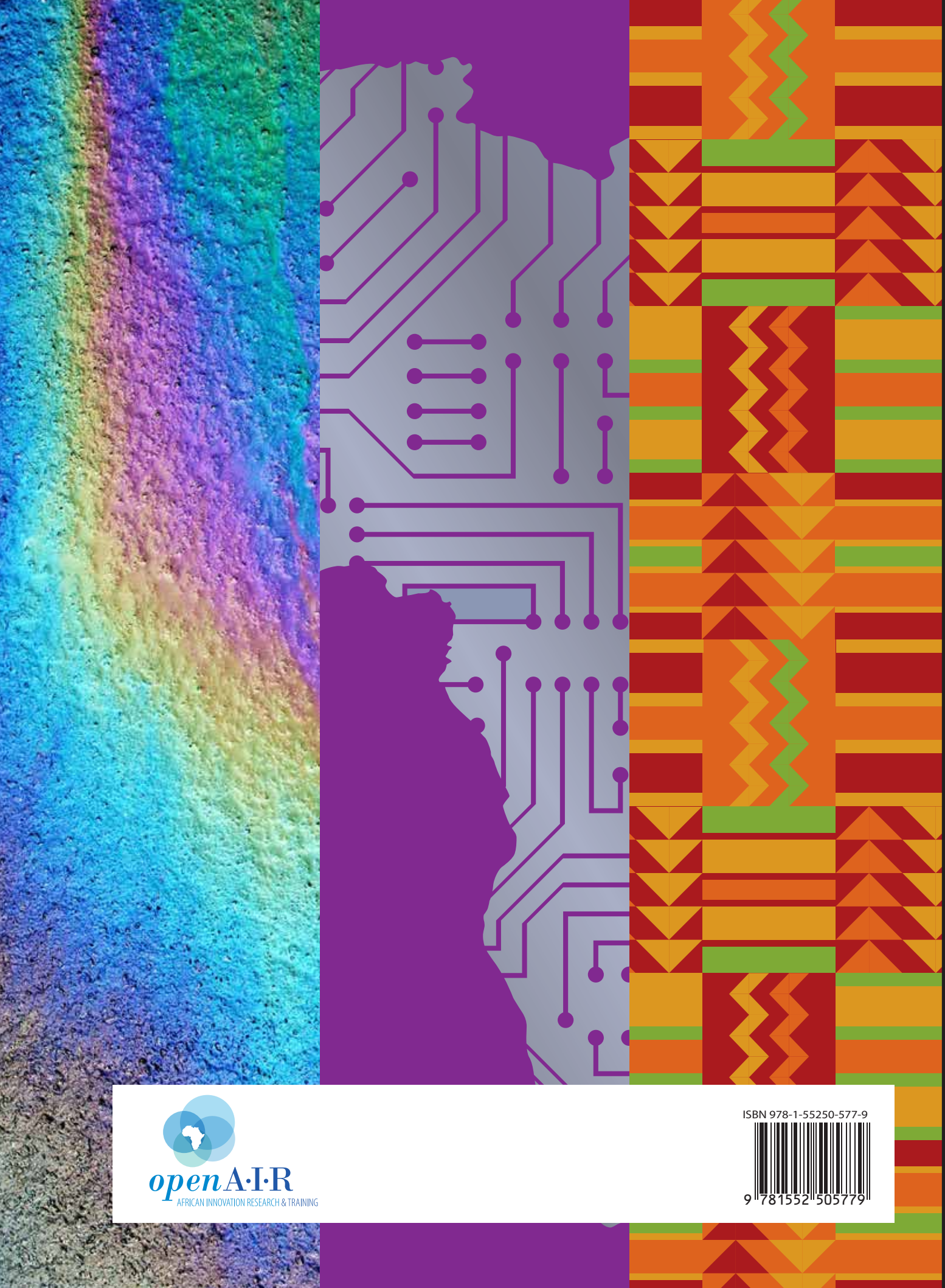
Photos taken during launch of Open A.I.R. scenarios at the *Open A.I.R. Conference on Innovation and IP in Africa* (9-11 December 2014)



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AFRICAN INNOVATION RESEARCH & TRAINING

ISBN 978-1-55250-577-9