



SUBVERTING, DISENCHANTING AND RATIONALIZING STI SYSTEMS FOR REVEALING MODERNITY IN AFRICA

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Abstract: The paper provides a speculative reflection on the power of modern science, technology and innovation systems (STI) for revealing some distinctive style of modernity in Africa. The modernization of these systems, as the backbones of any mode of modernity, also requires the modernization of our mental or intellectual costumes. This process is essentially the passage from closed, self-confirming, faith-based, customary, totalizing or terrorizing knowledge systems to essentially falsifiable, evidence-based, scientifically-established and technically-proven innovative knowledge systems. In these systems scientific knowledge can be construed as a theory of the real and as a technology of truth and understood as the epistemological foundation of any form of Afro-modernity. It is also the passage from the 'Book of Scripture' to the 'Book of Nature' or from the submission to the white man's colonizing gods to the more authentic and genuine African identities, beliefs and values, such as those embodied in the concept of *ubuntu*. The paper discusses a possible way forward in terms of capacity development in STI in Africa with an emphasis on some observed weaknesses regarding fundamental long term neglected issues. It provides some ideas for filling gaps in the context of the call by a number of African thinkers, including the Executive Secretary of UNECA, for initiating a 'scientific revolution' on the African continent.

Keywords: Africa, innovation, innovation systems, STI, capacities, science, technology, knowledge, modernity, MDGs

INTRODUCTION

In spite of a series of new initiatives and renewed political will the way forward in capacity development in STI in Africa remains a major challenge. This paper discusses some of these challenges and outlines promising and achievable policy orientations that could bring about more rapid and paradigmatic change. This paradigmatic shift should be toward modern or scientific ways

of knowing and understanding. This requires championing the scientific method, the rule of technique and innovation as well as promoting decisive scientific arbitrations, increased technical mediations and a redefinition of STI's relationships with religious, cultural, social and economic life.

For this shift to occur there is a need to better appreciate modern science as a method of both calculative and subversive

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thinking, as a means of achieving the systematic renovation of conventional/medieval/pre-modern realities and as a way to reconstruct and re-order African realities from fresh fundamentals and from the latest scientific insights. This may require strengthening various capacities to probe, undermine and rationalize oppressive systems (religious, cultural, social, economic, political). It may also require re-cosmologizing, re-mythologizing, 're-prophetizing', re-charlatanizing and re-directing the evolution of the African reality toward a region free of wishful thinking, fallacies, lies, superstitions, prejudices, magic and witchcraft and toward an Islam-free and Christian-free scientifically-informed free-thinking innovative post-colony.

In this perspective rejuvenating knowledge systems and purging Abrahamic and Shamanic worldviews of non-scientific constituents can open a path from the mostly totemic, enchanted, mystified, supernatural, patriarchal/phallocratic and over-religious worldviews and mindsets of pre-modern Africa to the more desacralized, secular, rational, liberal, enlightened and autonomous worldviews and mindsets of modernity.

Whatever theories of knowledge (Audi, 1998), of science (Kuhn, 1962), of innovation (Muchie, 2003a), of development (Preston, 1996) and of modernity (Heller, 1999) one embraces, the essence of the Millennium Development Goals (MDGs) cannot be met and there is no access to an Afro-modernity of any kind without the rigorous exploitation and use of modern science, technology and innovation. Effective STI systems drive countries forward along the development ladder and along the transition to some kind of modernity. Paradigmatic innovation may be necessary for this transition and for overcoming poverty and hunger – the essence of MDGs – and this cannot be achieved without upgrading and modernizing innovation

systems. It cannot be achieved without new visions, new paradigms and new strategies. This is what this paper is about.

Many African countries are making remarkable progress in STI and in knowledge in spite of meager budgetary resources and important pre-modern cosmological, cultural, linguistic, social, economic and political complexities and difficulties. The progress is real and encouraging, even spectacular in some cases (RSA, Morocco, Tunisia, Egypt...), even though government pledges are not fulfilled. But much of the region has been historically incapable of fully exploiting the power of modern STI systems for development. This might not change fundamentally without a paradigms shift, something that is being heard more and more in STI meetings and conferences. Scientific and technical capacities indeed remain low, with relatively few autonomous and unconstrained thinkers, scholars and intellectuals, and relatively few researchers, scientists, engineers, technicians, doctors, publishers, patentees and *Internauts* per capita. There is also a low capacity to give a significant content to the idea of paradigms shift and 'scientific revolution' and relatively few theorists and sages capable of truly 'thinking outside the box', that is outside received dogmas, creeds, doctrines, beliefs, canons, taboos and cultures. This low capacity is documented in great details and do not need to be discussed further here.

Increasing capacities for launching a 'scientific revolution' and uncovering some variety or brand of Afro-modernity requires specific strategies and related capacities that are presently weak. It requires strategic capacities to carry out uphill struggles and expend considerable efforts 'simultaneously' on an extensive range of battlefronts or battlegrounds. These have been summarized under eight areas.

The first area of capacity development focuses on linking effective visions and strategies of innovation and on building or strengthening the necessary fundamental capacities to meet the spirit of MDGs and to uncover a modern and novel Africa. Effective visions should be based on those developed by the best of a host of African thinkers, theorists, intellectuals, writers, academicians, scholars and politicians during the last 50 years and on those of the *Philosophes des Lumières*, who shaped and advanced the values, ideals and principles underlying the ambitious project of modernity. These call for assembling related critical innovative thinking, policy-making and management capacities for developing modern, effective, liberal, free, dynamic and open STI systems.

The second area deals with the strengthening of capacities to put in place a conducive or enabling climate for the modernization of STI systems, stressing a Renaissance or a revival perspective, faith in instrumental rationality, intellectual vigor, equal opportunities, true or factual knowledge and modern-day mythologies. The enabling climate should facilitate or enable (1) the scientization (secularization/rationalization/disenchantment/demystification/enlightenment) of African societies, (2) the sacralization of the scientific method and a science-based or evidence-based knowledge order, (3) the recognition of the full freedoms and rights of individuals (autonomization) as an important driving force for advancing scientific cultures and for accessing modernity, and (4) the renovation of technological codes (codification) for facilitating technologization processes.

The third area of capacity development highlights the importance of capacities in leadership, entrepreneurship and commitment to innovation and to modernity,

in line with the African STI policy narrative agreed at the level of Heads of State (Renaissance principles adopted by OAU in 2000 and commitment regarding R&D and S&T adopted by AU in 2007). The African development agenda has to be more in the hands of Africans and less dependent on foreign policy narratives, wisdom, ideologies, aids and hand-outs.

The fourth area underlines the necessary capacities to develop the systemic and synergistic aspects of a set of two dozens typical STI institutions, constituting the major policy instruments of a 'standard' STI system. Here the popular modern innovation system narrative has to be somewhat deconstructed and re-contextualized for pre-modern cosmological, theological, intellectual, cultural, linguistic, social and economic settings.

The fifth area of capacity development underscores the capacities to forge partnerships and other forms of collaboration to advance modern STI systems. Nowadays no country - large or small - can advance an STI agenda alone. Every country needs to develop internal and external relationships, such as sharing, associations, linkages, twinings, alliances and joint ventures.

The sixth area focuses on capacities to advance Pan-Africanism, regional integration of STI systems and the sharing of STI resources, expertise, institutional assets and markets. This is an area where African countries could and should be making more progress. Without more integration and unity Africa may be too fractured, divided, fractioned and balkanized to access modernity.

The seventh area concentrates on capacities to fund and invest in STI programs and activities - an area historically rich in

government or public promises and pledges but rather poor in follow-up and implementation. Public investments in STI have to at least double, as already agreed by African Heads of State, to jumpstart the transition to modernity. Private investments in available technologies (FDI = \$US 50 billion in 2007), on the other hand, could increase dramatically in the years ahead as they reveal resource-rich Africa as an immense energy reserve and fuel station universally coveted for powering the global technological engine.

The eighth area draws attention to meeting the emerging challenges of innovative knowledge societies, economies, networks and management. Here there is a need to inject more 'Enlightenment' and scientific knowledge into African STI systems, cosmologies, idioms, religions, beliefs and cultures, in order to reveal the face of a distinctive Afro-modernity - hopefully not as eco-violent, disillusioned, melancholic and material as the North Atlantic mode of modernity. And there is a need to understand that knowledge is not additive but transformative. That means that some knowledge, acquired through acculturation and socialization, has to be unlearned, deleted or subtracted to make room for new knowledge and new worldviews. The main difficulty lies not in acquiring new knowledge but in escaping the old ones.

In conclusion African stakeholders could be urged to build capacities to realize a 'scientific revolution' and to investigate, undermine and transform pre-modern STI systems with up to date scientific cosmologies, traditions, reasonings, practices, processes, principles, methods, facts and insights. They could be encouraged to re-imagine the African region as a post-totemic, disenchanting, secular, post-phallographic, scientifically-literate and more innovative one.

CAPACITIES TO LINK VISIONS OF MODERNITY AND STRATEGIES OF INNOVATION

There is a need to strengthen capacities to formulate coherent and effective visions of modernity and build appropriate capacities and strategies of innovation, which would include substantial subversion, disenchantment and rationalization components. There is a need to better link visions and strategies. And there is a need to fill the lack of vision and strategy behind MDGs. Without a generous vision and a workable strategy access to an authentic form of modernity in Africa will remain elusive.

Various development strategies have been formulated around the idea of building capacities to innovate, lead, leapfrog, assimilate, follow, imitate, differentiated by countries, regions, sectors or enterprises. Other strategies have revolved around building capacities to exploit available technology, particularly new technologies, such as bio, agro, nano and geo. More recent strategies have focused on digital technologies and ICTs - currently the most powerful technologies for transforming the African region and for accessing modernity - on knowledge management, on upgrading indigenous knowledge and technologies, on technology transfer or on scientific research. Climate change is also emerging as a vital issue that needs to be addressed through science and mitigation and adaptation strategies.

But some important elements of any successful strategy for accessing modernity are still missing because religion in Africa will "largely shape development in the 21st century" (Ellis, 1998) as it has in the 20th century: "When the missionaries arrived, the Africans had the land and the missionaries had the Bible. They taught us to

pray with our eyes closed. When we opened our eyes, they had the land and we had the Bible” (Jomo Kenyatta).

A strategy that can be considered is a complementary one addressing some neglected - if not ignored - aspects of STI for development in the African context. The complementary strategy could rely on the vision of a reborn, renewed or reawakened Africa developed by a dozen African leaders since the 1960s, on the one hand, and, on the other hand, it could rely on the vision of the Enlightenment philosophers and thinkers who designed the ideological project of modernity in the first place.

Innovation and Subversion Capacities

The performance of African innovation systems depends on capacities to subvert current cosmological, religious, cultural, social, economic and political orders. These may include the capacities to question, overthrow or overturn systems of principles and convictions as well as forms of dominance, control and power incompatible with or not sustained by individuation, autonomy, subjectivity, self-determination, democratic rationality and other features of modernity (*“Every great advance in knowledge has involved the absolute rejection of authority”* - Thomas Huxley). They may include capacities to reconstruct prior assumptions and reevaluate known facts, to challenge existing shared fundamental conjectures and overcome established community resistance. They may also include capacities to evolve more pragmatic, empirical, disillusioned and mechanical worldviews.

Capacities to subvert lethargic STI systems in the African region may include capacities to expose theoretical anomalies that can no longer be ignored and dispute old

truths that do so much violence to known realities. “The truth that makes men free is for the most part the truth which men prefer not to hear” (Herbert Agar). They may consist of capacities to challenge sacred or religious totalizing structures and to challenge undemocratic political and governance configurations (*“In religion and politics people’s beliefs and convictions are in almost every case gotten at second-hand, and without examination, from authorities who have not themselves examined the questions at issue”* - Mark Twain). They may comprise capacities to trigger and set off far-reaching radical changes, including scientifically and technologically-induced socio-cultural changes and socio-culturally induced scientific and technological changes (*“Time destroys all things”* - Nigerian Proverb).

Subversion capacities are needed to go well beyond symptoms and wishful thinking and get at the roots of African underdevelopment.

Subversion capacities should also include capacities to ‘de-privatize’ (many) African States and privatize economies (including farming lands). These capacities constitute basic pillars of performing innovation system and modernity.

Innovation and Disenchantment Capacities

Innovation systems are not very performing when buried under thick layers of outdated cosmologies, ancient mythologies, dyed-in-the-wool superstitions and prejudices, and modern lies and deceptions. “That which has always been accepted by everyone, everywhere, is almost certain to be false” (Paul Valery). There is a need to strengthen disenchantment capacities for liberating African STI systems, stuck in pre-modernity under their own weight and according to their

own logic and dynamic. These may include capacities to strip reality of supernatural entities and causes, of spirits, of angels, of heavens, of demons, of miracles, of prophecies, of revelations, of gods...and deal with a naked reality, freed from the debris of history. They may comprise capacities to discover and unlearn flawed accounts of realities acquired through acculturation, socialization and education. They may consist of capacities to denounce, condemn and overcome pre-modern defective theological and ideological formations, whether home-grown or alien.

Disenchantment capacities also means capacities to evolve effective symbols and meanings, such as those of a generous and mobilizing vision of a modern Africa, and to 'sciencize' or 'technicize' or 'disenchant' indigenous languages (Wiredu, 1992). They may include capacities to comprehend scientific revolutions and move beyond Imperial Islam, Constantinian Christianity, Magical Witchcraft and Mystical Shamanism. And they may comprise capacities to guide the disenchantment or the 'rebirth' of the self, or to cultivate the 'reborn' Afro-self as a more worldly, material, fluid, secular, fragmented, mature, autonomous, skeptical, inquisitive, global and modern self ("*To reconstruct our very selves on a continuing basis ... is one of the most important meanings of technology*" - L. Hickman).

Disenchantment capacities are crucial for the performance of innovation systems because "we don't see things as they are, we see things as we are" (Anais Nin). Indeed, "reality is merely an illusion, albeit a very persistent one" (Albert Einstein).

Innovation and Rationalization Capacities

Rationality is at the heart of the modernity project and modernizing STI systems

means building capacities to rationalize these systems. This rationalization requires capacities to absorb the scientific method, be guided by instrumental reason and practice science in new ways. It requires capacities to 'mathematize' and channel the forces of nature and apply accurate calculation of technical means to achieve precise ends for human purposes. It also requires capacities to design and manufacture modern material artifacts and appropriate technologies ("*Africans do not advance technologically, not because they are primitive, undeveloped, but because their distinct mental orientation gives them different pursuits and methods ...the African turn of mind does not encourage technology*" - Mesai Kebede).

Rationalization capacities also means capacities to trim down uncanny STI processes and absurd transaction costs (WB estimates that it takes an average of 68 days before exports are allowed to leave Angola, including 25 days to prepare documents, eight days to clear customs and another 24 days to get through port). It means capacities to reorder traditional agriculture by cutting down on or by reordering mythological inputs: long periods of fasting (half the year in some African countries), numerous religious holidays, prayers for rain, no pork or wine or beer, sacrificial massacre of goats, holy water, women role as food purveyors, girls exclusive burdening role, children as fences, fear of 'unnatural' or ungodly biotech and GM crops, etc. It means capacities to appreciate that scientific illumination, technical action and modernity offer only a partial escape from the human condition. And it means capacities to uncover, produce or reconstruct truth through the scientific method - an essential technology in a sea of lies, half-truths, self-delusions, clichés, cock-and-bull stories, and an important constitutive element of modernity ("*All truth begins in blasphemy*" - G. Bernard-Shaw).

These capacities may be required to unleash the full power of modern STI systems and reveal a unique form of artistic and ingenious Afro-modernity. Rationalization capacities must be strengthened for dynamizing African innovation systems. But building these capacities may require putting in place an enabling climate of innovation.

CAPACITIES TO CREATE A CONDUCTIVE, ENABLING CLIMATE OF INNOVATION

There is a need to improve the climate of innovation in African countries if any kind of a modern region is to emerge. This can be done by increasing capacities for the scientization and secularization of the continent; for the sacralization of the scientific method; for the liberation of the individual (individuation processes); and for the revision of technological codes. These may be needed for underpinning and sustaining the development of effective STI systems and for revealing authentic Afro-modernities.

Innovation and Secularization Capacities

Science is essentially an atheistic venture or undertaking built on a rejection of religious authority, supernatural or 'divine' causes or explanations, sacred revelations, witchcraft, evil spirits, ancestors worshipping, customary healing, reincarnation and other faith-based beliefs necessarily giving rise to more secular, laicized and disenchanting societies than long-established over-religious or over-shamanized African ones. Faith-guided knowledge systems that force nature into fixed old boxes do not belong to modernity.

Given these facts, it may be necessary to question Abrahamic universes, canons and dogmas, which rule or domesticate the

lives of 90% of Africans (according to themselves), and which unfortunately provide few escape routes: less than 1 in a 1000 succeeds in breaking away from the Abrahamic system of beliefs he/she is born in. This medieval trapping (thinking, understanding, believing) may lock a majority of Africans in pre-modernity for a very long time, with little hope of getting away and graduating into some variety of modernity. "It is always easier to believe than to deny, our minds are naturally affirmative" (John Burrough) and "the public will believe anything, so long as it is not founded on truth" (Edith Sitwell).

What is needed is more religious freedom and less theocratic interference in the democratization of science (Haynes, 2004), the freedom to reject inherited systems of beliefs and the freedom to choose one's own religion. All these freedoms are in very short supplies. Africa may not be able to shine scientifically and technologically if it cannot innovate cosmologically, theologically, religiously, culturally, socially and politically and it may not be able to access any form of true modernity if it does not provide full freedoms to individuals as guaranteed by modern States.

The Abrahamic system of beliefs places humans outside, beside or above nature, as supernatural beings, created in the image of God. This Abrahamic conception of humans, coupled with an instrumental/utilitarian view of technology, has a tendency to turn nature into a consumable or a pure object of consumption. Such a view is utterly flawed as shown by the vengeance with which nature reminds humans that they are indeed integral parts of her and threatens them with climate change and eventual destruction. By destroying nature, including driving species to extinction, humans destroy themselves, as has been often said. Hence the urgent need to question

the Abrahamic view of humans and their place in nature.

In order for STI systems to fully operate on many African societies it is necessary to rid existing worldviews of shamanic mysticism or magic, providential or divine intrusions, amazing archangels, absurd limbos, far-fetched miracles, occult forces and charlatan tactics, pretenses, frauds and deceptions. Imported Evangelical or *Qur'anic* models of reality, although of relatively recent human constructions and bearer of positive civilizational values, lack other decisive values for opening the door to modernity, such as democratic governance (without interference from divine powers); the full utilization of feminine talents and aptitudes (down for ever with pre-modern Shamanic, Islamic and Christian theocratic phallogenies!); affection and care for nature (re-centering humans in nature); a concern for the future (down here); superiority of scientific methods and hypotheses over 'gaseous' prophetic knowledge; a strong focus on life before death; and a less fatalistic attitude toward poverty and destiny.

Imagining, contemplating and valuing a life after death provides hope and an escape for this life but it also devalues life (and believing in a soul devalues the human body). Abrahamic religions are essentially the religions of the slaves, oppressed, poor, deprived, sick and disinherited. They keep their believers and practitioners firmly into pre-modernity or into a fantasist medieval world. This is abundantly evidenced by the incongruous facts that "in most [Sub-Saharan] countries, at least half of all Christians in every country surveyed expect that Jesus will return to earth in their lifetime", that "at least half of Muslims say that women should not have the right to decide whether to wear a veil", and that "one-third or more of Muslims say they support the

death penalty for those who leave Islam" (Pew, 2010). These are the hallmarks of intellectual or mental pre-modernity, darkness, cruelty, tyranny, colonization and underdevelopment.

Africa has been so thoroughly corrupted and seduced over the past few centuries by Abrahamic fictions that it will not be able to recover and touch the 'real reality' any time soon. The degree of corruption is so complete that Abrahamic fabrications obscure, blind, burden, intoxicate, cripple, domesticate, enclose, mislead, possess and colonize their unfortunate captive believers to the bones, resulting in abject material and intellectual poverty. Access to any form of African modernity requires a painstaking and comprehensive emancipation and liberation from Abrahamic mythologies and superstitions.

Ancient sacred religious texts, documents and books, such as the Koran and the Bible - the two most widespread and influential written knowledge sources in the African context (not exactly hotspots of fresh knowledge) - may constitute virtual owner's manuals for the life of many Africans-of-one-book. This, under certain conditions, is not conducive to paradigmatic innovation and to a swift transition to modernity. Evangelical, *Qur'anic* and Shamanic models of reality are pre-modern social constructions far from or quite different from modern scientific constructions. Aging or bogus medieval realities should be questioned, resisted, denied or defied. "A thorough reading and understanding of the Bible is the surest path to atheism" (Voltaire).

Euro-modernity, in addition to the overturning of the kings' power, came as a reaction through the power of thinking, conflicts, wars and revolutions, against the autocracy, abuse of power, exploitation,

repression, colonialism, cruelty, misogyny and obscurantism of European medieval Christian churches. To be true and to put it mildly these churches have not been kind to scientists and autonomous thinkers, particularly women (many burned as witches), for deviating from the doctrines and the credos. Islam, on the other hand, has been better in some respects than Christianity as regard science since it is less ridden with shocking miracles and outrageous tales that are contrary to common sense and to the known laws of physics, biology and nature. This may help to explain the immense contribution of Islam to science in medieval time – a contribution that is well documented and beyond disagreements. But Islam and true African modernity cannot cohabit. What is needed is a pervasive culture of innovation and free-thinking: not a single new god has been invented in more than a thousand years!

In order to unleash the enormous power of critical/subversive thinking it is necessary to develop capacities to think outside-the-box, outside Islam, Christianity and Animism, freely and rationally and to think in terms of innovation – not in terms of respecting traditions and systems of beliefs inherited from ancestors. It may be necessary to develop capacities to practice self-exorcism and break with past understandings, religions and wisdom. It may be necessary to resist over-domestication or reduction of humans to petty objects in the hands of customary superstitions, including shamanic and Abrahamic ones.

It may be important to be aware of the danger of subjugating scientific facts and principles to abusive medieval cosmo-religio-cultural interpretations. It may be important to rethink any medieval faith-based representations and institutions, including the institution of Heaven/Hell – amongst

the most powerful establishment regulating (possessing, mesmerizing ...) the lives of Africans (“*Imagine there is no heaven*” – John Lennon). In modernity outsourcing costly social policing duties to religious enterprises is not indispensable.

To be sure, the modernization of Abrahamic mythologies would be challenging to the culture of salvation, of subjugation and of non-questioning (faith-predetermined beliefs) of both Islamic and Christian Africa. Any culture of avoidance, disdain, veiled censure or contempt for science is not in line with the autonomous inquisitive modern subject. It is not in line with science as a way of thinking (Carl Sagan), as a method (Descarte), as a culture (UNESCO) and with modernity’s in-built worldviews and mindsets. In this regard facts speak for themselves: poverty, hunger, diseases, degradation, disputes... are high; number of doctors, engineers, scientists ... are low, while research efforts, scientific publications, patents, technology licensing, tech-intensive exports, investments in science, and so on, remains stuck marginally around 1% of world total.

Only a paradigm shift can revive or re-invigorate African innovation systems and fundamentally turn the situation around. And this includes a dramatic shift toward the disenchantment and secularization of the region, making room or opening an intellectual space for practicing science and developing scientific cultures. This is another important pillar of truly unlocked, open and dynamic African innovation systems.

Innovation and Sacralization Capacities

African thinkers could be more active in advocating a science-based knowledge order. Concretely this implies prioritizing

scientific knowledges and theories over Holy Scriptures, revelations, divinations, illusions, superstitions and fantasies. It implies evolving more worldly/post-chaired African societies. It implies reversing the current trends of building many times more churches and mosques than technology or research centers (more than 100 times more in some African countries). It implies scrutinizing the conjectures, postulations and standpoints of received systems of faith-based beliefs in relation to a laicized, demystified and disenchanting modernity. It implies sacralizing science, the scientific method and scientific knowledge as critical pillars of effective African STI systems.

African thinkers, scholars, policymakers and scientists should strive to achieve a paradigmatic 'renewal' (*ubuntu*) requiring structural or fundamental reforms of the inner working of African societies. These sages should fight for a coherent vision of Africa's future, clearly showing the inescapable pain of change and going beyond wishful thinking, pipe dreams and begging bowls. A workable strategy for the transformation of the foundations of African STI systems is still lacking. This strategy should achieve a shift toward scientific ways of observing, analyzing and knowing or toward science as the latest myth or the new religion of the time that can propel the continent into some original form of modernity. It should achieve an effective sacralization of facts-based or empirical knowledge systems.

There is a need to understand that the emergence of some brand of distinctive modernity on the African continent goes much further than the simple ownership and display of modernity's most visible technological products, tools, appliances, gadgets and gizmos. It is the hidden or unconscious background thinking that should be the object of close examination and challenge. In

this regard policymakers could climb on the shoulders of the great Enlightenment philosophers, thinkers, fighters, activists and scientists of the 17th and 18th centuries (Descartes, Bacon, Voltaire, Kant ...) who designed the modernity project with the concern for rationality and the scientific method at its core (Shapere, 1984). That is precisely what needs to be sacralized.

It may also be necessary to refuse being over-technologized or reduced to raw material, resources and system components in a dehumanizing technological world (Ihde, 1993). Or refuse to "become the tools of our tools" (H. D. Thoreau) and refuse to grant to technology a monopoly over human destinies. It may also be important to refuse to see new technology as an emerging new 'God' or 'Saviour' (only technology can 'save' Africa from hunger, poverty, diseases ...?). What needs to be emphasized is the scientific method or science as a way of thinking, and not technology as such which needs to be desacralized and which needs to remain under human control. The 'sacred' scientific method is the master key which can open the door to modernity. It is another essential pillar of effective African STI systems.

Innovation and Autonomization Capacities

Freedom to innovate (artistic, literary, social, economic...) is one of the most significant factor (and product) of scientific, technological and socio-economic development. Hence the need to fight for the freedom and autonomy of the individual. This includes freedom of expression, such as Internet freedom, which is abusively curtailed or monitored in many African countries. STI policymakers should be acquainted with the meaning of various freedoms, which is defined in universal Charters, Conventions

and Instruments, and be acquainted with the fact that STI systems are more dynamic when they provide more liberty to individuals – featuring more intellectual, economic and political autonomy.

Policy-makers and strategists should encourage the development of a set of fundamental freedoms which are essential to effective innovation and modernization processes and which would open the way to systems development, progress and eventually to modernity. These processes may include individuation, demystification, feminization (less patriarchal forms), democratization, liberalization, laicization, trans-nationalization, systematization, differentiation, technocratization and humanization processes. Enlarging freedoms of the individual is key to advancing these processes and to revealing modernity.

Effective innovative STI systems require the freedom to battle unfair, cruel or brutal structures (political, cosmological, religious, social, economic...) without fear of intimidation, threats, reprisals or ridicule. They require the freedom to grill or openly and candidly discuss terrorizing gods and demons, authoritative governments, phallogocratic ecclesiasts, polygamous masters, mystifying medicine men, possessive/controlling males, domestic slavery...They require the freedom to challenge hidden foundational assumptions and masked values underlying the construction of customary models of reality. They require favoring technological paths or making technological choices that do not tend to reproduce pre-modern elite power structures (Cohen, 1992).

Freedom of thinking may easily be corrupted by inherited ancient customary (and modern) viewpoints, taboos, ancestors' tyrannies, norms, ideals, alien religious canons and credos (Mbiti, 1990) and by

the quasi-hereditary obscuring tunnel visions of pre-contemporary cosmological and ideological formations, revelations and prophecies. In order to modernize conventional thoughts, if it is something desirable and possible at all without a colonizing or an imperialistic approach, it may ultimately be necessary to have the freedom to question the tyranny of the 'Gods' hijacking the African mindscape and to question 'Because-God-Wants-Me-To' submissive type of behavior (veiling or *women as carriers of sin*, sexual mutilation, bride abduction, arranged marriages, commanding husbands, etc.). Liberating the individual from pre-modern ideological constructions is key for the performance of African STI systems.

STI stakeholders need to have the freedom to defy indoctrination, mental colonization and unconscious acceptance of, or obedience to, dubious knowledge claims socially received from inherited pre-modern visions of reality. They need to cultivate the corrosion of doubt for all socially received doctrinal knowledge and to understand that progress of individuation, autonomy and subjectivity (freethinking/rational subject) is necessary for evolving a science-based innovation culture, as a quest for objectivity (Popper, 1979). Modernity requires the full sovereignty, autonomy and freedom of the individual. Granting maximum freedoms and rights for the liberation of the individual constitute an indispensable pillar of dynamic African STI systems.

Innovation and Codification Capacities

There is also a need to revise the technological codes that regulate technologization and innovation processes and that reveal and order reality as resources to be mobilized and optimized for development purposes. Not unlike the construction codes,

the mining codes or the road codes, the technological codes embody sets of beliefs, values, standards and practices that facilitate or hinder technological application and innovation. It is imperative to critically examine these codes across the region. The underlying sedimentary layers of conformist or totalizing ideals, ethics, morals, interests, principles, prejudices, taboos and prohibitions need to be scrutinized, including the asymmetric or unfair power relations underlying the codes. Revising the codes is also important for directing or streamlining agricultural and industrial technologies with a host of incentives or disincentives, and facilitative or prohibitive measures, regulations, assistance, subsidies, grants and taxes. Updating technological codes is also important for the uptake of new technologies, such as new biotechnologies, clinical and reproductive technologies, GM crops technologies, etc. In this regard there are a number of AU-defined 'model' laws and regulations that can be useful.

Technological codes must be harmonized across the region and particularly between neighboring countries where they diverge, as it is the case with transportation technologies for instance, such as with cars, trucks and buses - the most important and costly sector of technology acquisition in African countries, as important in monetary terms as all other technologies put together. In this area principles of taxation and regulation differ widely according to age, size, complexity and cost of technology, making customs crossing a complex activity. Many African countries have taxation and regulation regimes that discourage or prohibit importing older-than-five-years old technologies while others have lower taxations and mild regulations for these technologies in order to favor access, freedom of choice

and effective uptake of technologies that people can really afford.

There is a need to engage true scientists (Rouse, 1996) and STI communities in public understanding of technological codes in order to improve them in a participatory manner and there is a need to better understand how the codes control or shape technologization, modernization and innovation processes.

Science is not only a popular buzzword and not only a stock of knowledge but above all a technique and method of thinking that cuts like razor blades as it cuts across traditional systems of customary bodies of beliefs. This is the kind of thinking that is needed to revamp technological codes and better regulate technologization, innovation and modernization processes. Stakeholders should appreciate that modern thinking capacities regarding these processes are more important than money or political promises. Indeed, "*The world we have created is the product of our thinking – it cannot be changed without changing our thinking*" (Einstein). The same thing can be said about the technological codes that we have created as products of our thinking. So stakeholders should realize that Africa has no other choice than to practice modern thinking and to go through the pain of having to abandon some highly cherished forms of thinking and received ideas, keeping in mind that "*Ideas are the most painful things in the world*" (Galbraith).

These modern thinking capacities are also needed for advancing the STI narrative in Africa - a narrative that is too often imported from more technologically-advanced regions and in need of de-construction and re-contextualization for pre-modern cosmological, cultural, linguistics, social, political

and economic environments. Reforming technological codification constitutes another critical pillar of effective African STI systems.

CAPACITIES TO STRENGTHEN OWNERSHIP, LEADERSHIP, ENTREPRENEURSHIP AND COMMITMENT TO INNOVATION

Innovation and Mobilization Capacities

African policy-makers are frustrated by the lack of importance African leaders attach to STI systems (see *sti4d-africa* discussion list on Development Gateway). Policy-making capacities have to support successful policy processes by adopting bold guiding principles, moving away from somewhat academic, elitist and reductionist policies. These processes should be explicit, inclusive, transparent, participatory and visionary. They should be forward looking, strategic, broad-based, comprehensive, multisectorial. And they should be cross-cutting, selective (finite resources), outward looking (international/global dimension), attentive to promising emerging technologies and gender sensitive. There is a need to build a wide range of significant political and management capabilities in assessment, foresight, safety, acquisition, generation, adoption, debugging, demonstration ..., but more generally there is a need to build leadership capacities for mobilizing the resources and efforts necessary for the modernization of STI systems.

STI policymakers, including politicians, should 'own up' development paradigms, policies, strategies, programmes, projects and funding. They should also 'own up' their knowledge. And they should lead in involving multi-stakeholders in policy processes (civil society, media, farmers,

industrialists...); lead in engaging STI communities in discussions, debates, confrontations; lead in adopting the necessary sustainable/long term STI systems perspectives; and lead in bringing STI systems at the center of development plans and efforts. They should lead in resisting basing the way forward excessively on charities, aids, hand-outs and relief resources. They should lead in empowering girls and women in STI; lead in encouraging tech entrepreneurship; lead in promoting a 'green revolution' with effective STI systems (InterAcademy Council, 2003); lead on issues related to climate perturbations; and lead in addressing growing energy issues (micro-hydro, wind turbines, energy-efficient stoves, solar cookers and water heaters, biogas digesters, biofuels ...).

They should also lead in fostering popularization and diffusion of key technologies (irrigation, fertilization, health, environment...) and in enforcing useful regulations (biosafety, eco-standards, ethics issues, etc.). In addition to effective political and administrative leadership building effective STI systems requires strong leadership from other sectors of civil society. Innovation requires an important mobilization of efforts.

Leadership is an important pillar of successful STI systems.

CAPACITIES TO DESIGN EFFECTIVE POLICY INSTRUMENTS, INSTITUTIONS AND STI SYSTEMS

Innovation and Design Capacities

STI system processes are inherently political. Formulating feasible visions for societal transformations; shaping directions of change; raising, allocating and managing public STI resources; organizing society and the economy to benefit from STI systems

and designing effective policy instruments, institutions and systems are all eminently political processes. The technologization of agriculture and industry are also essentially political processes. In this connection the forming of Parliamentary Committees on STI in a number of African countries is a good practice that should be replicated throughout the continent. It contributes to the strengthening of capacities for steering political processes toward the modernization of STI systems.

There is an abundant literature on STI systems and system analysis that has provided useful concepts and tools for policy analysis and policy making. The main thrust of the narrative, perhaps, needs to be revisited for many African societies, weighed down by pre-modern ways of apprehending and operating on reality.

Policy-makers should aim at increasing the general performance and integration of STI systems and subsystems. These are typically made up of a set of standard institutions, comprising among others: 1- Ministry or Commission or Council for STI policymaking; 2- STI Budget; 3- STI Funds; 4- Taxation; 5-Subsidies; 6-Scholarships; 7- Research Grants; 8- Venture Capital; 9- Centers of Excellence; 10- Incubators and Tech Parks; 11- IP; 12- Standards; 13- R&D; 14- Support, Demonstration, Advice and Consultancy; 15-DatabasesandInformation; 16- Academies; 17- Professional/Learned Societies; 18- Parliamentary Committees; 19- Recognitions, Prizes and Rewards; 20- Interdepartmental Forums; 21- Chief Science Advisors; 22- Conferences and Seminars; 23- Science Clubs; 24- Science Days and Open Doors; 25- Extension, 26- Radio Tutorials.

All these institutions must be effective and work properly together. They are

the institutional pillars of performing STI systems.

CAPACITIES TO FORGE VALUABLE PARTNERSHIPS, ALLIANCES AND RELATIONSHIPS FOR INNOVATION

Innovation and Organization Capacities

Policy makers should forge useful Public-Private Partnerships (PPP), Government-University-Industry Partnerships and North-South and South-South Partnerships. They should nurture bilateral cooperation and support collaborative research to benefit from international or multilateral STI organizations. They should implement international agreements in STI, twin STI organizations, muster involvement of youth, mobilize private sector and rally the Diaspora. They should enlist NGOs engaged in STI, participate in relevant and promising IGOs activities and programmes, favor clusters of enterprises around industrial innovative leaders and liaise with RSA's strengths in STI.

Africa has also forged privileged relationships with the G8 and G20 and has developed bilateral and multilateral partnerships with Europe (Africa-Europe Summits), with China (Africa-China Summits), with India (Africa-India Summits), with Korea (Africa-Korea Summits), with Japan (TICAD Summits), with the US (Africa-USA Business Forum, Leadership Africa-USA, etc), with Canada (Partnership Africa-Canada, Canada Fund for Africa, Africa-Canada Forum, Canada-Africa Parliamentary Association, Canada-Africa Study Exchange) and with Latin America (Summit of September 2009 in Caracas).

These relationships are important for the globalization of African systems of

innovation and should be nurtured more vigorously.

CAPACITIES TO ADVANCE REGIONAL AND SUB-REGIONAL STI SYSTEMS

Innovation and Regionalization Capacities

African countries should work harder for an integrated Pan-African region in STI. Pan-Africanism provides the platform for the launching of a counter-hegemonic emancipatory project and provides the ideology and the foundation for an evolution toward a truly autonomous post-colonial region (Muchie, 2003b).

In the area of STI systems African countries should work more closely with AUNEPAD/ST, AMCOST and ECA. They should expand subregional and regional 'teamwork' (no country has the resources to do it single-handedly); share regional scientific and technological facilities (metrology, etc...); guarantee free movement of scientists and tech entrepreneurs across the region; and support regional initiatives (regional meetings, regional networks, regional forums). They should define common positions on regional and international policies; develop potentialities, specializations and complementarities at subregional and regional levels; carry out joint exhibitions and set up shared demonstration units; and conduct regional and subregional STI systems studies. They should strengthen the STI system components of regional and subregional organizations, institutions and associations (such as ECOWAS, PTA, COMESA, SADC, etc.); be more active in emerging regional and subregional STI system networks (ATPS, AAS, Magtech, Incubators and Parks, etc.)

and consider paid memberships and active participation in regional centers, projects and initiatives (ARCT, ARCEDEM, OAPI-ARIPO, ARSO ...).

Pan-Africanism and regional integration and cooperation constitute another functional pillar of innovative STI systems in Africa.

CAPACITIES TO FUND AND INVEST IN STI SYSTEMS, PROGRAMMES AND ACTIVITIES

Innovation and Investment Capacities

There is a need to double funding across the board for STI systems, programmes and activities to propel African countries into modernity. This need is recognized by the highest authorities and is related to a wide range of funding instruments, means and objectives, such as the now famous 1% of GDP for R&D, which has a long history of decisions, pledges and deceptions. Most current UNESCO statistics on science show African countries spending 0.3%, 58% of which is funded by external sources, with a growing involvement of American donors and philanthropic foundations in agricultural (African Green Revolution Initiative -AGRI) and health research (malaria, HIV-AIDS, etc.).

It is necessary as a general rule not only to more than double the budget to R&D but also to double national budget for STI infrastructures, institutions, training.... It may also be necessary to double FDI, micro-credit, venture capital, licensing and fiscal incentives. Financial assistance to tech-based micro-enterprises also needs to be doubled. The use of open source

software/open access info and knowledge, including scientific and technical knowledge, may also alleviate funding concerns as well as the regional STI funds that are currently being set up (recent AMCOST-instituted and AfDB administered fund and KMA 2009 decision to create a fund for knowledge management).

Increased public funding is necessary to enable greater access to higher education and broadband Internet. These need to be upgraded significantly for Africans to be able to compete internationally in science on even playing fields. Technical capacities, such as engineering, medical and business, on the other hand, remain generally weak and are needed to reorder, engage with and transform reality. Strengthening these capacities also necessitates a better management of brain circulation (retaining and attracting STI professionals), a commitment to knowledge sharing and to lifelong 'true' learning, i.e. not education as the acquisition of a collection of prejudices and questionable entrenched pre-modern paradigms.

Increased public funding is also necessary for strengthening adaptation capacities to survive to and to profit from large-scale changes. Adapting to changing knowledge, technologies, times, contexts, regimes or environments, is the name of the development game and it is a costly process. There is a need to adjust to liberalization/globalization/democratization/technologization undercurrents. There is a need to reduce scientific and technological dependency. There is a need to overcome the consequences of the current technological tsunami shaking African societies and economies.

Increased funding and investments in STI constitute another essential pillar of successful African STI systems.

CAPACITIES TO MEET THE CHALLENGES OF KNOWLEDGE CULTURES/ SOCIETIES/ECONOMIES

Innovation and Learning Capacities

Capacities to assess and upgrade knowledge in the African region, particularly knowledge acquired by emphasizing the scientific method and de-emphasizing knowledge acquired through traditions, acculturation, prophecies and revelations, must be strengthened considerably to meet the daunting challenges of modern knowledge cultures, societies and economies. These knowledge challenges must be met for STI systems to perform in the years ahead. To begin with, knowledge in various parts of Africa is somewhat:

- More Shakespearian than Newtonian, tacit, orally-transmitted, symbolic, figurative, local, rural
- Monopolized, controlled, secretive (non-sharing knowledge practices and ethos) and unprotected (except by diversion tactics)
- Rich in unique sciences of biodiversity, of eco-systems, of indigenous foods and medicine and of survival techniques; extremely rich in creative arts, such as music, etc.
- Fractured (Islam/Christian divide), compartmented (by ethnicity), balkanized (by six colonizing powers), fragmented (+ 1000 idioms and worldviews) and atomized (not part of any advanced international knowledge networks)
- 'Unscientific' (disregarding scientific revolutions), mythologized (with indigenous and foreign superstitions), de-contextualized (uprooted and transplanted from more technologically-advanced areas), 'canned' (ready-made and pre-packaged),

- Underused (scientists as taxi drivers), misappropriated (by power hungry sources), under or mis-professionalized (shamanic knowledge) and misapplied (ecocidal)
- Eroded (extinct or dying languages and knowledge), drained (brains seeking greener pasture), rarely rented (against royalty payments), and
- Plagued with spirituo-, mystico-, magico-, Euro- and phallo-centricity.

The ability of a worker, a firm, a country or a region to assess a given stock of knowledge such as traditional and modern knowledge, sort it, filter it, assimilate it and apply it to commercial or developmental ends is critical for any type of development and for accessing modernity. It is critical for unlearning/relearning and for the acquisition of key modern knowledge and competencies. It is critical for entering into the 21st century global knowledge society (Hamel, 2005). It is critical for deconstructing a pre-modern reality acquired through acculturation and socialization and it is critical for learning a new version of reality: *“The illiterate of the 21st century will not be those who cannot read and write but those who cannot learn, unlearn and relearn”* (A. Toffler).

It may be necessary to tame and demystify scientific knowledge (science is very obscure and injurious to the masses, even in some of the most advanced economies). It may be necessary to realize that attitudes toward knowledge are more important than stocks of knowledge. It may be necessary to view scientific knowledge not as an add-on, not as a parallel domain, but as a holistic system approach central to any development process. It may be necessary to direct efforts toward the enlargement of a knowledge culture, on the enrichment of knowledge assets and on the upgrading of pre-modern knowledge systems. It may be also necessary

to perform knowledge needs appraisals and audits and to get rid of pseudo or junk science (witches' spells and Jonas-in-the-whale types of stories pervading many parts of the African mindscape).

Policymakers should emphasize the application of public domain knowledge and technologies and adopt strategies that make the most of the latest technical knowledge and new technological regime (ICTs, bio, eco, agro ...). They should recognize the value of and protect indigenous knowledge (*“Every time an old man dies it is as if a library has burnt down”* - African Proverb). They should recognize the appropriateness of some indigenous technologies and solutions. They should adopt green technologies and espouse the sustainable development paradigm (Ahmed, 2009). They should also put in place a monitoring system for measuring knowledge societies/economies (indicators, statistics, benchmarks, polls, studies...). In this regard African countries should support an ongoing AU-NEPAD initiative, supported by ECA, designed to measure the advancement of STI systems, particularly innovation.

A focus on recognizing the value of some indigenous knowledge and on upgrading ancient and medieval knowledge platforms is another pillar of performing STI systems in the African region.

CAPABLE PARADIGMS, WORLDVIEWS, COSMOLOGIES, MINDSETS AND PRACTICES FOR THE MODERNIZATION OF STI SYSTEMS AND FOR REVEALING A TYPICAL AFRO-MODERNITY

Innovation and Modernization Capacities

STI efforts must be oriented toward revealing some kind of original and imaginative

Afro-modernity. In this regard it is important to understand the reasons for the little lasting impacts of Nyerre's *Ujamaa*, Mobutu's *Authenticité*, Sengor's *Négritude*, Nkruma's *Conciencism*, Kenyata's *Harambee*, Wade's *Omega*, Bouteflika's *Ennahda Movement*, Mbeki's 'Call to Rebellion' - let alone the vision of the *Commission for Africa* and a host of other appeals for an African 'Renaissance' (*African Century*, *Third Wave*, etc.). Perhaps there is some truth in the idea that "A problem cannot be solved with the mind-set that created it" (Einstein).

Today, one out of two African countries depends on food aid to feed their populations, and one out of two Africans live with less than \$2 per day, after more than one trillion dollars in development aid. This relative failure brought us to the MDGs framework with no accompanying STI strategies. Hence the need for a complementary STI strategy of subjecting Africans to the subversive, disenchanting and rationalizing power of the scientific method and the rule of technique.

Modernity in Africa may not be uncovered with the manipulation of economic variables alone, including external financial assistance, but it will certainly necessitate sound economic policies and strategies. Much of the development discourse in Africa revolves around economics, finance and money but modernity, in addition to being a science, technology and innovation-driven process, is essentially a cultural process, with the scientific technique and tradition at its center.

The scientific technique and tradition provides tools for resisting 'intellectual domestication' and for embracing more modern or post-modern mythologies (Lyotard, 1991). A large majority of Africans swears by or are 'owned', ruled, domesticated, tamed or possessed to some degrees by Abrahamic

mythologies and statistics show that hardly any African succeed in breaking away from the Islamic or Christian system of beliefs he or she is born in. That clearly shows the strong appeal, fascination, addiction, dependence and the irresistible charm of these two great pre-modern religious solitudes. The scientific method provides a way out of this blind lottery and of this medieval intellectual trapping. Could subversive sciencism be the new 'religion' of the time that could bridge some century-old divides and transform a traditional reality into a distinctively creative, modern and truly Pan-African one?

There is a need to engineer a transition from self-confirming systems of medieval thinking, superstitions and prejudices to modern worldviews and true and effective knowledge systems. There is also a need to avoid subjecting human beings to excessive mythological control - including science and technology as the new mythologies. What we see depends on what we look at and on what our previous conceptual experience has taught us to see. Abrahamic dogmas and other indigenous superstitions and illusions are often invisible to the persons they hold, blind or govern. New dogmas and new paradigmatic frameworks are needed for the region to construct a unique style of Afro-modernity, different from the North-Atlantic style, which is neither replicable nor desirable on a large scale.

The 'scientific method' paradigm is at the forefront of paradigms wars and it should be promoted more forcefully by STI policymakers, often too obsessed or busy with structures, institutions and money than with promoting scientific rationality, wisdom and cultures. The African reality will change, hopefully in a non-violent manner, only when current paradigms are dethroned by more effective science-based paradigms.

There is a need to be aware that science, technology and society are co-emerging, co-evolutive and mutually constitutive of each other and to be aware of the seduction of unbridled triumphant techno-scientific dogmas (Winner, 1977), which may lead to the devastation, excesses, wastefulness and pathologies of post-industrial consumerist cultures. Perhaps STI policy makers should support the creation in each African country of free-thinking think-tanks to reflect on and promote an authentic Afro-modernity essentially based on holding fast to the scientific and sustainability paradigms, as the core of a new code of belief, and on adopting scientific knowledge, which would provide an increasingly adequate, detailed and refined understanding of nature, the world and Africans in it. And it is also important to resist worshipping science and technology as a new God or a new Savior and not to let pre-modern, medieval or ancient cosmologies, worldviews, mindsets, paradigms, traditions, customs, beliefs, mythologies, superstitions, prejudices and fallacies unduly dominate, control or monopolize African destinies and fortunes.

It may be appropriate to renew, enlarge or deepen current STI policy accounts in Africa, which are often somewhat self-deceptive, boxed-in, toothless, limited, naïve or biased, using a more robust, effective, practical or significant narrative. A renewed narrative is needed, indulging less on minor variations around the *status quo*, to address emerging issues related to cosmological revolutions, technological effervescence, globalization, urbanization, energy crises, food shortages, climate change, species extinction, environmental degradation, inter-continental competition and epidemics.

New knowledge orders and new paradigms do not come effortlessly and without struggles because few free-thinking

scientists are willing to take the risk of challenging established truths; because current knowledge orders are considered sacred whereas criticism may be considered blasphemous, heretic or politically incorrect; or because existing entrenched paradigms have to be displaced or replaced by new, disturbing and much less magnetic ones. Or because "*the competition between paradigms is not the sort of battle that can be resolved by proof*" (Thomas Kuhn). In the end the competition between rival paradigms comes down to a choice between fundamentally incompatible worldviews and modes of cultural, social and economic life.

Various capacities should be built, as discussed in this paper, to probe, subvert and rationalize STI systems with more scientific understanding and practices. And no effort should be spared in order to re-cosmologize, re-mythologize, 're-prophetize', re-charlatanize and re-direct the evolution of the African reality toward some original form of post-totemic, post-enchanted, post-phallocratic, post-shamanic and post-Abrahamic region, or toward an innovative Islam-free and Christian-free scientifically-informed free-thinking post-colony. For this evolution to materialize perhaps the first priority of policymakers could be to strengthen capacities to imagine or develop a strategic vision of a different, renewed, revived, secular and modern Africa, and to link this vision to an effective innovation strategy, such as outlined in this paper.

Finally, it is also important to keep in mind that Africa is a very diverse and heterogeneous region and that general statements - such as the ones above - do not do justice to the immense contrasts, differences and divergences that are found across the continent. Yet, most African countries are deeply corrupted, degraded and ruined by the dogmas and practices of Christianity, Islam and

other indigenous romantic cosmological fabrications, such as the belief in an after-life which weakens African vitality and holds back African innovation. Think of Somalia for example or of a dozen other 'chaotic' or 'messy' countries, possibly stuck or 'buried' for the foreseeable future in pre-modernity. Whatever modern futures can be envisioned for these countries they will have to be more scientifically informed, more drastically disillusioned and more radically worldly and secular (Africa 2.0?). That constitutes an immense challenge to all of us, politicians, stakeholders, policymakers, academicians, scientists and innovation theorists.

BIOGRAPHY

Jacques L. Hamel graduated in Engineering (Québec), in Spanish (Malaga), in Business Administration (MBA - Paris) and in Economics (PhD.- London School of Economics). After five years in Europe, two years in Latin America and twelve years in Canada, has been assisting African countries for more than fifteen years in the formulation and implementation of effective science, technology, innovation and knowledge strategies and policies for revealing a distinctive style of modernity in the African region. Has acquired a good experience in international programmes implementation and projects management as well as extensive global experience and understanding of cultures and history through self-studies, wide-ranging readings and travel in 123 countries.

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