



Knowledge and Innovation: Evolutionary and Revolutionary Techno-economic Change over Time

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Summary

This briefing note is based on a webinar held on 8th April 2021 in which Prof. Rasigan Maharajh was the main speaker, while Dr. Anne Aseeey & Dr. Abiodun Egbetokun were discussants. The webinar considered the origins of the innovation & development (I&D) field internationally and in the African context. By delving into issues of history, theory and pedagogy, in relation to knowledge and innovation, it addressed the following overarching questions: 1) *Where are African countries in the history of innovation and development studies as a field of study?* 2) *What are the prospects for advancing the I & D field in Africa?*

This event was part of the on-going seminar series focusing on the broader topic around development of I & D field of study in Africa.

Key messages

- Africa is the fastest growing economy in the world.
- Africa needs to create a system that works for the region as opposed to putting itself in a subordinate position relative to the current hegemonic economies.
- In this time of COVID, the inability to account accurately on the population of African continent and its impacts on healthy system is further endangering or placing Africa in a precarious position than just being marginalized economically.
- The failure to be integrated economically results to poverty, the failure to measure and know what is happening in our continent places an extensional challenge before the African continent . The notion around self-interest plays a crucial part in determining whether innovation is widely distributed or constrained.
- Africa should be extremely concerned about locking itself into others' framings and determinations of what stage of development that the region is in. There is need to create theories that suite Africa based on the issues that confront us.
- Africa should not accept its marginalization as a permanent future.
- The scarcity of centres where knowledge can be generated and applied is a key contributor to Africa's low contribution of knowledge.
- Africa needs to shift from over emphasis on neo-classical economics to embrace more evolutionary thinking.
- The low quality of derivatives from R&D are not the root issue, the entire system of national accounts is. Africa needs to pool resources together to measure more efficiently and effectively.
- Africa needs to take an endogenous approach to development.

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About the keynote speaker

Prof. Rasigan Maharajh, *Founding Chief Director of the Institute for Economic Research on Innovation (IERI) at Tshwane University of Technology, South Africa*

Prof. Maharajh graduated with a Doctor of Philosophy degree from the Forskningspolitiska Institutet (RPI) of the School of Economics and Management of Lund University in Sweden. He holds concurrent faculty appointments at the Sustainability Institute and the Centre for Research on Evaluation, Science and Technology (CREST) of Stellenbosch University in South Africa; Nodal Head of the Department of Science and Technology and National Research Foundation' Centre of Excellence in Scientometrics and Science, Technology and Innovation Policy; the founding Chief Director of the Institute for Economic Research on Innovation (IERI) at Tshwane University of Technology; an Associate Research Fellow of several reputable institutions, including the Tellus Institute in Boston among others. He has been a Visiting Professor and Researcher in Brazil, Cuba, Kenya, India, and Sweden amongst others. He is an active member of the AfricaLics Scientific Board. Prof. Maharajh research interests include the political economy, innovation systems and public policies in the context of the global knowledge commons, economic development, social cohesion, and democratic governance. Prof. Maharajh has published widely with contribution of over 65 publications in form of monographs, peer-reviewed articles in accredited scientific journals, chapters in academic books and other seminars and colloquia.

About the discussants

Dr. Anne Aseey, *Senior lecturer, Department of Educational studies, University of Nairobi, Kenya*

Dr. Aseey's research interests include gender and technological innovations, especially ICT and relevance in distance education. Dr. Aseey benefited from a "teaching innovation and development workshop for university lecturers in Africa" organized by AfricaLics in 2016. This workshop had been designed to support those who have been integrating or expecting to implement an innovation and development course into their curricula offering in various forms at their respective Universities. She is an active AfricaLics network member, and she adds value to the discussions around gender and inclusive innovation within the network.

Dr. Abiodun Egbetokun, *Assistant Director, Research at the National Centre for Technology Management (NACETEM), Nigeria*

Abiodun Egbetokun is an economist with a rich multidisciplinary background. His PhD in Economics complements a BSc. in Mechanical Engineering and an MSc. in Technology Management. In his capacity as the Assistant Director, Research at NACETEM, he contributes regularly to the development of Science, Technology and Innovation Indicators, among other policy-relevant projects. His research experience spans a decade and a half during which he has gained a deep understanding of the microeconomic factors that shape entrepreneurship and innovation in sub-Saharan Africa and beyond. His expertise on innovation and entrepreneurship in the context of sustainable development has been recognized in several forms including media mentions, keynotes, guest lectures, consultancy projects and policy engagements. He is linked to some of the world's topmost research clusters including the Oxford Department of International Development. He is also an active member of AfricaLics.

Introduction

Africa's lack of capacity to effectively measure data, for instance; economic and demographic data, places the region in a much more precarious position than just being marginalized economically. The failure for Africa to be integrated economically results to its poverty and the inability to effectively deliver reliable or good quality statistics. In addition, the archeological evidence of Africa provides the earliest evidence of the emergence of complex symbolic technological behavior that characterize our species (Wilkins et al., 2021). Arguably, there is a direct correlation between the expansion in population size in Africa with its prowess. As Africa's capacity to understand the world or translate it into capabilities to which can be used to manipulate the world, has afforded the region a massive possibility of a population increase. In an effort to achieve geographic growth, Africa has also incurred particular ecological damage.

Approximately 10,000 years before the last ice age, human population was estimated to be 4 million. It has taken the human race an extremely long time to achieve sustained and accelerated population growth. According to a study done by Robert Fogel at the University of Chicago, there's a way that Africa could correlate its technological capacities and innovation in terms of what the continent has produced and then deploy it into the society, economy and political systems that it has generated. For instance, things that have facilitated increased population growth include, the development of penicillin. The products of Africa's global knowledge competence are not evenly distributed and hence the contradictions and crisis that the region continuously faces. The main issue here is the uneven distribution of knowledge, the know-how on how to do things is concentrated in particular places. Over time regulatory administrative institutions have been put in place to oversee diffusion and access to the knowledge.

The concept of innovation has a long history. As of the 21st century, the human race occupied the entire planet. However, in regard to those that support innovation, much of this is premised in their capacities/ capabilities to draw down benefits to themselves. The notion around self-interest plays a crucial part in determining whether innovation is widely distributed or constrained. The density of the population also plays a particular role in innovation because of the biophysical impact that it has

generated. The human race is currently overseeing the 6th mass extinction, and this is also contributing to our own precarity by unleashing a whole range of viral vectors that are zoonotic in origin (jumping species).

The Making of World Systems and the Marginalization of Africa

There is a dynamic surrounding Africa's marginalization, and the key component in this is - when is Africa's contribution to world systems reduced? As colonialism expanded, more of the world became incorporated into a system of value production largely premised on western Europe and subsequently in North America. The rest of the world was forced to accommodate this from 1820, with the USA leading the hegemonic and most advanced developed capitalist economy in the contemporary times. The dynamic is still in state - thus considering this, Africa should not accept its marginalization as the permanent future. Countries that have achieved high incomes per capita, constituting OECD, have decreased their contribution to world systems. The fastest growing economies in the world are currently in Africa. However, does Africa match these quantitative increases qualitatively? Africa needs to create a system that works for the region as opposed to putting itself in a subordinate position relative to the current hegemonic economies. The quality of growth is very critical and the understanding of collective progress in different places has very particular effects materially. The role of people's analysis of the economy plays a crucial role in impacting the world economy by their capacity to understand what's happening and through that, influence the future direction. Capitalism did not emerge from publications of people's text. The concept of capitalism emerged, and its understanding put forward different ideas about the concept and a way forward. There is a balance between the investment in understanding the economy, the ability to forward ideas about its current status and what Africa wants to impact going forward. This balance is seen over time in terms of the major events e.g., recession, industrial revolution, great depression, World War I, World War II, setting up of Bretton Woods institutions and all the regulatory and multilateral framings. These schools of thought about the economy are not just abstractions, they comprise real people, for instance Veblen, Galbraith, Kuznets, List, Keynes, Tobin, Samuelson, Krugman, Friedman, and Mundell among others, who predominantly originated

from North America and Western Europe. According to Stein (2021), the antidotal evidence that supports much of the contentions in the standardized textbooks draw the examples from Western Europe and North America. Those are not the same conditions that occupy the global south. This is a concern, and an area that needs regress and concrete effort. However, there is emerging work on economy especially from young scholars in Africa who are starting to contest this and not accepting that economics must come from abroad.

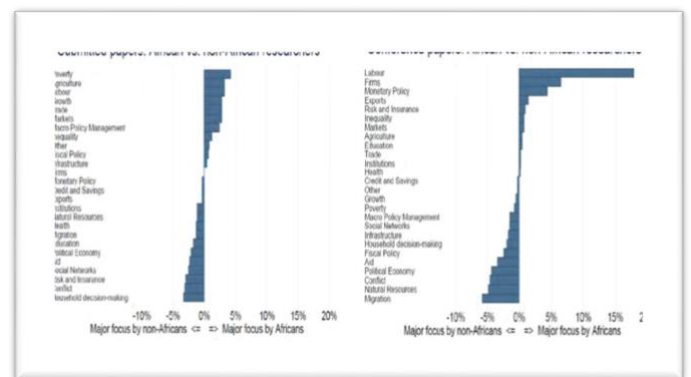
History of Economic Thought: Evolutionary Economics and Systems of Innovation

The adoption of the systems of innovations approach by South Africa in 1996 was a major contribution to literature by establishment of the basis of measurement based on what the country has done/ is doing and having something to measure against. There's much more to be learnt about South Africa's adoption of the systems of innovation approach, which has tremendous value to the rest of the continent. In as much as the high interconnectivity of the different regions in the world, it's important that the continent learns and criticizes things that are not working within its context. Work done by Bengt-Åke has been very crucial in reframing the asymmetry in information and knowledge. It's also important to pay attention to Schumpeter's contribution especially creative destruction. This has a huge importance to Africa, but a lot of emphasis has been placed on the creative part, with very little focus in terms of evidence or support for the things that are not working, which is essential for Africa's growth. It's very important to use the benefits of innovation systems thinking and evolutionary economics. There is need to embrace this notion both around creation and destruction, and the importance of learning systems to combine them. There's also need to recognize evolution as a process of self-transformation and why it's important to see what is currently happening. The analysis that is conducted using evolutionary economics has a differential impact on the policy framing that is utilized. Such policy is not that same as technology policy and neither of those two are equal to innovation policy. It's worrying when politicians use these three terms interchangeably as if they substitute equal meaning between the two areas. Consequently, it's implications in the broader economic transformation also becomes visible. The main objective for many people is to achieve growth, but in many instances, growth is taking place,

the products of the growth however remain unequally distributed. Investments and finance play a huge role in growth, but according to the UNESCO innovation survey database, Africa remains behinds in regards Gross Domestic Expenditure on R&D (GERD) contribution especially during this pandemic period.

Contemporary Research Challenges

Most of the literature written by African scholars based in Africa mainly emphasizes on poverty, agriculture, labor growth, fiscal policy, and infrastructure. However, non-African scholars are writing about monetary policies, firms and even household decisions in Africa (Figure 1). African scholars must shape the theories they use based on the facts that confront the region and should not primarily focus on how these theories are applied in the OECD.



are not weaved between and locked into one rhetoric that suggests that everything needs to norm towards the 4th industrial revolution. Africa is yet to fully receive the benefits of the 1st, 2nd and 3rd industrial revolution. However, all of these can be accomplished if Africa thinks beyond the 4th industrial revolution even up to the 10th industrial revolution and all these need to take place simultaneously as shown in Figure 2 below.

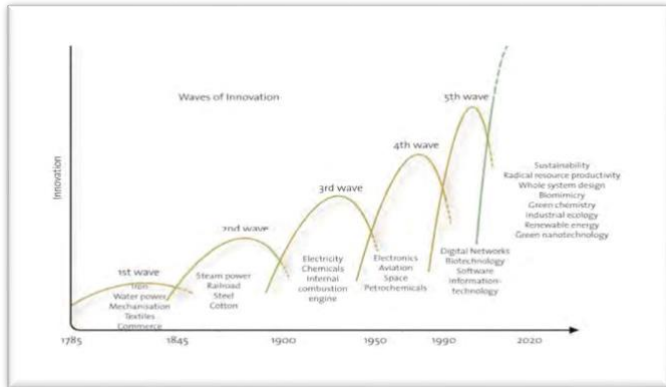


Figure 2: Waves of techno-economic paradigms. Source (Hargroves & Smith, 2013)

Chris Freeman noted that it remains necessary for us to develop systems that challenge what exists and that helps inform our way forward. In this regard, Africa needs to be honest and actually work towards what is preventing functioning as learning economies, to learn from what is being done, and put in into practice in terms of remedying the prevailing situation (Lundvall & Lema, 2016).

It remains critical that Africa’s domestic capacities, capabilities, and competences in areas of learning, innovation and competence building systems (LICS) are both enhanced and expanded. There is need to expand the engagements with society and go beyond just making scholarly comments to each other via the established academic groups and engage more directly with societies and communities. In addition to this, criticism about what mainstream economic discourses is doing to the society need to be taken on board. This implies that Africa does not need to norm itself to the mainstream discourses and use the same measurements and variables as done elsewhere outside Africa. Rather, Africa cannot have a tradition that criticizes what came before and thus this should be embraced practically in a historical and contextualized relevant form.

Discussions

The discussion revolved around a number of issues highlighted below.

Quality of measurements/ data in Africa

All the measurements in Africa and the entire system of national accounts have challenges. Over-determination of a particular aspect leads to further degradation across the system. Africa needs to describe its own conditions but not to conform to other regions’ measurements. It further needs endogenous development and not how the region requires to fit into the global north’s accumulation of capital. This cannot be done on the basis of being subsidiaries to other people’s measurements activities and writing case studies for their theory.

One of the reasons why R&D indicators are poor in the continent is not because minimal form or low level of R&D takes place. Rather, there is a tendency to over-emphasize the formal R&D at the expense of R&D activities in the informal sector. Notably, there have been some efforts by initiatives such as the Science Granting Council Initiatives (SGCI), National Centre for Technology Management (NACETEM) and Centre for Science, Technology and Innovation Indicators (CeSTII) in measuring innovation in the informal sector. Hopefully this forms the core of the conversation on how to measure innovation more efficiently within the continent. This approach does not necessarily address the issue of poor data quality in the continent but it’s a good starting point.

There is need to experiment on what works for the region and what does not and share the results amongst each other. Through this, there can be an improvement through learning from each other about what should be measured and how to measure it better. This is key to the development of theories that are firmly located in African realities.

Role of National Innovation System in the differential performance of a country

In the original formulation of the system of innovation approach in South Africa, the outcome of applying the system was an improvement in the quality of life of the population of South Africans. However, over time, the quest for improvement of quality of life has led to the improvement of business performance. The object

become the expansion of the business sector whereas the data comes from measurement in a performance of the system, which shows a decreased appetite for investment in R&D from the private sector. Debatably, its sufficient support from the private sector cannot be gathered, then ways to utilize the available resources should be solicited. Africa needs cooperative NSIs across the region because the differences between the countries' national systems can help enhance each other's national systems. This is the same learning approach used by Europeans and states of America, and they cooperated. The African economic research community is the counter-insurgency affecting the continent and is responsible for the teaching and practices of classical neo-economics. There has been tremendous success in that, which calls for monitoring in size and scale. At the moment, the innovation system thinking community is too small relative to the weight of African Researchers Consortium (ARC) in influencing all the policy instruments, whether it's multilateral across the continent/regional or at national level. This is an enormous task ahead, but under the excellent custodianship of AfricaLics, it's possible.

Priority aspects that should be identified in countries to inform a progressive and relevant national innovation policy

If development, emergence and nurturing of the innovation system is based on the country's specific situation and its available resources, this only enhances the work that is being undertaken. However, this would mean that focus is on the areas which are different across the continent. In 2021, the African continental trade integration process came into being, and therefore the AfricaLics network can make a massive contribution to inform how this integration process can proceed. UNESCO has approved a research chair based at Institute for Economic Research on Innovation (IERI) on the topic on African integration whose objective is to bring these perspectives all the way from measurement through to practices and share it throughout the continent for the purpose of Africa integrating as a continent. With climate change rapidly approaching, the challenges around scarce resources are going to become more pronounced. The migration and mobility within the continent should be encouraged, which entails embracing the 1.4 billion people as a community. Africa has a competitive edge especially in terms of its age profile against other societies which are aging rapidly. These other societies

do not have a productive community that will produce the value addition or the surpluses to be extracted to pay for them, but Africa does. Africa needs to wield that much more wisely and not keep adding to others' advancement and development.

Conclusions

Although starting from a low base, Africa is now the world's fastest growing continent. However naivety and optimism on this ground should be avoided (Karuri-Sebina et al., 2012). The recent growth has been concentrated in particular countries and sectors, however, the transformation of growth into sustainable social & economic progress will not happen automatically. There is a discrepancy between the reporting of record growth for African economies in the media, and the reality of how people's living conditions have evolved over the last decade and the African high growth economies. The widely shared understanding among development scholars that registered economic growth and development must be seen as two distinct, even if related processes and this has become more evident than ever (Lundvall & Lema, 2016).

Literature has shown that Africa's contribution to the global knowledge space is minimal compared to the rest of the world. The 1.5 billion people in Africa contribute about 1 – 1.5 % of the total scientific contribution across all disciplinary fields produced in the world. This does not necessarily mean that Africans lack the capacity to conduct research. How can the capacities of young people/academics in research be harnessed and enable them to contribute to the general knowledge pool? The scarcity of centres where knowledge can be generated/created and applied is a key contributor to Africa's low contribution of knowledge. For example, Centres of Excellence in innovation studies are very few in Africa compared to the rest of the world. The fact that our collectiveness is limited, the extent to which our voices can be heard is also limited. Most economics faculties in universities/ learning institutions in Africa, teach from a neo-classical perspective which is more focused in its states of equilibrium in optimal resource allocation. This is one of the theoretical tenets which has been criticized by the innovation systems approach. The interests have now shifted to evolutionary thinking, structural equilibrium. Africa needs to shift from over emphasis on neo-classical economics to embrace more evolutionary thinking. There is still a gap in the evolutionary thinking in regard to policy making in most parts of Africa. There

is evidence that African countries do not coordinate well when it comes to policy making. This notion is clearly seen in neo-classical thinking where there is a state of equilibrium where if one particular actor gets it right, all the other actors imitate that as the perfect solution instead of considering what works for them. For example, whenever Botswana or Zimbabwe has introduced an industrial policy that seems to work, South Africa follows the same. This results in a scenario in which these neighboring countries compete in the same sectors in the same export market. One country may out-compete the others, the winner will take all in the export market but in the domestic market, inequalities both in developmental and capacity terms will persist.

One of the problems innovation studies community and the continent faces is that of measurement. The result is that most policy conclusions given by most studies are drawn from a very small portion of the population. This is one of the reasons why policy makers sometimes ignore scholars. This calls for pooling resources together to measure more efficiently and effectively. Several initiatives have emerged in Africa that are working towards addressing this issue e.g., African Observatory for Science Technology and Innovation (AOSTI), African Science, Technology, and Innovation Indicators (ASTII) Initiative and the Science Granting Council Initiative (SGCI). Evidently, some researchers focus on certain areas because those are the areas where data is available, while other areas that are just as important lack good quality data. The question is, how can we talk about the things that matter to us when we can't measure those things adequately? One of the reasons why Africa has not been leap-frogging well, is through ignoring the accumulation of capabilities for too long. Capabilities are path dependent; we are now living in a world where capabilities are advancing too rapidly and increasing returns are now playing a huge role. This has led to the rapid development of countries like South Korea and Singapore which have identified windows of opportunity and stayed ahead of others such that when the rest of the follower countries catch up, they have already accumulated sufficient capacity to be able to show the way. This has implications as noted by Ceasar Idago, who argued that *“those who wait to see how things play out will be left behind and by the time they know what's next, any adopters will be on-top mountains of knowledge that will be even harder to climb.”*

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