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**Title: From forgetting to Learn and Innovate through Externally Imposed Development to Learning to Learn and Innovate African Transformation Through Self-Reliance**

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# **Title: From forgetting to Learn and Innovate through Externally Imposed Development to Learning to Learn and Innovate African Transformation Through Self-Reliance**

## **Abstract**

The price of forgetting to learn and innovate is heavy. Most African economies can be seen perhaps as “forgetting to learn and learning to forget” types unable to enter the world economic and technological competitive race by displaying their independent agency. In a rapidly learning and globalising world economy driven by a constantly changing ‘killer’ technological momentum, the learning curve of many African economies has not kept up with world standards. A sleepy learning strategy is neither ahead nor disruptive of the curve; it remains at the same level with incremental changes across the same frontier. In today’s globalised economy, the world technology moves like the attractor in complexity theory where novelty and emergent properties are distinguished by the uninterrupted disruption and re-composition of the learning curve.

Innovation and learning have speeded up what Karl Marx called the revolution in productive forces, and Schumpeter called “creative destruction” and Frederick List called a national system of production and political economy for Germany, then racked by regional rivalry. What-creative destruction, revolutionising the means of production, organising a national system of production, had in common was this: they all stimulate new products, new organisations, new networks and new systems which together become embedded to provide a turbo-generating logic to the workings of the world economy.

The system of innovation is the independent variable as the generator of the new products and new markets and new organisations and new ways of doing, knowing and creating. Economic performance is the dependent variable. How a system of innovation is organised, mobilized and works and deals with and responds (feed-back) to the internal and external strategic environments Largely contributes to economic performance. It is therefore important to specify conceptually the relevant and distinctive interactions that go into forming a system of innovation of a particular national economy. A global knowledge economy is leading world production and concepts such as the triple helix (Leydesdorff & Esktowits) New production of Knowledge (Gibbons) , a learning and innovating system of global economy (Lundvall and Johnson) are trying to capture the distinctive processes of the emerging trends in economy and society.

However the contour and geography of this global knowledge economy is spatially uneven . The process of systemic innovative “creative destruction” is marked by uneven distribution. Such an unevenness translates into the differentiation of economies in space- time into those that are capable of creative destruction and those that are not capable of either creativity or destruction that enables new and higher economic reconfigurations. There are simply some economies that are out of the learning loop altogether falling on the outer fringes of the world economy. These economies fail to undergo any process of disruptive creation within the knowledge economy..

In this paper I will be exploring mainly how an African economic system with a logic of new combinations, competition, innovations and processes of creative destruction may be mobilised or fostered by employing learning and innovation as independent variables for thinking about change

in Africa. I shall also outline the criticisms levelled on development as such and offer the recent work on innovation and learning as possible sources for stimulating new lines of enquiry for dusting off much of the baggage attached to the development idea and practice.

## **1. The Questioning of Development : Opening the way to development through innovation and knowledge?**

Development as a term has been questioned for controlling the terms of speaking about change and transformation. Modernisation theory has also been questioned for the way it assumes modernity has to reject the pre-existing conditions that it associates crudely with "backwardness." Both development and modernisation theories are said to have displayed a self- validating arrogance to the extent that they consider the history, traditions, values and approaches from non-western communities not to matter. Their power to define and classify some as modern, or developed and most others as underdeveloped or pre-modern have been under fire by some historians, feminist writers, environmentalists and some non-western scholars.

The technology divide does not have to follow the income divide, nor does it have to arrogate civilisation to those with technological mastery and assign barbarism to those who are waiting to master technology. Having said that, there is no justification not to be learners, innovators, and imagination producers to cope with the demands of existence. There is a need for all human beings to live in a society where the killer logic of disease and hunger is displaced by a life-reinforcing logic of health and sufficiency.

## **2. INNOVATION & LEARNING to REPLACE the DEVELOPMENT DISCOURSE**

Innovation can be widened beyond its role in accelerating economic growth or development to include functions such as quality of life improvement, human-well-being development, searching solutions for ecological problems and above all for changing the metaphysics, assumptions, mentalities and attitudes in society. In this wider role, the promotion of innovation and the culture of continuous learning can be critical to change the prevailing pessimist assumption about Africa's capacities and possibilities. The value of innovation as an **alternative** or **new** discourse to challenge the now wearing discourse of African failure by the development community/industry is of vital interest. The question of who exactly failed in Africa is an important issue to reflect upon. Is it the development community itself who are often engaged in proposing policies and equally and readily are quick to be the first to show that the policies have not worked? Is it the African elite that used western education to maintain a colonial mentality of disdain and contempt for the ordinary people of Africa? Failure points more at the door of the elitism of the elite of Africa and the paternalism of the donor community. Together African elitism and external paternalism have established ethically unworthy and incongruent relationships with Africa over the course of nearly half a century. The collapse of development in Africa is as much a problem of how development was conceptualised as anything else. Primarily, it is that connection of African elite- cum donor community policy and practice that have failed Africa. **I say Africa has not failed; it has been failed.** I shall suggest, that innovation studies uncontaminated with the prevailing conventional development discourse, can be worked through to promote African transformation by bringing about a new intellectual matrix and frame, capable of directing action for unhinging African 's agenda to transform itself structurally from the twin grips of African elitism and donor paternalism.

Here I propose to use innovation in a role for denoting a discontinuity from African failure into a move for African successes by anchoring the concept of **free Africa** on an on-going process of structural social- economic transformation without transgressing ecological constraints. Placing the challenges and problems of African transformation in light of innovation and learning dynamics can assist to launch a positive, non-pessimistic thought process and reflection on the continent, its problems, potential, capabilities and possibilities. Moreover, innovation and learning can provide the conceptual framework for identifying *what* and *who* is to change in Africa and *selecting* the actors, drivers, dynamics and processes that induce and make social-economic transformation.

While innovation studies have evolved narrowly in the context of the dynamics and management of economic growth in developed countries, here, an attempt will be made to transpose these ideas and use them to re-interpret Africa's structural transformation within a post- pessimist framework. There is a double displacement of the concept: a re- location to Africa and a widening of the concept to embrace the economic domain along with human well-being, quality of life, environment in Africa. In Addition, "innovation and learning" provide metaphors for "*Africa can do it also, as others have done and are trying to do.*" The wider/broader use of innovation and learning suggest a shift in attitude about Africa from a confining pessimism to a cognitive commitment for guiding research intervention with an entirely new approach to bring about a rapid structural transformation of the continent. This approach takes after the view: How a matter is named and framed ontologically is part of and becomes constitutive of the changes the matter is likely to undergo, and the way knowledge is secured about the dynamics of change including the methodology for making/constructing knowledge. In Africa, the observer's ethical compass, attitude, and the value, interest and his defining lens has been as much a problem to Africa as the manifold problems bedevilling the continent. I claim that the pessimistic casting of Africa by much of the development discourse have wrought havoc in Africa as much as the misguided nature of the policies of structural adjustment pushed by the Washington based IMF-World Bank institutions since the 1980s. Some African scholars write about Africa by bland and blatant assertions that "Africa is a tragedy," and the "most backward region in the world." They open their introduction with tragedy and death and conclude their writing with the same resignation and hopelessness that they began their narrative. Such a non-emancipatory assertion is not knowledge. It is a vapid opinion. And opinion is not knowledge. There is a need to couple innovation and learning with emancipatory research in order to build knowledge that will assist new trajectories for making wealth in the interest of eradicating poverty and inequality. The key is to create wealth without sacrificing social cohesion. This requires the creation of systems of innovation and learning to support in the making of an identifiable sphere for independent public policy formation..

I propose, therefore, to change the terms of talking about Africa's problems: away from tragedy into the terrain of hope and imagination. I use innovation and learning advisedly to resist being weighed down by Africa's manifold problems. I use innovation and learning (IL) not only to recognise the many and complicated problems in and of Africa but also to recognise that the agency and imagination to solve those problems is waiting to be mobilised within Africa. IL can assist to paint an upbeat picture on a broader canvass to convey the simple maxim that problems beget solutions provided the agency of the problem solvers is released from all confining encumbrances.

Whilst IL help in this larger sense, they can be deployed more narrowly as conceptual tools for shifting and changing the prevailing development discourse in Africa into a discourse for bringing about social-economic structural transformation without violating ecological constraints and degrading human well-being into ill-being. It is important to use structural transformation instead of development as the latter has become a controversial and woolly term that some, in fact, have pointed out that development itself is the very problem of Africa.

In recent years, approaches to African 'development' from conventional institutions have swung from poverty alleviation to structural adjustment and now gradually back to poverty reduction. Against this dominant discourse, I shall propose innovation studies as a catalyst for directing attention, thought, selection of actors and stakeholders, policy and practice for bringing about the structural social- economic transformation of African economies with due recognition of ecological norms and regulations. The linkage of innovation with Africa's possible structural transformation suggests a different set of policy approaches, policy mechanisms and policy learning compared to strategies of development as have been defined by the donors and the African elite in Africa. My objective is to open new analytical perspectives using innovation and learning for finding paths that may be feasible to bring a structural transformation of the continent.

### 3. The Problems with the Development Idea is the Graft

The donor community and the African elite in Africa have defined the development debate. It has been imposed and was not negotiated with the population it seeks to help or transform.

From the late 1940s to 1960s development theory was dominated by:

- a) Growth theory
- b) Modernisation theories.

Together the theories directed attention to mixed economy, authoritative state intervention and planning. An intellectual strategy where authoritative intervention was legitimised by economic growth theories and models prevailed. The early growth models were extensions of Keynes saving/ investment theory. Harrod-Domar built on Keynes's theory and struggled to establish the necessary conditions for equilibrium between aggregate saving and investment in a developmental/dynamic economy. These Neo- Keynesians searched for the conditions of full employment connecting investment and saving behaviour, the actual growth rate of national income, and the rate of growth of the labour force: Harrod's, dominant growth model has been used as a planning tool by many planning ministries of developing country Governments. The main objective was to plan growth by recapitulating in African countries the historical experience of the developed world.

The growth theorem suggested that steady growth of the system occurs when  $G_a$  (actual rate of growth) =  $G_w$  (warranted growth) =  $G_n$  (natural rate of growth) based on the rise in human numbers (population).  $G_a$  was calculated as a ratio of the marginal propensity to save over the marginal capital –output ratio. Warranted growth was introduced to account for the role of the Keynesian entrepreneur. The Harrod growth model predicted economic pessimism such as stagnation, instability and the difficulties of attaining full employment.

Modernisation theory had the objective of imposing U.S. society's type modernisation on the developing world in Asia, Africa and Latin America. The theory arose in fulfilling the political concerns of the USA, the bipolar competition between the USA and the former USSR, the U.S. strategy of containment and the emerging aid- donor competition. The agents of modernity were UN agencies, US Government and the post- colonial states as clients. Modernisation was

predicated on social evolution based on the optimism of economic growth through donor assistance. The suggestion was that traditional society would shift into modern society. The main economic thinkers were Solow and Rostow in the USA. They were more optimistic of economic growth possibilities in the developing countries than the Neo- Keynesians.

Parallel to modernisation theory, structuralist development economics was spawned from a) Ricardian theory of comparative advantage, b) Inter-war depression and import- substitution industrialization, and c) Latin America's debate on terms of trade between core and periphery. Structuralism stressed rigidities owing to: a) interests can be sticky, and sectors can have interests, b) global and historical structure matter and c) centres and peripheries exist in the global system. Therefore, structuralism claimed that the objective of securing national development could not be dispensed with: The theory recommended the following:  
a) Regional integration, b) a strong national state, and c) engagement with global rule setting for trade, investment and money.

Dependency theory in the late 60s and 70s built on the structuralism case and added its own nuances. In the 1970s a number of ideas crowded the development debate: unified development, development of people and not things, recognition of diversity in pursuing development paths, self-reliance, another development, basic needs, redistribution with growth, integrated development, endogenous development, development of underdevelopment, dependent development with core and periphery, world systems approach, neo-structuralism development including dependency and so on.

In the 1980s market driven development dominated the development debate: structural adjustment, minimalist state, states to seek comparative advantage through open competition, deregulation, privatisation and de- nationalisation were prevalent.

In the 1990s market led development is contested with sustainable development, globalisation and development, redevelopment and human development and above all the scattering of development studies into management, human resources, culture, area studies and policy studies and international relations.

There is a whole theoretical development that question development called post-development theory. The main thesis of this approach is that development is part of the problem and not the solution to poverty and living. All developmentalist theories from the radical to the conventional were thought to share a belief that development can solve problems when they thought it to be the problem.

In general, development studies assume every economy is more or less in the competitive race. That is not strictly true. Innovation studies can bring insights how those who are not in the race might be able to join, and those that are late might enter the race and catch up and those that failed to make a non- market system work might learn to forget the past habits and learn new tricks.

Some have said the problem of developmentalism is that it is a continuation of colonialism by indirect means. They say, in any case, development took off where colonialism left off and much of the infrastructure of the colonial apparatus particularly the mentality has been bequeathed to the native "ruling elites." Others have written the obituary of development itself.(Sachs,1992)

Thus the prestige of development studies both as knowledge and effectiveness in furnishing development policies is poor. It has been claimed by UN agency reports (e.g., ILO, UNDP) world poverty is on the increase. World prosperity is being concentrated in a fewer and fewer hands.

There is a need to re-think the out-worn old ideas. Catching up may not be possible;

A new normative orientation is needed to re-think what it means to prosper and accumulate wealth in the era of globalisation. There is a need for a new concept of wealth and prosperity.

That will, inevitably, mean confronting or challenging the hermeneutics

of existing interpretations and respects with which development and innovation are thought and

spoken about. The tools of analyses we have need to be re-examined and re-fashioned. Sometimes

the tools may be more of a problem than the situation to be analysed. There is thus a need to do a

critique of development itself in the context of structural transformation in Africa.

#### **4. Innovation as an input to change the terms of speaking about Africa's transformation**

Neither developmentalism nor post- developmentalism seems relevant in the African context. Africa should choose to go for transformation by changing its problems into challenges that demand mining its own resources, capacities through innovative engagement and learning. In this sense innovation and learning can occupy the discourse of problem- solving in Africa where developmentalism has failed. If development took off where colonialism has left off, innovation and learning should take off where developmentalism has failed to make a difference to Africa's structural transformation. I propose that we convert Africa's problems of transformation into challenges for innovation and learning. By doing so, we assign new significance and meaning to innovation and learning by providing a different direction to the theories of innovation developed over the last decade in relation to the catching-up aspirations of the South East Asian Tigers. We also identify a new approach to address Africa's problems of transformation. We use transformation advisedly to distinguish it from development as the latter is associated with the agenda and objectives of the core of the northern donor community and the core of the South mainly the ruling and self-serving elite of the externally-linked Business and NGO communities. "Development" connotes unfortunately the growth of the social elements protected by the unattractive twins of African elitism and donor paternalism.

There is another *general* reason for re-casting the challenges Africa faces in solving social, economic and ecological problems. Innovation research can be made to furnish a new intellectual matrix to frame the values, interests, actors, tasks and problems of African's transformation. Developmentalism inadvertently seemed to have encouraged the dominance of a paralysing cognitive pessimism within the scholarly community, as indeed with many other communities with respect to describing, explaining and interpreting Africa's capacities and possibilities for structural social-economic transformation. It has reached an intellectual impasse. Some are writing the obituary of development studies- its rise and fall. The nasty empirical manifestation of reducing poverty in some sector or locality comes with a system-wide increase of poverty at a national or continental level. Despite many efforts to reduce poverty, there has been a general system-wide increase of poverty globally. Why does the number of poor people keep increasing while there are so many angels of mercy ranged to reduce the number of poor people? And why do the Gini coefficient rise and the Lorenz curve keeps diverging showing wealth concentration in fewer and fewer hands? The persisting asymmetric relations in income, wealth and power require an approach where the problems drive the search, the tools for mapping, navigation and exploration. We require

no more fancy concepts than the release of innovative capabilities, learning and a culture of self-reliant imaginative solution to be part of the common sense of every person, institution and organisation.

The *specific* reason is to investigate the challenges of African transformation as a problem of a complex evolution and interplay of institutional and technical innovation. The challenge is to bring about a structural social-economic transformation of the continent without transgressing ecological constraints and understand how technical change and the innovation process facilitate and constitute the practice and action of transformation. Innovation studies can provide a perspective, a conceptual framing and direction for understanding and generating policy options to guide Africa's processes and dynamics of social, economic and ecological change.

## 5. The Diffusion of Innovation and Learning as a Challenge to Afro-Pessimism

In Africa, there is a need to select issues that can assist to question matters that often feed negative cognition and practice. It has become conventional wisdom to make damning judgements from the events and occasions that frequently happen in Africa. Almost anyone who writes on Africa from any academic direction seems to assert the "failure" of Africa. For example some Afro-pessimists like the French Africanist Bayart have surrendered any hope for optimism for Africa. They seem to say the only source from which Africa may generate hope is from evil.<sup>1</sup> Bayart used the biblical metaphor that described the supposed fall of Adam and Eve: in Africa, "from the tree of evil, comes knowledge"<sup>2</sup> We are admonished to look into the crises of Africa to seek Africa's redemption.<sup>3</sup>

The framing and naming of Africa with such a pessimist cognitive orientation has even affected those who have begun research on innovation and development in Africa. African researchers too, perhaps unwittingly, repeat such a negative portrayal of Africa's capacities and possibilities:

A few examples suffice to illustrate the point:

A researcher writes that Sub-Saharan Africa is "locked in a development tragedy."<sup>1</sup> Another African researcher repeats: "Sub-Saharan Africa ...(is) probably the most technologically backward area of the world today."<sup>2</sup> Sanjaya Lall adds his twist to the same view: "In a world of accelerating technical change, intensifying competition and globalising production, Africa is not only failing to improve its international competitive position- it is falling behind."<sup>3</sup> Writer after writer begins with a sense of an African tragedy and concludes by pointing a finger at some congenital incapacity or limitation of the continent, that discourages research on what can be done due to the essentialising undercurrents of much of the writings and speakings about Africa.

I myself went with the paralysing view of "tragedy, failure or death" – having been contaminated by the prevailing common-sense about Africa- to study the pollution crises of a major agro-

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<sup>1</sup> See My "Towards a Theory for Re-Framing Pan-Africanism: an Idea Whose Time Has Come: **DIR Working Paper** : No. 83, 2000, Aalborg: Also Translated in Chinese by the Chinese Academy of Social Science, **Journal of West Asia and Africa**, March-April, 2001

<sup>2</sup> See J.F. Bayart, Ellis, S. & Hibou, B, 1999, **The Criminalisation of the State in Africa**, Oxford, James Currey, p.116

<sup>3</sup> The pessimist sees Africa as crises and sees no other space other than the crises he condemns for finding a way out. Thus his own mode of cognition of the African situation is as endlessly problematic as his pugnacious recommendation.

industrial sector in Kenya: the Leather Industry. The material I found on the ground was impressive. One of the leading researchers that was asked to carry out a peer review of the research product I accomplished expressed surprise about how much positive work was being done on pollution prevention by the Kenya's leather product sector itself.<sup>4</sup>

Whilst acknowledging real problems and difficulties in Africa, many of the countries have made more progress on the whole in education and other indicators in less than 50 years of decolonization than in over 100 years of colonial rule. To be sure, it can be argued they could have done much better; but the tendency by writers to essentialize Africa's many problems, and compress Africa's complex situation into evocative symbols of "tragedy, failure, risk, hopelessness and death" needs contesting. Here it is suggested that innovation research in Africa can provide a resource for contesting the prevailing tendency for a casual moral condemnation of the continent. Besides the practical problem of technical transformation of industry, innovation studies can provide a useful cognitive and epistemological re-orientation away from "failure-speak" to "innovation-speak." This is, in itself, a worthy change in the African context, if it can be achieved.

The more specific outcome of such a re-orientation is the enormous significance for the provision of a new perspective for guiding policy and practical action to bring about Africa's structural change. In addition I suggest that innovation policy and practice in Africa can furnish some material content in reinforcing the ambition expressed by some African leaders for "mid-wifing" an African renaissance.

Innovation studies have been proposed in the African context to open avenues that can assist to frame Africa's challenges of transformation within a post- pessimistic conceptual foundational principle. The actual state of innovation is one thing; the potential of innovation to bring about transformation in Africa is another. The actual and the potential, the empirical and the normative can be twinned in analyses, description, explanation, modelling, understanding, interpretation and prediction. Empirical findings and regularities need to be interpreted in light of policy perspectives that seek new avenues for expanding Africa's transformation possibilities. The question of " what is the state of existing innovation threshold in unlocking Africa's challenges of transformation" should be connected with how can the innovation system and process be embedded within the transformation dynamic of the continent? Raising the point of "is" without the "can" will make research *passive* while connecting the "is" and the "can" will make it *active*.

- a) How does innovative activity take place actually?
- b) In what way may innovation systems and activities be mobilised to bring about social-economic transformation of Africa without transgressing ecological and social constraints? The empirical finding about the actual states and conditions are presented to feed into the normative ambitions of post- pessimist framing of Africa's capacities for transformation.
- c) The actual and the normative direction can be made to feedback on each other to outline the innovation and learning trajectories of Africa's specific transformation profiles.

## **6. Systems of Innovation (SoI): Meta-level definition<sup>1</sup>**

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<sup>1</sup> See C. Freeman, **The Economics of Industrial innovation**, Penguin, London, 1971, B.A.Lundvall, **National Systems of Innovation: A Theory of Innovation and Interactive Learning**, Pinter, London, 1992; Nelson & Winter, **Evolutionary Theory of Economic Change**, Harvard University Press, Cambridge, 1982; N. Rosenberg; **Inside the Black Box**, CUP, 1982

“Capitalism, then, is by nature a form or method of economic change and not only never is but never can be stationary. And this evolutionary character of the capitalist process is not merely due to the fact that economic life goes on in a social and natural environment, which changes and by its change alters the data of economic action.”  
(Schumpeter, **Capitalism, Socialism, Democracy**, 1975, Harper Torch Books, New York, p.82)

The concept of systems of innovation (SoI) has been developed over the last decade in recognition of the significance of managing innovation for economic growth and subsequently for quality of life and the environment. The success of the newly industrialising countries (NICs) such as South Korea, Taiwan, Hong Kong and Singapore provided the stimulus for the emergence of the concept. Neo-classical economists invariably assume a freely available world production function along which all countries move. There is no difference between a predominantly agricultural economy and a predominantly industrial economy. Neo-classical describe both with the structure- neutral production function. They try to explain the success of the NICs by rapid and high rates of investment that enabled movement along a production function. Physical and human capital through widening the production function frontier is thought to account for the lion's share of national output.

Against this view, evolutionary industrial economists suggested that much of the success of the NICs can be attributed to learning about and learning to master new technologies. Though high rates of investment, physical and human capital have been necessary to absorb new technologies, risk-taking entrepreneurship, effective learning and innovation played a relevant role. For Example Korea's export from a mere \$40 million in the 1960s (by selling labour intensive goods such as textiles, apparel, toys, wigs, plywood,) grew to \$125 billion in 1995, with virtually all the increase represented by products Korea did not know how to produce at the start of the era.<sup>2</sup>

The transformation of South Korea from poverty to prosperity within a mere twenty years has given impetus to studying its national system of innovation. The linkage between innovation and development has been confirmed by the successes of the NICs. Like S.Korea, other specific countries have specific structures and institutions. The system of innovation tries to unravel the specific way in which structures and institutions cohere and interact with values, cultures, norms and legal, financial and property relations to make best use of knowledge originating both locally and/or externally. The concept of national system of innovation (NSI) specifies how the training and education system interacts with the business and production systems. The concept of NSI identifies learning from the routines, activities and searches to solve new problems that often emerge from the interaction of the economic structure and the specific institutions and the existing norms and values found in a given society.

In general the concept of system of innovation tries to open the black box in a country showing how its institutions, actors, activities co-ordinate and interact to create, produce, disseminate, acquire and apply and use knowledge, innovation and learning. NSI has been used to understand the process of how nations and sectors within them acquire technological capabilities and accumulate uneven levels of technological learning and competence. NSI refers to the social-technical and techno-cultural environments and their interactions. Such environments facilitate or hinder on-going processes of learning, searching, exploring and innovating for the purpose of producing what Joseph Schumpeter called new combinations in the form of new products, new

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<sup>2</sup> L.Kim & R. Nelson, **Technology, Learning & Innovation: Experiences of Newly Industrialising Economies**: Cambridge University Press, Cambridge, 200, P.2

techniques, new forms of organisation, new sources of materials to fabricate products, and new markets.

**Some constitutive components of a system of innovation are:**

- The SoI introduces learning and innovation to existing institutions; In Africa, learning and innovation need to become rooted into the traditional institutions. Learning and innovation make sense if integrated within the traditional arrangement and emerge as part of it. For any change to be enduring, it must be rooted in the native institutions to transform them root and branch.
- The SoI assists in building and shaping new institutional systems by a network with the traditional institutional arrangements
- The SoI connects existing and new institutional arrangements to initiate and bring structural transformation.
- SoI helps to change the norms, values, interests and attitudes of those engaged in the transformation process on the creation and use of knowledge to make resourceful learners out of sleepy persons and institutions.
- SoI relates the challenge of change to the learning and innovation competence or mastery of the core organisations such as industry, farms, offices and firms and their supporting networks. Knowledge creation or use becomes part of the every day culture and common sense for responding to or dealing with any expected or unexpected difficulty and problem coming from within and outside the environment or the interaction of the internal and external environment.
- SoI is to strengthen institutional arrangements, which in turn are related to the quality and efficiency of networks between the economic structure, the legal, financial and political structures.
- SoI strengthens existing or new networks of institutions in the public and private sectors that are in place to assist structural transformation..
- How coherent or incoherent are the inter-linkages within national economies of such components as the financial, legal, policy, educational, scientific and social institutions is a key matter in arranging a country's national system of innovation. How effective are the institutional components in performance and how well do they co-ordinate and work in concert – these are key issues that require systemic modelling, adjustment and resolution.
- SoI is useful for providing the conceptual framework for a structural social-economic transformation process between the macro-level co-ordination with the micro- level activities. How strong is the symbiosis between the institutions or networks of innovation and the micro-production processes that use and master knowledge and learning to create active comprehensive life-long learners.
- The extent of user engagement and participation in the process and dynamics of structural transformation.
- The degree of functioning and capacity of the modes and mechanisms that communicate knowledge flow and learning between different parts of the system of innovation.

These are some of the key components that need to come into play for a national system of innovation to take place. That is to say the structural transformation of Ethiopia as an economic and social entity is predicated on the infusion of the total learning and innovation concept in the components that make a national system of innovation. That is to say total learning and innovation becomes the general-purpose problem-solving guide for decision-making, and action. Such learning and innovation is embedded in the process of the construction of a dynamic system. Structural transformation at a national and systems levels are driven by innovative capabilities.

## **7. The geographical Dimension to systems of Innovation: Continental/national/regional/local/sectoral System of Innovation**

Nation states constitute a natural boundary of many technological systems. Sometimes however, it may make sense to talk about a regional or local technological system. In yet other cases the technological systems are international, even global.

When processes, dynamics and systems of innovation are specified with temporal and spatial coordinates of a continent, region, nation, local, city and sector, they can acquire a spatial/sectoral dimension and designation. The most popular has been the National System of Innovation (NSI) specified by the application of processes and systems of innovation in a national setting. This introduces a geographical and locational dimension to the stylised concept of systems of innovation described above. In principle a system of innovation can have as many types of geographical descriptions as it seems reasonable. There is debate revolving around problems of geographical specification: city, sub-national, national, regional, sub-regional, continental and international systems of innovation have been compared, contrasted and evaluated. There is merit however in examining a national system of innovation by taking the nation-state (European pattern) and state-nation (African pattern) of economic, political, science, technology and human resource training systems. There is bound to be distinct patterns and differences due to historical evolution, cultural patterns, socio-economic structures, and policy styles, law, and tradition and governance arrangements. Taking the national unit is also appropriate because the system of nation state seems to survive despite the free mobility of information, knowledge, finance and goods and services.

NSI is the concept, which helps the identification of actors and activities, and their interaction at the national level in order to specify further how learning and innovation have been imbedded to keep a country on a development track. The learning and innovation institutions facilitate knowledge on how nations go about building the acquisition of technological capabilities, technological accumulations and competencies. On the one hand the rate and direction of technological learning in a given country is determined by the degree of co-ordination of national institutions, the effectiveness of the incentive structures and ease and efficiency of knowledge and learning flows, on the other the learning and innovation dynamic and culture of the system of innovation should be embedded in national histories, institutions, structures and policy making. Nelson and Rosenberg have argued that despite the broad common features amongst those countries, which witnessed almost equal economic development, there are also very significant differences. These are differences due in "national histories and cultures including the timing of a country's entry into the industrialisation process." that influence the evolution of the institutions, laws and policies".<sup>3</sup>

NSI refers to the learning and innovation based activities, and actors and institutional networks by whose concerted action a national economy builds its technological, business and industrial strength. Together the synergy of private and public institutions, their capacity, organisation, management and performance (given an adequate incentive structure) create a culture of knowledge, learning and innovation. The possibility of enterprises, universities, governments and users to engage in making best use of a country's internal and external (including donor-fed) available resources is facilitated.

Differences in systemic interactions and specificity's in social-economic arrangements inscribed in specific differences in culture, histories of institutional development, economic structure and political conditions and policy styles provide the stuff to conceptualise specific *innovation and*

*learning paths* in different countries. Some nations have robust systemic interactions. Others are not so. There is thus a spectrum to the national systems of innovation related to the degree of embeddings of the knowledge, learning and innovation culture and dynamic in a given national setting. Those with weakly embedded cultures of learning and innovation are said to have weak or lopsided national innovation systems and those with a strong culture of embedded learning and innovation are countries with strong national systems of innovations. The national system of innovation concept helps in providing a heuristic to comprehend different patterns of technology learning paths, capability and competence accumulations even within a similarly clustered set of countries such as, for example, the African region.

The concern here is to stretch this concept further by adding another source for learning and innovation that different NSI's have to include as part of stimulating an ecologically underpinned innovation process. International and national regulatory regimes along with continued pressure from environmental activists have succeeded in securing the inclusion of an ecological constraint to the challenges of transformation. Expanding NSI to include ecological constraints would require additional systemic capabilities to prevent pollution and waste emission at source by the concerted action of local and national institutions. It means adjusting further the national macro-economic framework, institutional structures and incentives of the existing domestic arrangement to accommodate the ecological cost of structural transformation. It means evolving a concept of a national innovation system that can help to understand a pattern of technology accumulation and development with an ecological dimension. The ecological constraint on many African countries can be a source of new knowledge, learning and innovation. The structural transformation of Africa will have to be at the same time an ecologically sensitive transformation. The ecological constraint on Africa broadens the scope of the concept of NSI and makes institution building and acquisition of a new culture of knowledge, learning and innovation a complex undertaking.

## 8. Relations between Different Levels of Innovation Systems

The above characteristics that are said to apply and are also said to describe the African system of innovation also broadly describe the regional and national levels of innovation. There is a need to identify specifically the way the specific NSI in each country of the relevant African region is evolving. In a system, **interaction** is everything. The important problem is to identify both conceptually and empirically the interactions that are significant and that matter more than others? Is there a path dependency to the system of innovation? How do systems able to maintain closure under the conditions of openness? How do the different levels interact while maintaining closure under system openness? How is the boundary condition to be determined? How do the various relevant structures, actors and practices of the national level activity influence and impart to the development of a specific identity of the NSI? The influence of the NSI to the development of the sectors and, conversely, the dynamics of change of the sectors and their contribution to the development of the NSI constitute an important problem for empirical research.

Their interaction can be assumed to take a number of forms:

1. Where the NSI is found to be weak in the relevant country of study, the influence to the sector will not be positive.
2. Where the NSI is found strong, the influence on the sectors will not be at least negative: the spill over effect is expected to be positive unless there are other countervailing factors.

3. Where the NSI is static, the influence on the sector might be indifferent or negative unless there are mitigating conditions to feed NSI non-dynamism into neutral sectoral impact.
4. Where the NSI is collapsing, the influence on the sector might be negative whether there are mitigating conditions in place or not.
5. Where the NSI is lopsided, uneven and with some peculiar characteristics, the influence on the sector might have to be known by conducting detailed empirical analyses  
This is the influence flowing from the macro-economic location to the sectoral level.

**Supposing we reverse the flow from sector to NSI.**

6. The stronger the rate of transformation of the sector, the more likely a positive contribution is to come from the sector to add to the NSI
7. The weaker the rate of transformation, the more unlikely is a positive contribution to come to the NSI
8. The more static the sector's evolution, indifferent or negative outcome to NSI will be the more likely outcome
9. A learning and innovative sector is likely to have positive spill over effects to the macro-economy
10. Conversely a learning and innovative NSI is likely to influence positively the various sectors, and regional systems of innovative performance.

Different levels and interactions can be generated amongst regions, sectors, economies, communities and production units up to a continental scale.

A system of innovation confronts varied environments and situations to which it must respond and/or deal with. In the process the internal coherence of the system of innovation may either be strengthened or weakened. A system of innovation that increases efficient economic performance while sustaining social cohesion and/ that is known to increase economic growth whilst creating income disparities with concentration of income at the higher bracket and lowering at the low earning bracket or that increases economic growth while maintaining income equality represents a desirable form. B.A. Lundvall suggests the Danish model of the national system of innovation reflects economic dynamism with social regulation unlike the Anglo-Saxon system, that is known to increase economic growth whilst creating income disparities with concentration of income at the higher bracket and lowering at the lower earning bracket. From a normative stance, an innovation system that increases economic growth while maintaining income equality can represent a desirable form if one puts a premium on social cohesion to social discontent, growth of crime and other undesirable social consequences.

As Lundvall said:

“The Danish system of innovation and competence-building is small in global terms but it has certain characteristics that makes it interesting as a model for international institutional learning. Denmark has one of the most egalitarian societies in the world in terms of income distribution and at the same time it has an income level that is amongst the highest in the world.”

(B.Aake Lundvall, Innovation Growth and Social Cohesion: The Danish Model, Edward Elgar:, 2002, p.2)

Assuming threats and opportunities that are similar faced by different national economic arrangements, the response can vary depending on the difference in innovative systemic capabilities to innovate and to cope with change. National or even local economic arrangements

or systems also have different ideas, policies, institutions and styles for sharing the burdens and benefits of change. This has impact on the dynamism of the economic system and the cohesion of the social arrangement.

A well-functioning system of innovation is open to new opportunities and deals with threats that emanate from the environment. A strong system of innovation functions in periods of stability and instability. A weak system of innovation may function in periods of stability, while it may not respond effectively in periods of dynamic instabilities. A learning innovation system copes with new problems while an innovation system that is not quick to adapt to changing circumstances get stuck. Some analysts have explained the failure of the Soviet system as a failure of innovation system. The argument is that the Soviet system became locked into economic practices and institutions that were incongruent with the changed circumstances of economies being driven by technologies, knowledge and services. Powerful vested interests resisted the change and the successful innovation of the first wave of Soviet industrialisation was inadequate to keep the Soviet economy deliver the consumer goods that the population wanted. Thus the national system of Soviet political economy broke down. It was fit in the period of extensive industrialisation, but failed to maintain the same momentum in the period of intensive industrialisation. New actors, new technologies and new businesses are required to stimulate the innovation and economic performance of the society. When that fails, crises set in. In a similar vein some analysts have tried to explain the East Asian crises of 1997 as a failure of their system of innovation. The argument is that there was a successful innovation system for a stable economic period, when the world economy transformed with the ICT revolution, the system of innovation was not prepared to cope with the transforming or what some have called a learning globalized economy. Vested interests resisted, new actors could not establish themselves. The ensuing period saw massive dislocation.

In the case of Africa, the system of innovation is useful in providing a conceptual tool for integrally connecting the mobilisation of an African national project to deal with and respond to the pressures and changes in the world economy while overcoming the structural problems of social-economic transformation and eradicating poverty. African economies are lured to liberalise their economies with the incentives of donor funding. This may stimulate production while aggravating poverty. An African system of innovation is necessary to deal with this challenge in order to assist Africa to design its own principles and institutions.

A system of innovation can be thus linked to different internal and external problems different economies are facing. In Africa it is one of building a national system of innovation; in Russia, it is one of dealing with a transition from an over regulated political economic system to one that creates a new balance with social regulation and economic development. In East Asia, it is one of dealing with a learning globalised economy and adjusting to it. In Denmark it is one of keeping an innovation system that seems to be working well. In The Anglo-Saxon world, it is one of finding a system that keeps economic development without sharply contrasting income inequalities. So different systems of innovation exist since nations face different internal and external challenges.

The mutual dependence of NSI and production unit, sector-level or region level system of innovations means that synergies or lack of synergies in different circumstances lead to differentiated technological, business and national economic performance. The fact that knowledge, learning and innovation are interactive and they affect the rate and direction of economic performance means that policy perspectives have to address the problem of building synergies

amongst actors, institutions and activities. The key is to construct the appropriate type of interactions: changing negative interactions into positive links, strengthening positive interactions and rejecting negative ones. The Achilles hill of policy decision is making sure synergies are attained in knowledge, learning, innovation from the various forms of interactions in order to stimulate best technological, business and economic performance.

## **9. An African System of Innovation?**

The crystallisation of a national project inclusive of the African world is an important task that is waiting to be done. The national system of innovation can be useful in developing the African national project to put it both on a learning and innovation pedigree. NSI in the Africa context is an energy mobiliser and national system builder. Africa has been locked in a primary commodity exporting economic structure. The central actors, institutional arrangements and outlooks that constitute a particular economic practice can be represented in the form of a system of innovation. Powerful vested interests continue to keep this unproductive structure to Africa and resist the mobilisation of a new system of innovation. The creation of an African system of national political economy emerges by unfettering and unlocking the primary exporting political economic structure. While this issue of structural change with the mobilisation of a new African national system of innovation is related in re-membering a Pan-African national metaphysics, it is, however, beyond the scope of this paper right now to deal with it. (For an initial attempt to theorise an African system of innovation, see the forthcoming book by, Muchie, Lundvall, Kuada & Jamison (ed.), *The African System of Innovation and Competence Building*, Aalborg University Press, 2003)

What I like to do here is outline the need for thinking of Africa's issues and problems through the national system of innovation perspective.

Hardly any research on the African system of innovation has been undertaken to date. There is, however, a need to elaborate the wider African as well as specific national systems of innovations especially in relation to how they assist the transformation of the condition of the ordinary lives of the ordinary people. An African system of innovation can be conceptualised from the interaction of external and internal inputs of technological innovation and the formal and informal institutions that exist for uptake, adaptation and diffusion of learning what, which, who, how, and why knowledge is applied to solve from daily problems to difficult problems of production and management of social existence. It specifies how the social and economic structure is modified by the technological and institutional interactions to determine the basic data for building the learning and innovative capability of a society. The broad features, which may be taken to influence a specifically African system of innovation, can be suggested as follows:

- The specific aspect that needs changing to date is that the elements in the system that enter to constitute a specifically African NSI - both the technology and institutional dimensions - are mainly externally driven rather than having been endogenously propelled based on the interactions of national social-economic arrangements and the different knowledge systems, which exist in African societies.

- The external dimension remains critical in the innovation, learning, and accumulation of knowledge, the building of competencies and capabilities in organisation, product, process, techniques, market and management in the continent.
- Africa's research environment including its science and technology system has been dominated by foreign sponsorship.

The R & D expenditure as a proportion of the gross national product (GNP) for the continent as a whole was a mere 0.28 % in 1980, while Asia spent 1.40 % of its GNP on R & D, and North America a 2.23 %. By 1990 the situation has worsened in Africa by R & D dropping to 0.25 % while in Asia it had increased to 2.05 % and in North America to 3.16 %.<sup>4</sup> the structural adjustment impact have not changed the science and technology system in Africa.<sup>5</sup> Overall Government support to R & D is lowest in Africa. On the whole countries in Africa spend nearly a tenth of the percentage of GDP that industrialised countries expend on R & D.

- Africa has not put in place mechanisms for intellectual property and patents for inventions and innovations despite the setting up of two regional organisations (Organisation Africaine de La Propriété Intellectuelle (OAPI) based at Yaounde, Cameroon set up as early as 1962! and the African Regional Intellectual Property Organisation (ARIPO) based in Harare, Zimbabwe (established in 1976). The system of intellectual property continues to protect foreign patents rather than stimulate and furnish incentives to African inventors and innovators. The AU may make new efforts, but the problem still exists.
- The numerous Governments have established science and technology policy machinery assisted by UNESCO and foreign consultants in many African countries, but the utilisation of science and technology for bringing about a structural transformation of economy and society remains to be undertaken. State support to R & D has yet to grow and supplant the disproportionate donor funding it is projected to receive for the foreseeable future.
- The private sector source's contribution to innovations is either from the in- house R & D departments of major multinational companies and /or from purchases in the form of capital and turnkey projects. The African centred R & D development and the link with production needs yet to be developed and increased.
- While there is no problem in learning from outside the weakness of linkages between the formal and informal institutions, private and public institutions, and the indigenous and exogenous technological innovations dissipates the external input.
- It has been claimed that the market, state, production and business and learning systems do not often work in concert. Institutions, structures of production, and infrastructure have weak techno-economic networks. Inter-African communication linkages are still to be forged.
- The science and technology system in African countries is mainly donor driven and much R & D requires donor input. For example in Senegal, between 30-40 % of scientists are French nationals.<sup>6</sup> This unduly injects donor influenced terms of references, priorities and donor preferences into the African system of innovation more than any region in the world. 80-90 %

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<sup>5</sup> J.L.Inos, **In Pursuit of Science and Technology in Sub-Saharan Africa: The Impact of Structural Adjustment Programme**:RKP/UNU Press,1995

<sup>6</sup> S.Tiffin & F.Osotimehin, **New Technologies and Enterprise Development in Africa**, OECD, Paris,1992, P.44)

of the recurrent R & D budget is said to be devoted to personnel emoluments.<sup>7</sup> Local researchers are severely disadvantaged in research agenda setting with respect to donors. Pattern of assistance is said to be skewed to favour the learning of expatriate personnel more than domestic researchers.

- The scientific and technological human resources in Africa is said to be below the critical threshold necessary to provide effective and innovative leadership in R & D.
- Many African researchers are said to be outside and those inside work for external actors and agencies.
- It is claimed that there is no African research university comparable to the level and distinction of the major European and American centres of learning and research perhaps except a few universities in South Africa.
- The policy environment in facilitating linkages and techno-economic networks is said to be largely unreliable. The domains of state, market, civil society remain weakly linked where the actors and activities emerging from them seem to sustain weak learning and innovation techno-economic networks.

## 10. Opening a New Policy perspective

We cannot transform Africa by repeating its tragedies and itemising like in a shopping list its numerous troubles. We need a new economics of hope to relate Africa's problems with parallel solutions. Learning, innovation and imagination provide the heuristics and interpretative orientations to convert problems into solutions. Why lament? Anger at the unwholesome conditions yes; but courage to change that condition should supplant the easy option to give in to despair. There is thus a great need to search for innovative approaches to generate solutions that may create further problems, which, in turn lead to more and better solutions.

If Africans strive to possess innovation and learning as a problem-solving culture and build competence, the ability to form a capability set and self-reliant orientation to solving problems will grow. Development has the in-built external orientation making Africans look for ideas and finance to the outside world when they should be looking mainly to mobilise Africa's own initiatives, resources and possibilities.

The policy relevance of the systems of innovation concept is related to the provision of new knowledge, new attitude, new conceptual frameworks and new policy mechanisms in the search for uncovering hitherto untried learning paths or old ones with new and original approaches. Such learning paths emerge from a detailed empirical examination of Africa's own human base, nature, institutions, systems, organisations, practices, successes and failures in the context of transforming Africa from poverty to prosperity. Rather than make policy selection amongst prescribed poverty reduction options, the policy direction for structural transformation is best figured out through the application of innovative capabilities in guiding Africa's structural change through the deployment of national, systemic and innovation properties, functions and performance.

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<sup>7</sup> *ibid*

Africa's comparative advantage to move away from poverty to enter prosperity requires marrying knowledge, learning and innovation to its main resources: people, nature and in refining continuously its native institutions. The national system of innovation approach has been suggested as a heuristic guide on ways of stimulating possible learning paths for transforming the human, natural, attitudinal and institutional base of the African world.

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