Summary:

Actually in the globalization, foresight of national system of innovation is a pre-requisite of the competitiveness of the policy of science, technology and industry in Africa. This article is an opportunity to analysis the conceptual framework of national system of innovation for African developing countries and the role of foresight in the future oriented policy of science, technology and industry in Africa. Second, the link between forecasting and national system of innovation in Africa and the co-evolution between foresighting and innovation policies in Africa is analyzed too. Thirdly, the theoretical foundations supporting the role of the analysis of the impact of the determinants of innovation infrastructure on economic growth and the SWOT analysis of national system of innovation in some developing African countries and recommendations offered from the innovation system foresight.

Keywords: national system of innovation, foresight, science technology and industrial policies.

Introduction:

In a world of rapid change and complexity, characterized by the era of global liberalization of trade, investment, human capital and knowledge flows, the desire of African countries to be globally competitive can be linked to several factors, among them the national system of innovation. Especially, the role that Foresight plays in enhancing the performance of innovation system is a basic of the competitiveness of many African countries. In fact, the future oriented technology analysis is the basic of the efficiency of science, technology and industrial policies in African developing countries. Actually, in this rapidly changing global environment, the development of innovation system in Africa is not, at present, able to take full advantage of its benefits. According to some authors, national innovation systems in some African developing countries and not all are even in less developed stage: the limited inclusion of the structures of scientific and technological research in the institutional framework; the low number of activities of researchers demonstrated; the insufficient scientific opportunities; the low opportunities of industrial application in inventions patents; the absence of a protection regime more appropriate for intellectual property rights; the inability of science policy to limit the brain drain abroad and the collapse of the national scientific community; a mismatch between the sphere of research and industrial sphere. All these factors limit the emergence and development of a national system of innovation in African developing countries.
Africa. However, much remains to be done on a competitive policy of science, technology and innovation based on a more coherent for national innovation system in African developing countries. The fact is that the development challenges facing African countries are partly a crisis of innovation. What we have in most of African countries today is a rudimentary national system of innovation. The innovation ecosystems are underdeveloped, largely ineffective and will require substantial reforms and investments. The main reason is that the way forward for Africa lies in foresight. In fact, foresight is not only the adoption of tools and process for exploring the future. The aim is not simply to undertake technology foresight but to build a new future-oriented culture in innovation policy making and implementation. Such a system can allow African countries to identify weak signals, provide early warning and facilitate learning to all for effective policy making and implementation.

The objective of Innovation system foresight is to strengthen the innovation system, which involves building, transforming the system by removing barriers and promoting desirable innovation activities. Building new networks and linkages between new actors into the strategic analysis, debate and mapping the vitality of the innovation system, and exploring future opportunities to create investment in science and innovation are all instruments for achieving the competitiveness of innovation system. The first section of this article contain the conceptual framework of national system of innovation for African developing countries and the role of foresight in the future oriented policy of science, technology and industry in Africa. Second, what about the link between forecasting and national system of innovation in Africa. It analysis the co-evolution between foresighting and innovation policies in Africa and how foresight can contribute to the system of innovation. Thirdly, the theoretical foundations supporting the role of the national innovation system and innovation system foresight as a prerequisite for the science, technology and industry policies in African developing countries. Finally, the SWOT analysis of national system of innovation in some developing African countries and recommendations offered from the innovation system foresight and the analysis of the impact of the determinants of innovation infrastructure on economic growth in the case of some African developing countries.

**Section 1: Conceptual framework of national system of innovation for African developing countries**

Given the importance of the topic and its implications, the definitions of scientific, technological and industrial policies are many and at the same time there is no consensus on a single definition. Indeed, government intervention in this area an ancient practice that has
developed in the rhythm and the different ways countries. The observation of economic history shows based practice dissimilar industrial structures depending on the level of development of countries. New goals and new justifications for public action have enriched the range of possible measures. And the development of a policy mix combining various measures well adapted to the environment and national targets remains a challenge as to increase availability and simplify the use of tax incentives for R & D; the trend in policies to take into account the entire system and the innovation cycle; increase their financial and structural efforts; provide a framework to help entrepreneurs and businesses to strengthen their scientific specialization, technological and industrial; important reforms in patent and market promotion of intellectual property; facilitate the development of quality infrastructure, etc. And this challenge will continue as the scope and content of government policies evolve over time, as determined by changes in globalization.

Section 2: Foresight as a tool for promoting innovation in Africa:

The fact is that the development challenges facing African countries are partly a crisis of innovation. What we have in most of African countries today is a rudimentary national system of innovation. The innovation ecosystems are underdeveloped, largely ineffective and will require substantial reforms and investments. The way forward for Africa lies in foresight. Foresight in this respect is not only the adoption of tools and processes for exploring the future. For Africa, foresight must become a way of life and thinking. Essentially, foresight is the belief that the future is ours to create. It requires that we become proactive, audacious, and strategic. The aim is not simply to undertake technology foresight but to build a new future-oriented culture in policy making and implementation. Such a system can allow African countries to identify weak signals, provide early warning and facilitate learning to allow for effective policy making and implementation in a world of rapid change and complexity.

1-The link between forecasting and national system of innovation:

A-The concept of Foresight:

Irvine and Martin defined foresight activities as “the techniques, mechanisms and procedures for attempting to identify areas of basic research beginning to exhibit strategic potential”.

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Foresight is concerned with creating an improved understanding of possible developments and the forces likely to shape them. The goal in foresight is: what chances for developments and what options for action are open at present, and then follow up to determine to what alternative future outcomes the developments would lead. In fact, the nexus between foresight and innovation system have been tentatively explored and they have mainly focused on how foresight can contribute to innovation system analysis in the studies of Cagnin et al. (2012); Martin and Johnston (1999); Alkemade et al (2007) and Weber et al (2009). Foresight is rooted in a European tradition of futures studies that was established in the 1960s and 1970s in Miles (2010)\textsuperscript{4} and Bell (2003). In the early 1980s, Irvine and Martin (1984) introduced the term foresight as a strategic, forward-looking technology analysis to be used as a public policy tool for priority setting in science and technology. Since the 1980s, foresight has established itself as a field of practice in both public policy making and corporate strategic planning and, more recently, as a scientific discipline. In this article, it focuses on context of public policy for science, technology and innovation. Hence, the essential rationale and motivation for public policy foresight are ultimately to link science technology and innovation policy more effectively to social and economic development, with innovation on the main level.

\textbf{B-Co-evolution between forecasting and innovation policy:}

Changes in the understanding and content of foresight since the 1940s have been motivated by changing rationales for engaging in foresight. Several studies have discussed this development and have identified different generations of foresight\textsuperscript{5}. During the same period, the understanding and the mode of innovation have also changed, and several studies have identified successive generations of innovation models. And the rationale for innovation policy has changed in response to succeeding innovation models. Lundvall and Borrás (2005)\textsuperscript{6} identify three ideal types of innovation policy in the post-World War II period: science policy, technology policy, and innovation policy. Science is observed as being capable of solving society's problems; therefore, the most important activity is basic science, and the most relevant actors are universities and research organisations. Technology policy emphasises the links between science and industry. Attention moves towards engineering and

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\textsuperscript{5} Miles et al., (2008); Reger, (2001); Georghiou, (2001); Tegart and Johnston, (2001); Schlossstein and Park, (2006); Linstone, (2002).

from the internal organization of universities towards how they link to industry. The ideal type of innovation policy is derived from the insight that innovation is a systemic process. Innovation policy concerns all relevant aspects of society that influence the process of innovation, which makes policy systemic.

**Table: Conceptual linkages between generations of the understanding of innovation, innovation policy and foresight:**

<table>
<thead>
<tr>
<th>Generations</th>
<th>Conceptual understanding of innovation in foresight</th>
<th>Type of innovation policy</th>
<th>Description of foresight generations</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st</td>
<td>The science-push model of innovation</td>
<td>Science policy</td>
<td>Mainly forecasting</td>
</tr>
<tr>
<td>2nd</td>
<td>The demand-pull and couplings model</td>
<td>Technology policy</td>
<td>Emphasizes the matching of technological opportunities with market and nonmarket (environment and social issues).</td>
</tr>
<tr>
<td>3rd</td>
<td>The demand-pull and coupling model The integrated model of innovation</td>
<td>Technology policy</td>
<td>Signifies an enhancement, or broadening, of foresight’s market perspective by inclusion of a broader social dimension that involves concerns and inputs from a broad range of social actors.</td>
</tr>
<tr>
<td>4th</td>
<td>Mix of conceptualizations with relatively diminishing emphasis on innovation</td>
<td>Technology policy</td>
<td>Foresight becomes distributed and broadened in scope. Intensifies characteristics of the 3rd generation.</td>
</tr>
<tr>
<td>5th</td>
<td>Mix of all conceptualizations co-existing with an increasing focus on systems and network approaches, but with relatively diminishing emphasis on innovation</td>
<td>Technology policy</td>
<td>Foresight becomes concerned with the science and technology systems perspective and (or because of) increasing orientation towards solving societal challenges.</td>
</tr>
<tr>
<td>Proposal</td>
<td>IS approach</td>
<td>Systemic innovation policy</td>
<td>Focus on innovation and transforming IS with increased attention to the demand for knowledge, context factors and diversity in innovation dynamics.</td>
</tr>
</tbody>
</table>

**Source:** A.D. Andersen, P.D. Andersen / Technological Forecasting & Social Change 88 (2014) 276–286.

C- Innovation system foresight: Porter approach:

**Porter (2010)** describes innovation foresight as being different from science-oriented foresight and technology-oriented foresight. Because it demands more attention to socio-economic contextual forces interacting with emerging technical capabilities to affect commercial product and services. Porter’s point is that the innovation domain is different from and broader than the domains of science and technology and that user’s play a more pronounced role in the innovation domain. In the same time, the science, technology and innovation dimensions of an innovation system are interdependent in a systemic way. Thus, there is reason to be conceptually more precise. The term innovation system foresight denotes foresight that explicitly takes the innovation system framework as its theoretical underpinning and thus operates with a systemic, contextual and evolutionary understanding of innovation. Moreover, innovation system foresight is more accurate than innovation foresight because it stresses the systemic and process-like character of both foresight and innovation. It is defined

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as a systematic, participatory, future-intelligence-gathering and medium-to-long-term vision-building process aimed at present-day decisions and mobilizing joint actions to improve innovation system performance with the ultimate goal of improving desirable socio-economic performance. The new knowledge is generated and diffused in a system of innovation that has actors, institutions and dynamics that must be analyzed and included in any meaningful foresight exercise. Hence, the systemic nature of innovation processes must be central to foresight thinking to generate better strategies and a stronger impact. Those foresight practitioners tend to overestimate the power of foresight as a result of underestimating the complexity of innovation. And, they are complementary and valuable elements to innovation system foresight insofar as they are designed to pay attention to interactions between science, technology and innovation.

D-What about the implication of innovation system foresight with Lundvall approach?

There are many implications as: addressing research gaps, design and conceptual implications and mapping the present. Firstly, in addressing research gaps, the gradual shift from a linear perception of innovation towards a systemic framework in foresight is reflected by two related research gaps that can be addressed by innovation system foresight. First, it is argued that foresight should increasingly move from being about priority setting towards being more focused on implementing insights and realizing structural change as. A lack of impact of foresight has led to an increased focus on the demand-side of the innovation process within foresight. The argument is that including demand more seriously will increase impact. Indeed, the role of demand for knowledge and users of innovation is theoretically central to the innovation system framework. As the importance of firm-external knowledge for innovation increases, interactive learning becomes the most important type of learning in Johnson (1992)8. This point was first introduced in the form of user-producer interaction in Lundvall (1985, 1992) in which innovation is observed as emerging from a confrontation of user needs with technological opportunities. This situation entails interdependence in innovation endeavours between users and producers via the exchange of information and interactive learning. It implies that the ability to identify, articulate and communicate problems and possibilities on behalf of both users and producers is very important and that the competence of users is as important as the competence of producers in Lundvall, (1985) and Pasinetti

(1993). Consequently, the quantity and quality of interactive learning linkages are likely to improve the performance of the innovation system in Lundvall, (1985); Fagerberg et al., (2009). These theoretical considerations can support innovation system foresight in conceptualising the demand for and users of innovation in foresight design. Second, it is increasingly recognised that foresight is embedded in a wider context that influences both the foresight process and its potential impact on innovation activity in Cariola and Rolfo (2004) and Barré (2002). Foresight must be able to systematically and coherently account for context diversities and how this relates to innovation. According Schoen et al., the contextual nature of innovation is being recognised in foresight, but further work on the issue is lacking. Foresight can learn important lessons about how and why context influences innovation from innovation system research. Due to its foundation in evolutionary theorizing on socio-technical change with Martin, (2012); Lundvall et al., (2002), an Innovation system S is understood as open, evolving and recursive. Innovations follow certain and different trajectories across time and space in a path-dependent manner in Dosi (1982). Innovation dynamics differ across contexts because: industries depend on different knowledge bases and technological opportunities differ across knowledge bases as a consequence of existing strongholds in production, science and technology; technological and innovation competencies, embodied in people and firms, are unequally distributed across space and time as a consequence of the specialisation of the industrial structure and the education system; and the quality and volume of demand for output differs across industries, resulting in diverse demand-pull effects in Dosi (1988). Moreover, institutions relating to appropriability conditions, competition and market structure differ in importance across industries in Nelson and Rosenberg, (1993); Pavitt, (1984).

**Section 3: What are the theoretical foundations supporting the role of the national innovation system as a prerequisite for the science, technology and industry policies in African developing countries?**

1. **The foundations of the theories of endogenous growth and conditional convergence on policy of science, technology and industry:**

The new policy of science, technology and industry in the context of globalization were inspired by early theories of endogenous growth as primary justification. Respond to market failures and promote a policy framework for positive externalities that industrial policy aims. It also justifies the direct actions targeted through direct state funding. With the first wave of
endogenous growth models, those of investment in physical capital with Romer (1986), the accumulation of human capital with Lucas (1988), physical infrastructure with Barro (1990) and the effort research and development with Romer (1990) justified the orientation of this policy in the context of globalization through actions the following guidelines: a policy of support for education, research grant, investment in human capital and for education, public spending on basic infrastructure, etc. In fact, public action is needed to correct market failures (externalities, market power, capital market failures) and to guarantee the provision of public goods. The market failures reflect a mismatch between the structure of private and social benefits and in the industrial policy context; they may be associated with positive externalities and informational asymmetries. This situation implies that private investments will be lower than socially desired levels. Following Crafts (2010), three types of market failure can be highlighted: infant industry-related capital market failures; agglomeration externalities; and rent-switching via strategic trade policy. And in the context of debates on infant industry protection, there two forms of purported market failure: imperfect capital markets and problems of appropriability. Then there are other market failures as: agglomeration economies, supporting specific industries via strategic trade policies. Indeed, several studies have helped reveal some policy of science, technology and industry measures accompanying the opening. This work concerns those of Grossman and Helpman (1991) on the effects of positive externalities and dissemination of knowledge on a global scale, then those of Coe, Helpman and Hoffmaister (1997) based on the role of knowledge dissemination conditioned by the local absorptive capacity of knowledge and human capital and finally Coe and Helpman (1995) with transferable through imports positive externalities. In order to support the opening and allow economic growth, namely

processes: measures for the attractiveness of FDI, learning and training of human capital, etc. However, this logic is extended, in an approach to catching-up the developing countries. Thus, theories have emerged as those of conditional convergence and suggested arguments directly related to the science, technology and industry policies in the context of catching up with the model Verspagen (1993) which combined catch and evolutionary theory. The latter highlighted the weight of accumulated learning ability, training, education and human capital and investment in infrastructure projects as a basis for initiating a process of technological upgrading. He also recognized for its work on the role of improving the efficiency of structures and public institutions in increasing the ability to assimilate the "spillovers" of knowledge in emerging countries. Thus, a policy through transfer strategies using several means, namely the establishment of an efficient system of education specialized in science and technology; the application of learning and training human capital program; operation structures and institutions within the state. Subsequently, in the same train of thought another model, that of Abramovitz, was used to analyze the role of social skills in catching up with developed countries. Therefore, this policy has become a policy aimed at catching up with other countries implementing strategies on: expenditure in training, grants for research and development, infrastructure spending, etc. At this level, the analysis developed in the direction of the role played by the national innovation in the development and prosperity of the policy of science, technology and industry. These questions were answered in the context of evolutionary theory to see how business competitiveness is conditioned by an efficient national system of innovation.

2- The foundations of evolutionary theory in favor of science, technology and industrial policy:

a- The evolution of the foundation in favor the national system of innovation:

At this stage, we discussed the evolutionary analysis of innovation that justifies a special role to the state and shows the weight of the national policy. Thus, concepts such as technological paradigm and technological trajectories seem relevant to study the dynamics of the evolution of science, technology and industry policies. This framework seems appropriate to study the role of the State and its new form, in the context of evolutionary theory, from the arguments

of the founders of this theory Nelson and winter (1982)\textsuperscript{19}. Within this theoretical framework, the State must constantly adapt to changes in its environment, even for science, technology and industry policies. But the contribution of this theory lies in the role played by the national system of innovation and its relationship with the logic of these policies. In the work on national innovation system is in the late 1980s: Freeman (1988)\textsuperscript{20}, Lundvall (1988)\textsuperscript{21}, Nelson (1988)\textsuperscript{22}. Indeed, several studies have been devoted to the science, technology and industry policies and were more oriented towards the promotion of technology in an evolutionary perspective to the work of Carlsson (1992)\textsuperscript{23} Metcalfe (1994)\textsuperscript{24}, De Bandt (1995), Niosi and Bellon (1995)\textsuperscript{25} Saviotti (1995)\textsuperscript{26} Lesourne et al. (2002) and Moreau (2004)\textsuperscript{27}. In his work, the State does not follow an optimizer behavior but kindness. In fact, government intervention has taken a "catalytic" to stimulate partnerships and economic inter-stakeholder networks and establish institutional compromise, nature etc. In fact, Nelson and winter (1982), in their work on evolutionary economics, observed that corporate behaviour was determined by tacit knowledge in the form of rules and routines learned within the corporate framework and passed on from one generation of managers to another. And rules and routines become embodied in other institutions, public and private. Networks of formal and informal connections between relevant institutions make up the national system of production and innovation. And develop institutions to promote networking and collaboration and to devise strategies to make best use of these institutions. And actually a systems failures approach is adapted to industrial policy and innovation. It addresses the broad set of


interactions between groups of key institutions that create the operating environment and learning context for firms. Implied in the systems approach is that governments interact with firms, and that an essential government role is to engage in dialogue with business in order to establish where public support is best deployed in order to capitalise on positive externalities, without the process being captured by any special interest group. And the systems approach is designed to overcome coordination problems. The developing countries have applied aggressive and intensive policies technological learning and they managed to catch up with developed according to the arguments proposed by Kim (1993) for example countries. For some authors, national innovation systems in developing countries are still at a primitive stage. For example, Mezouaghi (2002) argued that the concept of national innovation system has borrowed its physical and functional characteristics of innovation systems in developed countries, while its application in developing countries shows a number of limitations. Porter (1993) proposed a series of new measures in the new science, technology and industrial policy found their justifications. Indeed, Porter identified four national attributes interact to create the best possible environment is: the factors, demand, and related upstream industries and strategy, structure and rivalry of firms. Porter's analysis focuses on the role played by different types of infrastructure (logistics infrastructure, communication infrastructure, administrative infrastructure, financial market infrastructure and the innovation infrastructure). Indeed, science and technology infrastructure is a set of interconnected structural elements. In advanced economies, it became the source of new ideas for countries to reach the global technological frontier. In fact, analysis of the process of catching the problem of the existence of a global technological frontier, to which developing countries should aim. Developing countries have focused their attention on improving the absorptive capacity to benefit from the knowledge of others. These arguments have been developed in the work of Griffith et al. (2004), Coe and Helpman (1995), Fagerberg (1994) and

Lichtenberg (1992)\textsuperscript{34}. But innovation is not just a question of spending on research and development; it is also connected to other determinants of business environment based on the work of Furman and al. (2002)\textsuperscript{35}.

**Section 4: the quantitative empirical analysis of foresight innovation system:**

Analyzing the state of foresight innovation system is based on the impact of some determinants of competitiveness as pillars of national system of innovation on growth of many developing countries including African countries. This article reveal the effects of policy measures of science, technology and industry from estimating cross-sectional with 53 developing countries.

**Table: Determinant of innovation infrastructure:**

<table>
<thead>
<tr>
<th>Determinant</th>
<th>R\textsuperscript{2}</th>
<th>coef</th>
<th>t-stat</th>
<th>Prob</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quality of scientific research institutions</td>
<td>0.979</td>
<td>0.6551</td>
<td>2.525</td>
<td>0.0149</td>
</tr>
<tr>
<td>collaboration of University-Industry Research</td>
<td>0.982</td>
<td>0.9633</td>
<td>4.1029</td>
<td>0.001</td>
</tr>
<tr>
<td>Quality of the education system</td>
<td>0.977</td>
<td>0.4203</td>
<td>1.628</td>
<td>0.1099</td>
</tr>
<tr>
<td>Education quality math and science</td>
<td>0.979</td>
<td>0.5386</td>
<td>2.7342</td>
<td>0.0087</td>
</tr>
<tr>
<td>The quality of education in management</td>
<td>0.980</td>
<td>0.877</td>
<td>3.249</td>
<td>0.0021</td>
</tr>
<tr>
<td>Availability of scientists and engineers</td>
<td>0.978</td>
<td>0.493</td>
<td>1.077</td>
<td>0.0665</td>
</tr>
<tr>
<td>brain drain</td>
<td>0.979</td>
<td>0.496</td>
<td>2.572</td>
<td>0.0132</td>
</tr>
<tr>
<td>tertiary enrollment</td>
<td>0.976</td>
<td>-0.033</td>
<td>-0.924</td>
<td>0.360</td>
</tr>
<tr>
<td>Patents per million population</td>
<td>0.977</td>
<td>0.0061</td>
<td>1.467</td>
<td>0.1487</td>
</tr>
</tbody>
</table>

Sources: cross-section analysis (155 developing countries including African countries, south Africa included), Data from the WEF Report (2011 and results of Rats software).

Indeed, in terms of innovation infrastructure, some determinants have contributed significantly to the growth of GDP / capita as: the quality of scientific research institutions (0.65), the quality of education in mathematics and science (0.54), quality education management (0.87), collaborative university-industry research (0.96). Others determinants had less impact on growth as: the quality of the education system (0.43), availability of scientists and engineers (0.49), the brain drain (0.49), patents (0.006) but weakly positively


contribute to the growth of GDP / capita. Only scores for the tertiary enrollment negatively contribute to the low growth / capita. Thus the role of the state is essential in this area by: developing scientific research institutions, improving the quality of education especially in mathematics and science and improving collaboration between university industry and research and finally increase the number of patents.

**B- SWOT Analysis: Foresight of the national system of innovation in Tunisia:**

<table>
<thead>
<tr>
<th>Weakness</th>
<th>index  ( )</th>
<th>Strength</th>
<th>index  ( )</th>
</tr>
</thead>
<tbody>
<tr>
<td>Human capital and research: education: PISA scales in reading maths and science</td>
<td>396,6 (56)</td>
<td>Institution: business environment: Ease of resolving insolvency</td>
<td>55.0 (35)</td>
</tr>
<tr>
<td>Human capital and research: research and development (R&amp;D): QS university ranking, average score top 3</td>
<td>0.0 (70)</td>
<td>Human capital and research: education: expenditure on education</td>
<td>6.2 (25)</td>
</tr>
<tr>
<td>Market sophistication: trade and competition: applied tariff rate , weighted mean, %</td>
<td>16.0 (139)</td>
<td>Human capital and research: tertiary education : graduate in science and engineering %</td>
<td>42.4 (3)</td>
</tr>
<tr>
<td>Business sophistication: innovation linkages : university/ industry research collaboration</td>
<td>34.2 (109)</td>
<td>Human capital and research: research and development (R&amp;D): research, headcounts/mn pop</td>
<td>3,194,8 (30)</td>
</tr>
<tr>
<td>Business sophistication: innovation linkages : J-V strategic alliance deals/tr PPPGDP</td>
<td>0.0 (102)</td>
<td>Human capital and research: research and development (R&amp;D):Gross expenditure on R&amp;D, % GDP</td>
<td>1.1 (33)</td>
</tr>
<tr>
<td>Business sophistication: knowledge absorption : royalty&amp; license fees payments, % total trade</td>
<td>0.1 (111)</td>
<td>Infrastructure: ecological sustainability: GDP/unit of energy use, 2005PPP S/Kg oilpe</td>
<td>9.3 (20)</td>
</tr>
<tr>
<td>Business sophistication: knowledge absorption : FDI net inflows, % GDP</td>
<td>0.9 (116)</td>
<td>Market sophistication: domestic credit to private sector, %GDP</td>
<td>75.2 (42)</td>
</tr>
<tr>
<td>Knowledge and technology :knowledge impacts: new business/pop 15-64</td>
<td>0.0 (92)</td>
<td>Knowledge and technology outputs: knowledge creation: scientific and technical articles/bn PPPS GDP</td>
<td>26.3 (38)</td>
</tr>
<tr>
<td>Creative outputs: Madrid trade app.holders / bn PPPS GDP</td>
<td>0.0 (69)</td>
<td>Knowledge and technology outputs: knowledge diffusion: high-tech exports less re-exports, %</td>
<td>4. (34)</td>
</tr>
<tr>
<td>Creative outputs: online creativity: video uploads on youtube/pop</td>
<td>58.9 (52)</td>
<td>Creative outputs: creative good and services: creative goods exports , % total trade</td>
<td>2.8 (19)</td>
</tr>
</tbody>
</table>

**Opportunities**
- The establishment of an efficient system of education specialized in science and technology: Increasing the number of students in math’s and sciences.
- Improving the level of research in university and in laboratory
- More target tariff rate in trade and competition for more competitive market sophistication
- Development of linkages facilitating technology transfer and innovation by improving the dynamic relation between industries-research and public institution.
- More competitive environment to facilitate knowledge absorptions by increasing the implementation of national system of innovation and attract FDI.
- Promotion of the entrepreneurship for youth and women by improving the level of credit target to projects with innovative idea.
- Increasing research and development (R&D) in national budget for increasing the level of innovation and the number of patent

**Threats**
- The increasing phenomena of brain drain and increasing the level of flow of graduated student to foreign countries especially those graduate in science and engineering.
- Few oriented and less target scientific and research activities still exist and can’t be implemented in laboratory (research in university).
- Quality of imperfect competition between firms can be present, need for reforms to have more target tariffs.
- The less capabilities in firm to absorb transfer technology and few developed networking between actors to implement mechanism to facilitate innovation.
- Less linkage between FDI, NSI to facilitate knowledge absorptions limited by the less level of entrepreneurs.
- Need more targets policies, law and reforms to improve the level of entrepreneurship especially for projects with innovative idea.
- More better allocation of budget in R&D for increasing the number of patents and the level of innovation and not be limited to imitation.
Development of SME exporting products with high and medium technology

Reforms, laws, fiscal measures to implement more better environment of doing business, trade facilitations and credit finance to SME are needed and its related to political stability.


Conclusion: This article advocates an active role of the state science, technology and innovation policies for the improvement of the growth. This article advanced that the development of innovation infrastructure is essential for better economic performance and the SWOT analyses recommend that there are many weaknesses that need to be improved by implementing new actions for improving foresight innovation system in Africa. This goal can be achieving by implement new targets policies, reforms, laws and rules in African countries harmonized with the international levels and those in others successful countries.

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