

The Perception of Innovation in the Countries of the African Continent

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Abstract: Innovation has been a non compliant chapter wherein African countries are considered globally at per with emerging countries like India and Russia. A lot has been spoken in global conferences on innovative measures with statistical data which shows that recent trends point towards greater compliance in business models which has resulted in better governance and political measures for effective business practices in African countries. My research work primarily deals with theoretical established data related to African economy, nevertheless terming it as a cumbersome measure for establishing a blue print model for innovative Africa as African countries are huge and the data are often misleading in nature. My research will focus on greater visibility and judgmental based economic expression underlying development economics.

Keywords: innovation, national innovation policy, African countries, economic and development.

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I. Introduction

In Africa, the public financing of university research or research and development is the responsibility of governments and also of technical and financial partners, the most important of which are the institutions of Bretons Woods such as the International Monetary Fund, the World Bank, and others. Most of the financing of these researches and development does not fit with the requirements of markets, thus exposed to many risks existing in the different sectors of the economy.

In both developed and less developing countries in Africa, innovative activity is one of the most important areas of economic policy. Many researchers, according to their research, have recognized innovation as one of the most important factors in ensuring economic growth [1], and for sheer efficiency there is a clear need for the development and implementation of a system national innovation. To study the concept of innovation is to study a great deal of scientific research in the African and foreign context [2-7]. Scientists agree on the definition of the national innovation system as a combination of the following components: the presence of related formal and informal inter-institutions, well-established distribution and implementation of new technologies in a specific economic space (State), effective innovation process, etc.

The process of innovation in the economies of low- and middle-income African countries has been examined, for example by the research of Oyelaran Oyeyinka B. (2003, 2006 and 2014); Nkakene and Lebas (2018); Johnson B. and Lundvall B-A. (2003); Rodrik, D. (2013) and others. In particular, they showed that research and development (R & D) expenditure did not fully explain the decision to launch innovative activities [8-12].

Other researchers, on the other hand, have shown the preconditions for innovation in small and medium-sized enterprises in Africa, particularly the example of Cameroon, Ivory Coast and Senegal. Their results suggest that innovation is important and a development strategy for small and medium-sized enterprises, and the most common form of innovation in Africa is to "improve" organizational and marketing innovations. Similarly, their results reveal the main obstacles to innovation, for example: weak institutions, lack of infrastructure, inadequate conditions for business development and an underdeveloped education system [13].

1-The challenges of innovation in Africa

Critics of the paradigm of innovation activities often report on the validity and ideological underpinnings of concepts, models based on norms and directive principles that tend to promote structural transformations and practices in almost all economic sectors. Secondly, these criticisms continue to put pressure on the quality of skills in university courses with the aim of aligning the scientific system with market values and dynamics (Godin 2006, Milot 2003) [14-15]. There is also the potential threat of lack of funding for scientific culture, public ethics and the autonomy of the university field (Bernatchez, 2010, Chan and Fisher,

2006) [16-17].. Finally, the loss for the common market of each African integration zone for the benefit of the dynamic multinational equipped who will eventually impose their innovative products and services at a low price.

2-Notional and methodological framework

About the notional framework, the innovation relates on the stakes related to the competition for the access to the resources of the different actors ensuring the animation of the economic market, the scientific and social world. It is also related to the beliefs, meaning and value that animate, define and characterize the environmental field of each African country.

The notion of innovation is also technological, of which it refers to change thanks to modern economic conditions, when the question of the application of new technologies to each enterprise arises, when the demand of the consumers increases and the range of goods and services grows, innovative activity becomes an important factor for the development of companies, mature or new. And companies that cannot adapt to new conditions and environmental constraints can face many negative consequences, such as the disappearance of the market, loss of market share, loss of competitiveness.

The purpose of this article is to elaborate the relevant recommendations, and to propose a new generation of innovation for a positive social impact. To achieve this goal, the methodological framework this research based on available and accessible databases to review the inventory of fixtures on innovation in Africa. Then, make the complex and logical analysis of the available factors or indicators determining the innovation; after presenting the results, and finally open the discussion and then conclude.

3-Review of overview situation on innovation in Africa

Over the past thirty years in Africa, the role of innovation in the economy has been continuously increasing [18]. However, according to the Global Entrepreneurship Monitor, the level of development of innovation is still low [19]. If we talk about innovation in general, at the level of government spending on innovation, we can see different scales in the investments of African countries, for example, in R&D (see Table 1).

According to the data presented in table.1, South Africa is the continental leader in this field, spending 0.95% of its GDP on research and development. India spends about the same share, but less than Russia (1.5%), Brazil (1.2%) or China (1.84%), its partners in the BRICS club. Note that the nominal GDP of South Africa in 2017 amounted to \$ 294 billion, while China's GDP - 12 trillion \$ [13 Ibidem]. South Africa, however, is focused on increasing its investment in R&D to 1.8% of GDP in 2018–2020, by fundamental and applied research, which brought significant success. Managing an international radio telescope project (SKA: Square Kilometer Array) or a successful flight (AHRLAC) of the first military aircraft designed and manufactured in Africa are prime examples.

Tables 1: The average share of Research and Development (R&D) expenditure as a percentage (%) of GDP.

Country (zones)	Republic of South Africa	West Africa	East Africa	Central Africa	North African	Southern Africa
2015	0,65	0,4	0,45	0,4	0,5	0,6
2016	0,95	0,44	0,5	0,4	0,6	0,65
2017	0,80	0,5	0,6	0,35	0,6	0,7

Sources: Data by the UNESCO Institute for Statistics and World Bank.

It is noted that the organization of the African Union has set a target of 1% of GDP invested on R&D, but data available to the UIS show that only three sub-Saharan African countries are close to this target: South Africa, Kenya and Senegal (around 0.8% in all three countries).

A significant part of R&D expenditure is devoted to the salaries of R& D personnel (researchers, technicians and support staff assigned to R & D). In this respect, the figures for the indicator "Researchers per million inhabitants" follow a similar pattern, as do the trends in R & D expenditure. According to recent data, in 2016 the UNESCO Institute of Statistic present as follows: the Republic south of Africa, Morocco and Tunisia is leader of this continent with less than 2000 researchers / per million inhabitants; then comes the other North African countries with less than 1000 researchers / per million inhabitants, followed by East African countries with less than 300 researchers / per million inhabitants, and finally the countries of the East, West and center with less than 100 researchers / per million inhabitants.

Speaking of innovation activities in Africa, let's look at the analysis of firms' activities in the transformation of manufactured goods. In this section, about fifty countries that account Africa, only nine countries have available information on the various types of commitment to innovation activities in terms of

internal R & D, acquisition of machinery and equipment, software, training, external R & D contracts, external acquisition of knowledge and the introduction of innovation in the goods and services market.

The average of these indicators for the manufacturing company of these countries is strong for the acquisition of machinery and equipment, software, training, in market introduction of innovations; and has weaknesses for external acquisition of knowledge, internal R & D and external R & D contracts. This commitment data is shown in the following table.

Tables 2: (%) Percentage of manufacturing firms that engaged in innovation activities

		Percentage of manufacturing firms that engaged for 2005- 2017					
	African countries	In house R&D	Contracted-out external R&D	In Acquisition of machinery, equipment and software	Acquisition External knowledge	Training	In market introduction of innovations
1	Egypt	29,7	6,7	80,8	35	74,9	47,2
2	Ghana	49,6	23,7	94,8	36,6	80	59,8
3	Kenya	57,9	31,4	75,9	—	82,1	73,1
4	Morocco	60,3	39,7	69,3	—	—	—
5	Nigeria	48,8	30,7	82,9	51,7	81,2	61
6	South-Africa	54,1	22,4	71,2	24,8	69,6	42
7	Uganda	60,1	34,5	68,5	39	73	56
8	Tanzania	39,3	27,4	79,8	51,2	96,4	64
9	Ethiopia	19,2	8,8	94,8	31,7	44,9	38,6
	Total average	46,5	25,03	79,77	38,57	75,26	55,21

Sources: Data by the UNESCO Institute for Statistics (<http://data.uis.unesco.org/>)

4-The complex and logical analysis of available factors or indicators determining innovation

The complex and logical analysis here is not a multivariate function, but it involves using tables with indicators to construct graphs, analyze and interpret them in order to extract results.

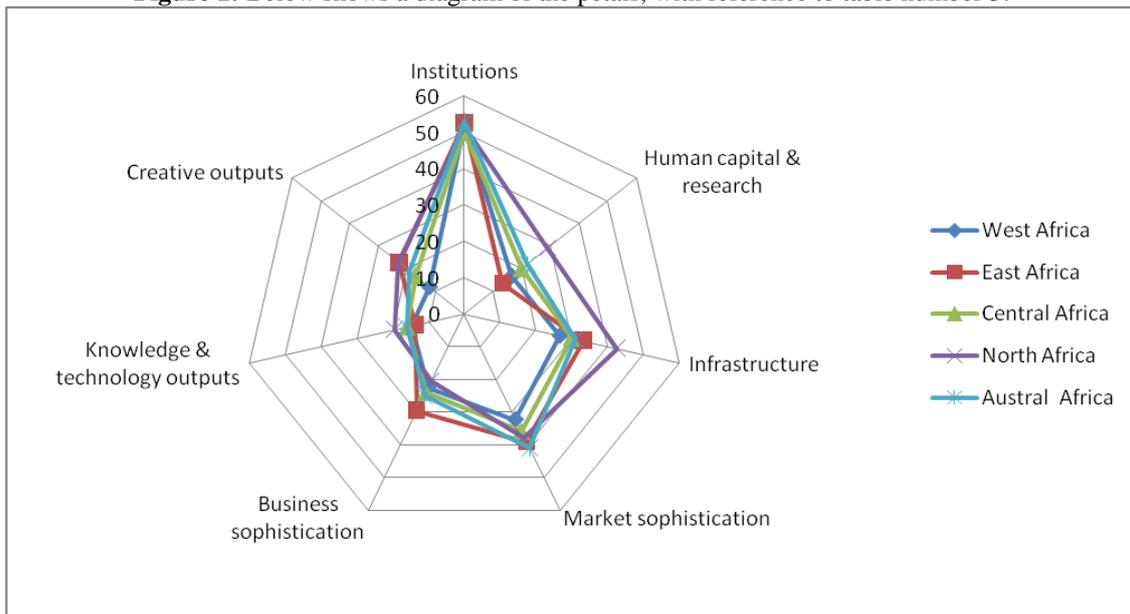
Table 3: Data for contribution and output innovation sub-index for African countries in 2018.

Countries Zones	The value contribution of innovation sub-index					The value of the output of innovative sub-index	
	Institutions	Human capital & research	Infrastructure	Market sophistication	Business sophistication	Knowledge & technology outputs	Creative outputs
West Africa	51,8	16,7	26,8	32,3	22,5	14,6	11,9
East Africa	52,6	13,5	33,2	39,1	29,6	13,6	22,5
Central Africa	50	20	30	36	24	16	17
Austral Africa	52,7	21,5	30,8	41,3	24,4	15,7	19
North Africa	51,7	29,2	42,7	37,7	20,5	19,3	23

Sources: Data of World Intellectual Property Organization (WIPO), Cornell University and INSEAD.

Based on the sub-index data used to calculate the Global Innovation index Africa countries for 2018, the researcher was able to analyze the data using a petal chart. The chart allows us to compare the total values of the indices, and the results show the most covered areas represent strengths or efforts made in terms of innovation activity, while the less covered areas represent weaknesses in terms of innovation performance in Africa countries zones. The overall results determine the level of innovation activity of the company in the countries zones.

Figure 1: Below shows a diagram of the petals, with reference to table number 3.



Source: Implemented by the author according to the available data table.2.

Thus, with regards to figure 1, it can be seen that efforts are being made when considering the level of innovation in almost all African countries. It can be concluded that, the institutional sphere in relation to innovation activity is covered. On the one hand, in terms of organizational and institutional innovation, the results are encouraging. Similarly, we note the important efforts of investment funds to build infrastructure and strengthen the internal market. And on the other, in the section on investing resources to promote innovation, there is a significant reduction in efforts in areas, such as: human capital and research; business sophistication (qualified and competent employees, innovative connections, knowledge development and payment of intellectual property).

In addition, as the graph shows, it is clear that the innovation performance of African countries is at a lower level, therefore, in companies, and concern areas such as: knowledge and technology outputs; creative outputs (new products, new services,.....)

The 2018 Global Innovation Index report ranks 22 countries in sub-Saharan Africa, with South Africa leading the way in innovation with a Global Innovation Index score of 35.1 and ranking 58th out of 126 countries surveyed. In terms of context, the country with the highest innovation score is Switzerland, which leads with an economic performance index of 68.4. So the leaders countries according to the Global Innovation Index is as follows: Republic of South Africa 35.1; Mauritius 31.3; Kenya 31.3; Botswana 31.1; Tanzania 28.3, Namibia 28; Rwanda 26.5; Senegal 26.5.

However, despite Africa's weak global position, innovation continues to grow on the continent. There are still many examples of individual ingenuity and more and more African countries such as Kenya, Rwanda, Mozambique, Malawi and Madagascar stand out for their ability to innovate at least three times in the last eight years as they try to improve the environment for promising innovators.

The table below lists international publications and collaborative scientific publications in Africa. These data show scientific publications that more or less could be of great importance to publicize original or substantive research, and thus contribute to the scientific debate between specialists. These publications can help to evolve the scientific knowledge of another particular aspect, especially the field of science, technology therefore innovation as a whole.

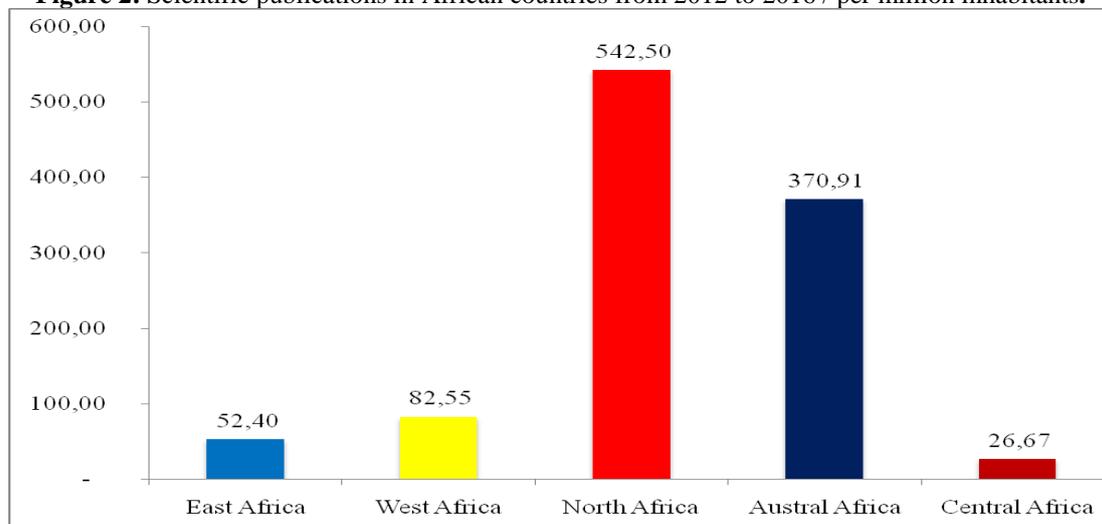
Table 4: Scientific publications of Africa countries from 2012 to 2016.

	African countries zones	Populations Estimates 2018.	Numbers scientific publications from 2012 to 2016.
1	East Africa	289 797027	3377
2	West Africa	343 189555	6106
3	North Africa	189 268020	20275
4	Austral Africa	163 315735	12978
5	Central Africa	163 315735	1008

Sources: World Bank Data 2016 //accessed 04. 01. 2020.

By making use of the results from these scientific data, trends can be built to show scientific publications in Africa from 2012 to 2016 per million inhabitants as shown in figure 2 below.

Figure 2: Scientific publications in African countries from 2012 to 2016 / per million inhabitants.



Sources: Implemented by the author according to the available data Table 4

The analysis of this diagram shows the southern and North African areas are leaders and the west, central and east zones in slow progression of scientific publications.

5- Results obtained.

Results for innovation perceptions in African countries show that:

- The level of all innovative activities is low according to the standards defined by the calculation of the Global innovation index.
- Then, another result that is more or less in the norms for African countries, according to the global innovation index concerns institutional or organizational innovation. Innovative activities concerning institutions have been encouraging (confers table 2).
- The perceptions of innovation in Africa according to the indicators of the Global Innovation Index is not good and shows a low level in all African countries, despite the efforts of some countries like the Republic of South Africa, Nigeria, Kenya, Algeria, Morocco and Egypt.
- The perceptions of innovation in Africa from the sub-indexes used to compute the global index of innovation show shortcomings "for knowledge and technology outputs; and creative outputs" (new products, new services ...); human capital and research and infrastructure.
- The perceptions of innovation in Africa in terms of the creativity of business ideas from startups seems to represent power development levers for African economies, including Nigeria and Ghana for West Africa, Algeria, Morocco and Tunisia for North Africa, Rwanda, Kenya and Ethiopia for East Africa, and the Republic of South Africa for Southern Africa.
- The perceptions of innovation strategies in general enterprises are significantly lower for almost all African countries.

- g) The perception of innovation strategies in terms of percentage of manufacturing firms that are engaged in innovative activities are:
- strong growth in indicators such as «In acquisition of machinery, equipment and software», « training» and «in market introduction of innovations»;
 - weak and stable at the level of indicators such as «in-house R&D», «contracted-out external R&D», « acquisition external knowledge ».
- h) Africa from 2008 to 2018 is perceived as a continent that is transformed by innovation, because many innovative companies establish themselves and develops, some jurisdictions are now identified as caring home territories of actors of the innovation. [20-21]
- i) The perception of innovation in Africa should be an opportunity for private equity, but unfortunately access to financing of innovative companies was sometimes considered as still very difficult for 87% of startups in Africa [20 Ibidem].
- j) The weight of African innovation capital on a global scale is still very small. This share of African venture capital remains modest on a global scale. The amount of \$ 1.163 billion raised in equity for Africa remains low, particularly in comparison with the United States: \$ 131 billion and Asia: \$ 93 billion. Despite these statistics, the African countries are showing unprecedented growth and very encouraging prospects. The facts are there [22-24] :
- consumer spending going from \$ 860 billion in 2008 to \$ 2.1 billion in 2025, according to McKinsey Global Institute;
 - a very high rate of adoption of "mobile money" and which is constantly increasing for sub-Saharan Africa ;
 - 395.7 million registered accounts in 2018, up 14% from 2017,
 - 145.8 million active accounts in 2018, up 14% from 2017,
 - 1.7 billion transactions in 2018, compared to 1.5 in 2017,
 - for a total of \$ 26.8 billion exchanged in 2018, i.e. + 15% compared to 2017.

II. Discussion and Conclusion

Let's open the discussion to go beyond the limits of this analysis. It would be relevant and useful to provide constructive criticism of the criteria used to assess the level of innovation development of African countries for the calculation of the overall innovation indices. These criteria are not suitable, so it is necessary to make recommendations in this sense, taking into account the level of development of these countries, their cultures and their environment. Another open discussion area concerns, recommendations that could be the subject of a proposal to measure the impacts of the level of innovation development, by bringing out the economic and social impact. It would therefore be uninteresting to integrate the stakes of innovation policies for another research, or the model of innovation systems in Africa, but at the expense of various international institutions that do not respect the social context environment and culture. The perception of innovations shows that researchers are not opposed to governments stimulating innovation with economic spin-offs, but rather that innovation policies should not be imposed on the entire university field of the countries sovereigns via international organizations to serve as test sites.

In conclusion, the perception of innovation in Africa must review the funding shortfalls in the productivity of R & D firms, which are still lagging behind due to the level of risk perception developed by the Western powers and imposed on financial structures that are reluctant to finance private sector projects in Africa. The paradoxical usage effects associated with the notion of innovation in Africa mark efforts to protect the professional identity of scientists and the autonomy of their field of practice. Innovation was already perceived in Africa in the past as a form of cunning by the "dominated by the scientific field" in their quest for legitimacy. Nowadays it also seems to be linked to the power struggle between scientific, economic and political fields. Finally, attempts to erase the boundaries between these fields call into question the political, managerial and accounting logics that are often incompatible with the production of knowledge, which remains for the majority of researchers the ultimate objective of their work. Although researchers do not consider that they are systematically incompatible, they establish a clear distinction between the quest for the truth of scientific research (fundamental and applied) and that of profitability, R & D (commercial and industrial).

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