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ANALYSIS OF INNOVATIVE ACTIVITY OF COMPANIES IN DEVELOPING COUNTRIES ON THE EXAMPLE OF WEST AFRICAN COUNTRIES

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In this current economic environment, dominated by the use of new technologies and strong demands for a wide range innovative goods and services by customers, innovative activity becomes an important factor for the development of the mature and new enterprises. Thus, companies which are failing to adapt to these changes or that have great difficulty in modifying their business operation are exposed to many constraints such as the disappearance of the market, or even dissipate their market share or lose their competitive position. Recently, the results of previous studies showed that in many African countries, the demand for skills has been growing in the public sector as a whole, especially in private sector, and this growth reflects the current pace of innovation. The situation requires political intervention from governments, which implies a better understanding of how innovation can be stimulated. The purpose of this article is to develop appropriate recommendations to increase the level of innovation activity of the West African countries community, therefore, their companies. And finally, make suggestions and recommendations to stimulate innovative activity in West African countries, which requires: a) developing a model for financing specific research in the region to ensure a stable distribution of resources, b) promoting the partnership of universities and companies at the national level can help to apply research to solve social problems; c) give priority to the more specific types of innovations that are characteristic of each West African country; e) support for new and existing companies to developed innovation activity.

Keywords: innovation, innovation activity, product or process innovations, organizational innovations, company, West Africa

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АНАЛИЗ ИННОВАЦИОННОЙ АКТИВНОСТИ КОМПАНИЙ В РАЗВИВАЮЩИХСЯ СТРАНАХ НА ПРИМЕРЕ СТРАН ЗАПАДНОЙ АФРИКИ

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В современных экономических условиях, когда на каждом предприятии встает вопрос о применении новых технологий, когда требования потребителей растут, а ассортимент товаров и услуг расширяется, инновационная активность становится важнейшим фактором для разви-

тия как зрелых, так и новых предприятий. И компании, которые не могут адаптироваться к новым условиям и приспособиться к ограничениям внешней среды, могут встретиться со многими негативными последствиями, такими как исчезновение рынка, потеря доли на рынке, утрата конкурентной позиции. Результаты предыдущих исследований показывают, что во многих африканских странах растет спрос на квалифицированных работников, как в государственном секторе в целом, так и в частном секторе, что доказывает потребность в инновациях. В данной ситуации нужна политическое вмешательство со стороны государственная поддержка, что подразумевает лучшее понимание того, как можно стимулировать инновационной активности. Исходя из вышеизложенного, в области инноваций содержание данного исследования является актуальным. Целью данной статьи является разработка рекомендаций, позволяющих повысить уровень инновационной активности в компаниях в странах Западной Африки. Для достижения поставленной цели в статье подробно рассматривается понятие инновационной активности в применении к странам Западной Африки, проводится комплексный анализ индикаторов инновационной активности. На основе проведенного исследования сформулированы следующие предложения и рекомендации для стимулирования инновационной активности в странах Западной Африки: а) разработать модель финансирования конкретных научных исследований в регионе для обеспечения стабильного распределения ресурсов, б) продвигать партнерства университетов и компаний на национальном уровне для лучшего применения результатов исследований для решения социальных задач; в) уделить приоритетное внимание конкретным типам инноваций, которые характерны для каждой западноафриканской страны; д) оказать поддержку новым и существующим компаниям в повышении их уровня инновационной активности в соответствии с целями разработанной национальной политики

Ключевые слова: инновация, инновационная активность, инновационный процесс, инновационный продукт, маркетинговые и организационные инновации, компания, Западная Африка

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Introduction. The issue of development through innovative activities continues to fuel the debate about the lagging behind of some developing countries. Despite the current trends of using big data by companies in contributing to the development of innovative products and processes, most African nations have not yet smelled the coffee. To this extent, most developing nations still believe in traditional ways of doing business, which is mainly the exportation of raw materials, for example, precious minerals, agricultural products etc.

Problem statement. Though quite a number of African leaders have been on record purporting in their speeches to concentrate on improving the level of development through innovation, the opposite has been the case, as many researchers have penned down on the relatively low level of innovation activities. Low prioritization by leaders on investing

in activities that promotes innovation has been at the centre of most West African nations.

Developing countries lag behind the rest of the world in implementing innovation-based development policies. In the context of globalization, it is impossible to talk about economic, political and social development without mentioning innovation. Today innovation is endowed as the cornerstone of development, as Schumpeter believed that the basis and dynamic accelerator of most economies are innovation and technological progress. According to the same author, he also noted that in industrial cycles, after major innovations, the economy enters a phase of growth, thus creating jobs, followed by a phase of depression, when innovative activity pursues companies «obsolete» and cause the destruction of employment [1]. In the current context of West African countries, where economic indicators are trying to catch up, there is a need to develop policies



to encourage entrepreneurship based on innovation activities. Thus, to see the context of the current global economic environment, the question of knowing if development policies based on innovation activities (scientific research, business research and development,...) are a guarantee to create perspectives, progress, development of the level of innovation activity in West Africa?

However, it seems that the answer to this question is the challenge West African countries face in developing policies that require appropriate public policy actions. The development of these policies must also foster cooperation between countries, aimed at improving the transfer of new technologies, on the basis of the creation of a national system of innovation that can allow the imitation phase to be left go to the thoughtful leadership phase followed by structured innovative achievements

Purpose of research. Based on the observation mentioned in the abstract of this study, the purpose of this research is to develop appropriate recommendations, with the help of existing indicators (Global innovation index), to increase the level of innovation activity of companies in West African countries, therefore, their companies. To cement the study, other indicators are also calculated and studied in order to get a global understanding of the innovative activity in this region. To achieve this goal, the following tasks will be performed:

- review of literature on the innovative activity of companies;
- analysis of statistical data on innovation (use data from the Global innovation index to show the level of innovation activities currently being carried out by companies in West African region)
- show the results obtained of innovation in West Africa in-particular;
- identify difficulties and limitations of results.
- make suggestions and recommendations that will stimulate the level innovation in West African countries.

Research methodology. The methodological approach of this research is mainly desk research as most of the parameters are from world recognized indicators already provided by the World Bank and

other intuitions. That is, theoretical knowledge and various scientific works, such as (in-depth review of existing literature on innovation, a large number of scientific publications, policy documents, reports and data from international institutions such as UNESCO, IMF, World Bank, etc.) will form the basis of the research. To summarize the methodology approach three key points will be critically considered: logical method of analysis, statistical analysis of data by graphs and comparative analysis. The relevance of using the tool for comparative analysis (Global Innovation Index) is that it goes further than the indicators traditionally used to measure R&D and innovation in a country (for example R&D expenditure, the number of scientific publications, etc.) and focuses thus more on the interaction between the various agents of the innovation system (companies, public sector, higher education, society etc.). Let's consider methods in more detail solving tasks.

Literature review of the innovative activity. In General, there is a fairly extensive literature on innovation, especially on the company's innovation activity (Mairesse and Mohnen, 2010) [2]. In their work, we can learn the dynamics of innovation in various sectors of the economy, especially in the industrial sector. Similarly, it is possible to distinguish two broad groups of factors that increase the ability of firms to innovate. On the one hand, the characteristics of the firm, and on the other hand, its ways of coordination, cooperation, as well as its ability to capture knowledge about the environment.

Thus, the scientific works of authors such as Adebowale. B., Lema R., Oyelaran-Oyeyinka O. Dossou Y.L, Khvatova T.Yu., Osakwe P. and Moussa N. Mègnigbèto, E. Nwaka, S., Ochem, A., Besson, D. and others approached innovation activities in West Africa with more emphasis on the investment in R&D, opportunities and challenges for entrepreneurial innovations.

In addition, there are various categories in which the level of innovation might be of particular importance within an organization, (for example products, processes, organizations, commercial, social, etc.). Having said that, there are particular areas which require special attention in choosing one

to concentrate with, and these are; investment in R&D, the relationship between innovation and competition, innovation and strategic vision of the company, innovation and demand, issues related to standards, certificates and patents, partnership and cooperation in the field of innovation [3].

In his work (Gallouj, 2002), it is clearly shown that innovation activity is still widely perceived as a subset of technology and largely depends on investment in research and development. According to the OECD guidelines, innovation is all the scientific, technological, organizational, financial and commercial steps that should lead to innovation. Some innovative activities are new to the market whilst others are just a revamp of the existing operations within a company [4].

According to the European Union Commission, innovation activity encompasses enterprise-level innovation efforts covering three dimensions [5]:

- innovators that combine companies with product or process innovations, marketing or organizational innovations, and in-house innovators;
- links between companies working with each other, joint public, private publications and private co-financing of public R & D spending;
- Intellectual assets include patent applications, trademark applications, and development applications.

In today's trending papers, it is mostly recognized that, the positive role of innovation in factors such as investment in R&D, firm size, international competitive pressure, government financial support for R&D, cooperation or sources of information is of high importance and should not be neglected [6, 7]. There is therefore the need to raise a fundamental question that, in business innovation, to what extent does market competition drive firms to increase their innovation capabilities? In the literature, this question poses a lot of problems for firms in the market facing innovative competitors. The only sustainable solution that can be brought about for such companies is to adopt a continuous innovative approach in a bid to survive at/on the competitive market. In the economic literature, the answer to this question has two or more possible meanings. On the one hand, it seems that when competition intensifies, companies have fewer resources to innovate. On the other hand, we also see that

innovation allows companies to avoid competition because a company can create other products (or niche activities) with very few competitors or thus reduce its production costs to exclude or weaken competitors [8].

Analysis of statistical data on innovation. Statistical data from Global Innovation index (GII) of the West African are shown in Tab. 1 below. Important data for innovation in West Africa are contained in the Global Innovation Index [9]. GII in 2018 was calculated for 126 countries around the world, and it included 80 factors that assess the institutional environment for innovation, which partly includes; political conditions, educational level, infrastructure development, etc. GII – an integral index based on the summation of a large number of sub-indexes, for example, in the section on investments in resources for promoting innovations, the most important are: a) investments in human resources and in research (education, research and development); b) investments in the development of infrastructure for business – innovative systems, knowledge management and intellectual property protection; c) investments in building knowledge and technology development, as well as promoting creative activities.

Based on Tab. 1, it can be seen that all West African countries have low innovation indices which is basically below average. The countries demonstrating the efforts for the last five years, as the table above shows are Senegal, Ghana, Burkina Faso, Nigeria, Mali and Ivory Coast. In 2018, the highest GII was 68.40 and the lowest index was 15.00. The Tab. 2 below, shows an in-depth analysis of innovation activities using the Global innovation index data

Based on the sub-index data used to calculate the Global Innovation index for West Africa for 2018, the researcher was able to analyze the data using a petal chart. The chart allows us to compare the total values from the indices, and the results shows 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 West Africa. The overall results determine the level of innovation activity of the company in the countries.

Table 1

Global innovation index countries in West Africa from 2014 to 2018 [10]

	Years	2014	2015	2016	2017	2018
		The largest index (globally)				
		64.18	68.30	66.28	67.69	68.40
		The lowest index (globally)				
		12.66	15.00	14.55	15.64	15.00
Nº	Countries	Global Innovation index				
1	Senegal	30.06	31.00	25.14	27.11	26.50
2	Ghana	30.26	28.00	25.66	–	24,50
3	Cap -Vert	30.09	28.60	–	–	–
4	Gambia	29.03	27.50	–	–	–
5	Burkina Faso	28.18	28.70	21.05	21.86	18.90
6	Nigeria	27.79	23.70	23.15	21.92	22.40
7	Ivory Coast	27.02	27.20	25.80	23.96	20.00
8	Mali	26.14	28.40	24.77	22.48	23.30
9	Niger	24.27	21.20	20.44	21.18	20.60
10	Benin	24.21	–	22.25	23.04	20.60
11	Guinea	20.25	18.50	17.24	17.41	20.70
12	Togo	17.65	18.40	18.42	18.41	18.90
13	Guinea-Bissau	–	–	–	–	–
14	Sierra Leone	–	–	–	–	–
15	Liberia	–	–	–	–	–

Table 2

Data for contribution and output innovation sub-index for West African countries in 2018 [11]

Countries	The value contribution of innovation sub-index					The value of the output of innovative sub-index	
	Institutions	Humancapital&research	Infrastructure	Market sophistication	Business sophistication	Knowledge & technology outputs	Creative outputs
Senegal	57,8	25,2	31,3	32,9	18,7	19,9	19,8
Ghana	46,7	20,6	32,1	34,9	27,7	16	17,2
Cap-Vert	–	–	–	–	–	–	–
Gambia	–	–	–	–	–	–	–
Burkina Faso	54,7	16,5	26,6	33,5	16,6	16	0,6
Nigeria	44,7	12,9	26,5	41,7	23,5	10,3	19,5
Ivory Coast	54,9	13,8	24,6	30,8	19	18,9	3,7
Mali	48,6	11,8	25,6	33,2	27,9	20	14,5
Niger	52,9	21,5	26,5	26,9	23,5	15,8	5,9
Benin	56,5	22,4	22,8	29,0,	22,2	7,4	13,9
Guinea	49,5	7,3	26,4	30	27,8	5,6	20,9
Togo	51,7	15,4	25,9	27,5	18,8	16,4	3,5
Guinea Bussau	–	–	–	–	–	–	–
Sierra Leone	–	–	–	–	–	–	–
Liberia	–	–	–	–	–	–	–

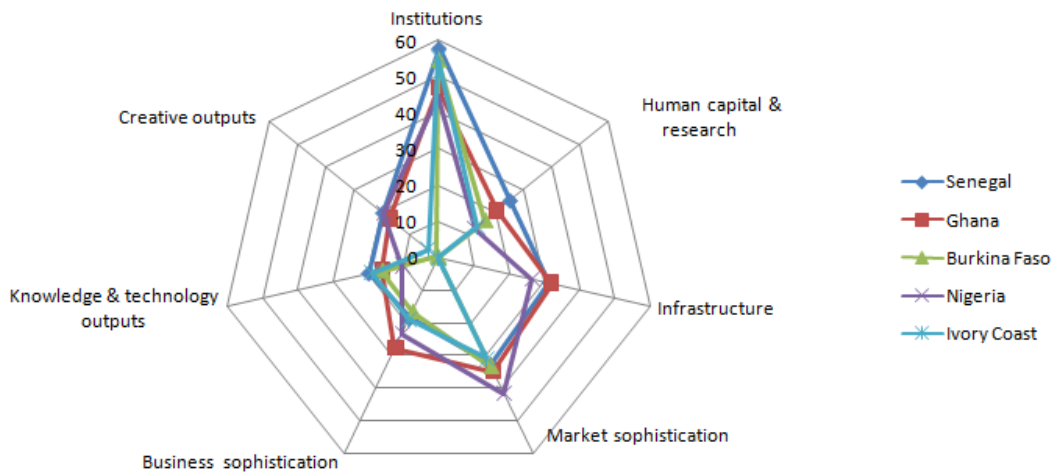


Fig. 1a. Indicator Chart used as the basis for calculating the global innovation index

S o u r c e : Implemented by the author according to the available data Tab. 2

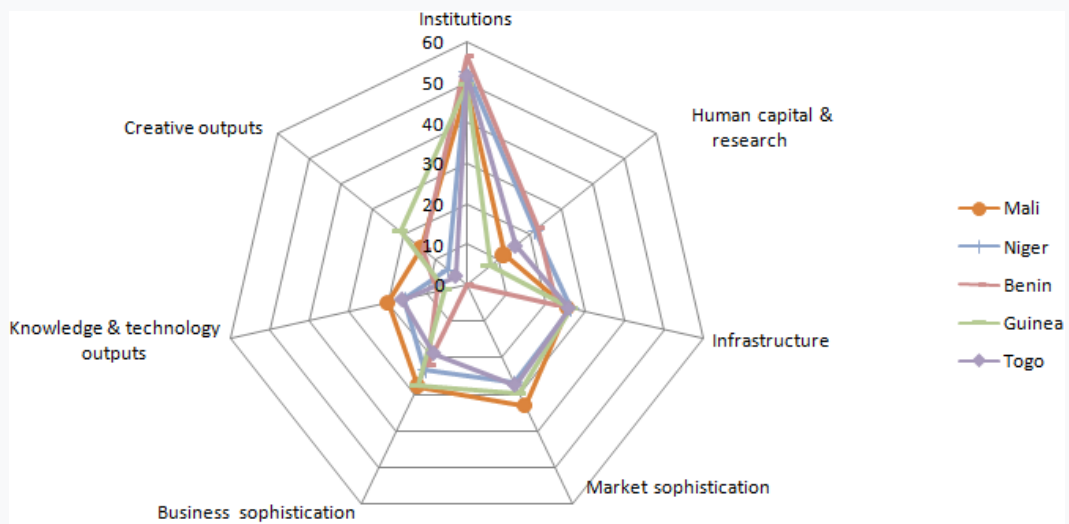


Fig. 1b. Indicator Chart used as the basis for calculating the global innovation index

S o u r c e : Implemented by the author according to the available data Tab. 2

Fig. 1a and Fig 1b below shows a diagram of the petals, with reference to Tab. 2.

Thus, with regards to Fig. 1, it can be seen that efforts are being made when

Thus, with regards to Fig. 1, it can be seen that efforts are being made when considering the level of innovation in almost all West 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 in 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 knowledge absorption).

In addition, as the graph shows, it is clear that the innovation performance of West African countries is at a lower level, therefore, in companies, and concerns areas such as:

- knowledge and technology outputs;
- creativeoutputs (new products, new uses services,.....)



Results obtained. Results of analysis for innovative activities in West African countries show that:

1. The level of all innovative activities is low according to the standards defined by the calculation of the Global innovation index.

2. Then, another result that is more or less in the norms for West African countries according to the global innovation index concerns institutional or organizational innovation. Innovative activities concerning institutions have been encouraging (confers Tab. 2).

3. However, comparing these results from the analysis of the Global innovation index to the results, based on that of 2010, of which Burkina Faso and Ghana are the two countries in the sample that participated in this survey, the first finding is that innovation activity was represented in small, medium and large enterprises [12]. In terms of types of innovation, there were innovations in products, processes and entire organization. For ties or connections of innovative within companies, it became clear that all the companies surveyed had one or more formal cooperation or partnership relationships with other companies. In most West African countries, organizational innovation is considered to be a bottom-up compared to other types of innovation. Hence, according to the researches done, it was noted that the main focus of innovation was also the acquisition of machinery, equipment and software, followed by Research and Development led by companies. Also, the low level of innovation presented can be explained by the fact that public incentives for business innovation in West Africa remain small, as few private firms have access to their public funding for their innovation project. Public funding is very necessary in countries with a low level of development, given the uncertainty of innovative activities. In fact, government funding must compensate for technological uncertainty and liquidity constraints of companies in order to focus their research activities on non-existent and very risky areas. This can help increase private profits through public funding for innovation.

4. In the process of studying the indicators used to evaluate and rank countries in accordance with the

level of innovative activity, in particular Global innovation index (GII), a number of weaknesses were identified. In general, it should be noted that many indicators are not currently suitable for making analysis for developing countries, in particular those from the West of Africa. In most developing countries, access to innovation information (and more) is limited; Institutional conditions in African countries are fundamentally different from other continents. Therefore, the use of existing indicators for assessing innovation activity, for comparison with other countries, as well as for developing innovative policies in developing countries, is not entirely advisable, hence forthwith, it leads us to difficulties and the limitations of the results.

Difficulties and limitations of results. A number of challenges and limitations were noted in the in carrying-out this research through literature. The difficulties varied from, the size of the companies in terms of the different forms of innovation to the lack of funding and the cost of high innovation. Projects such as those from R & D requires more funding, and are positively correlated to the size of the business. This was clearly shown from the data of Ghana and Nigeria, where the propensity to innovate has been studied in small, medium and large firms and whose results have shown a clear correlation between size and innovation of a company [13]. Other existing barriers being related to reputability of companies that dominate the market and the lack of information on some of the existing innovations. In Burkina Faso, Benin, Togo, Niger and Mali, for example, the lack of qualified personnel was cited as a more serious obstacle to innovation.

The limits of the results about our research are linked to the criteria of the Global index of innovation. The table below lists international publications and collaborative scientific publications for West Africa. This data shows scientific publications and details of intellectual property with regards to patents and property rights. This information could be of great importance as it shows how other companies benefits from existing technologies by means of data and experience sharing.

Table 3

Publications and scientific joint publications of West Africa countries from 2012 to 2016 [14]

№	Год	2012	2013	2014	2015	2016	Total
	Countries	Number of scientific publications and joint publications					
1	Senegal	287	299	332	371	353	1642
2	Ghana	549	603	662	794	982	3590
3	Cap-Vert	4	9	8	10	8	39
4	Gambia	37	45	49	42	46	219
5	Burkina Faso	209	183	201	219	221	1033
6	Nigeria	3582	3809	3994	3742	3821	18948
7	Ivory Coast	192	164	186	194	177	913
8	Мали	87	65	73	70	87	382
9	Niger	32	32	49	56	56	225
10	Benin	146	181	181	189	167	864
11	Guinea	11	11	23	27	38	110
12	Togo	47	64	81	78	75	345
13	Guinea Bussau	12	12	17	10	11	62
14	Sierra Leone	14	15	21	34	48	132
15	Liberia	10	9	11	16	16	62
	others						
	South Africa	9 341	10 251	11 990	11 417	11 881	54 880
	sub-Saharan African zone	19 014	20 853	23 597	23 073	24 197	110 734
	World	2 129 133	2 210 064	2 299 992	2 306 637	2 296 271	11242097

All fifteen West African countries produced more than 28504 articles in scientific and technical journals between 2012–2016 according to data from the World Bank group's science and technology index databases of the National Science Foundation. The most significant in terms of cumulative publications from 2012 to 2016 in this group were: Nigeria C (18958); Ghana (3590); Senegal (1642); Burkina Faso (1033); Ivory Coast (913) and Benin (864). Indeed, the Republic of South Africa produced scientific and technical newspaper articles in a percentage that makes up almost half, that is 49.5 % of the sub-Saharan African zone, but this production remains insignificant, that is 0,48 % of the total world share between 2012 and 2016.

By making use of the results from these scientific data, trends can be built to show scientific

publications in West Africa from 2012 to 2016 per million inhabitants as shown in the Fig. 2 below.

The result of these data in this diagram shows that West Africa is making efforts, but not enough for the development of scientific output as a whole, and therefore not enough innovative creativity. In addition, another study by UNESCO, it was reported that African scientific publications are more concentrated in agriculture, biology, engineering and health sciences [15].

However, the result in the same section on scientific publications, West Africa had to work with many different foreign scientific partner countries that are very visible in the field of innovation for the basis of transferring knowledge. These main foreign partner countries from 2008 to 2014 are listed in the Tab. 4 below according to the number of scientific articles.

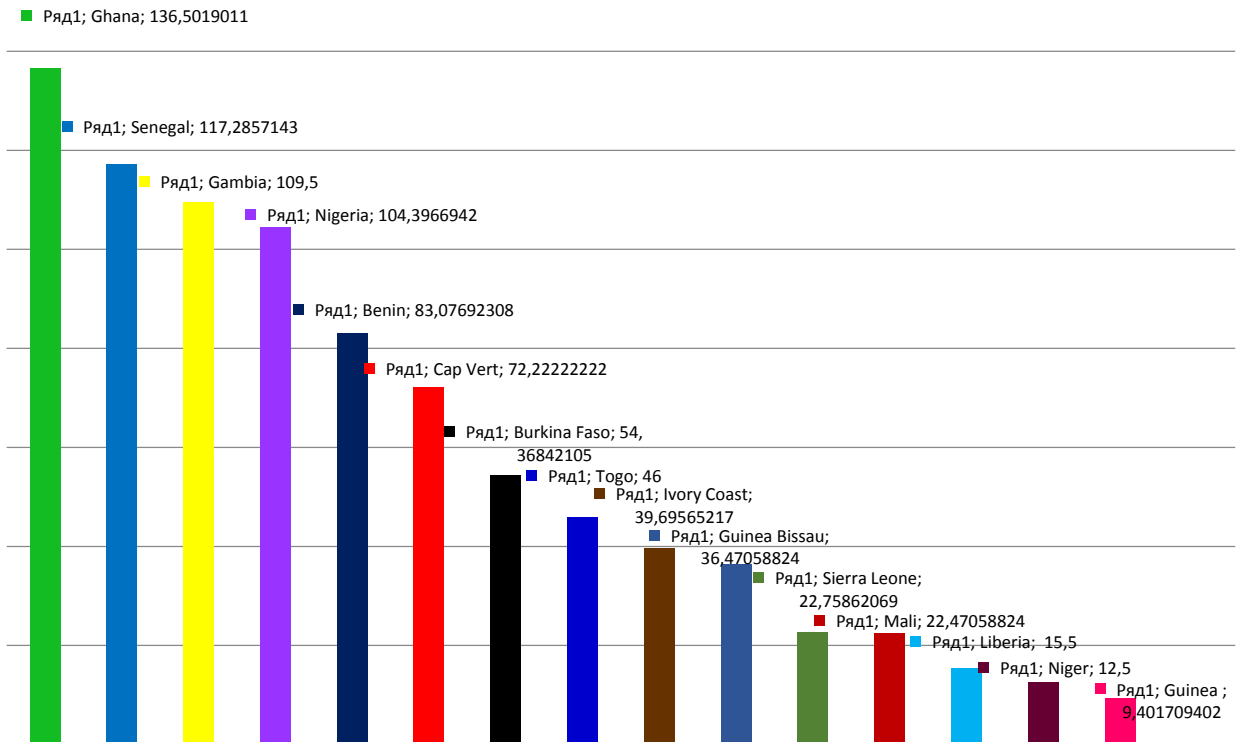


Fig. 2. Cumulative scientific publications in West Africa, since 2012 to 2016 / per million inhabitants
Sources: implemented by the author according to the available data Tab. 3

Table 4

Main foreign partners of West African countries in scientific publications (2008–2014) [17]

Countries	Partners	1 st partner	2 nd partner	3 rd partner	4 th partner	5 th partner
	1	Benin	France (529)	Belgium (206)	USA (155)	UK (133)
2	Burkina Faso	France(676)	USA (261)	UK (254)	Belgium (198)	Germany (156)
3	Cap-Vert	Portugal (42)	Spain (23)	UK (15)	USA (11)	Germany (08)
4	Ivory-Coast	France (610)	USA (183)	Switzerland(162)	UK (109)	Burkina Faso(93)
5	Gambia	UK(473)	USA (216)	Belgium(92)	Holland (69)	Kenya (67)
6	Ghana	USA (830)	UK (636)	Germany (291)	South Africa (260)	Holland (256)
7	Guinea	France (71)	UK (38)	USA (31)	China (27)	Senegal(26)
8	Guinea-Bissau	Denmark(112)	Sweden (50)	Gambia/UK (40)	–	USA (24)
9	Liberia	USA (36)	UK (12)	France (11)	Ghana (06)	Canada (05)
10	Mali	США (358)	France (281)	UK (155)	Burkina Faso(120)	Senegal (97)
11	Niger	France (238)	USA (145)	Nigeria(82)	UK (77)	Senegal (71)
12	Nigeria	USA (1309)	South Africa(953)	UK (914)	Germany(434)	China (329)
13	Senegal	France (1009)	USA (403)	UK (186)	Burkina Faso(154)	Belgium(139)
14	Sierra Leone	USA (87)	UK (41)	Nigeria(20)	China/ Germany (16)	–
15	Togo	France (146)	Benin (57)	USA (50)	Burkina Faso (47)	Ivory Coast (31)

Finally, the documentary result for intellectual assets includes patent applications, trademark applications and development applications. According to data from the World Bank Group, only three of the 16 countries have cumulative data from 2011 to 2017: Nigeria has 114 patents, Ghana 29 and Ivory Coast. But according to the World Intellectual Property Organization, the number of patent applications filed by West African countries in 2017 was 1173 [16]. Compare the total patent application data of 15 countries with those of the Republic of South Africa the same year, which had a total of about 2178 patent applications. It can be concluded that all the West African countries combined are not doing enough effort to develop the innovative activity.

Conclusion. We can conclude the existence of the innovative activity of West Africa, therefore at the level of the companies, but the criteria of the international organizations are not adapted to their evaluations. It should be recalled that the weaknesses or problems of innovation activities in West African countries concern the current level of development in the field of financing or investment in scientific research, training of qualified human resources. It must also be added, the lack of long-term vision, lack of originality, lack of structuring, lack of commitment of the public authorities to promote the implementation of innovation centers at the national level of each country. Thus, referring to the results obtained in the framework of this study, it is of great importance to focus on the positive socio-economic impact resulting from this low level of innovation activities. More studies can be oriented in this direction to shed more light on the real importance of innovation activities.

Given the low level of innovation activities in business environment for West African countries, we propose and recommend the following initiatives to be carried-out for the betterment and improvement of the whole region:

- Develop and implement a national innovation policy to include all sectors of the economy;

- Developing a model for funding specific scientific research in the region to ensure a stable allocation of resources, and further utilize the funds efficiently and effectively. Thus the promotion of partnership of the universities and the companies at a national level will be able to help the application of researches to solve the social needs;

- a closer attention on the types of innovations (products, processes, organizations, commercial, social, etc.), that are specific for each West African country needs to be prioritized;

- the government should delegate committees to solve problems related to standards, certificates and patents, partnerships and cooperation in the field of innovation;

- supporting new and existing companies to improve their level innovative potential of new technologies in accordance with the goals of achieving better results from national policies crafted;

- finally, we recommend that the states conduct medium and long term follow-up activities and assessments to address deficiencies in the context of a shared vision and future trends

Despite the results obtained after the study of innovation activities in West African countries, the possibilities for improvement are possible. West African countries have been less successful so far in terms of funding scientific research and development which is an important basis for successful innovations. While mobility and cooperation programs with leading partners in the field of innovation exist, the application of this research by the SME sector in order to tackle social problems is less visible. The other weaknesses identified during this study are related to the orientation problems of innovative activities, the definition of national priorities, the training of quality human resources, and the commitment of the State for the elaboration and implementation of a national innovation policy. Finally, it appears that innovation in West African countries faces challenges in terms of leadership, structuring, funding, support and commitment by public authorities.

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