

Measuring Innovation in Algerian firms

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Abstract:

innovation is a very wide concept and has many dimensions, measuring innovation is a very difficult task to perform. the purpose of this paper is to provide readers with information on the innovativeness of Algerian firms, information that may help the local firms understand innovation concepts and measures in this paper we measure the innovation activities of Algerian firms through. The applicability of the definitions and methodologies set out in the *OECD Oslo Manual* on the statistical measurement of technological innovation, which was used in the recent European Community Innovation Survey of the manufacturing sector has drafted some recommendations and enhancements in the measures of innovation both in private and public sectors, in our case we used data offered by the INAPI to measure innovation of algerian firms. moreover, we try to address the National Innovation System approach as an additional measure of innovation, in order to see what works and what doesn't within the local environment, so that local decision makers may take advantage of the information presented in this paper to make better decisions in order to enhance the Algerian firms innovativeness.

Keywords: Innovation, firms, manufacturing sector, environment

Introduction:

There exist several ways to measure Innovation, but the most used measures are known as the traditional measures of Innovation which are R&D expenditures⁴ and patents. Following many studies in this domain since the 1950s, R&D expenditures can be regularly collected, usually on an annual basis, in several countries, while patent data have been collected since an earlier period of the 19th century, in the case of Algeria, patent data are available electronically on the INAPI web

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⁴ Expenditure on research and development (R&D) is a key indicator of government and private sector efforts to obtain competitive advantage in science and technology. In 2005, research and development amounted to 2.3% of GDP for the OECD as a whole. (OECD (2007), Main Science and Technology Indicators, OECD, Paris.)

site; in this work we are going to discuss the measures of Innovation from a theoretical perspective while in the next chapter we will take both of them from data analysis and discussion. In this section we are going to analyse some statistics and tables which have been taken from several organizations such as the WIPO and the INAPI, in ways that allow us understanding more the stage in which Algerian Enterprises are, concerning inventions, patents, trademarks, and industrial property rights.

Innovation and Patents

As it is widely known, a patent provides protection for the invention to the owner of the patent, thereby, the invention cannot be commercially made, used, distributed or sold without the patent owner's permission, this protection is required in today's market and especially with all the emitted products and services that are found in the market, generally this protection is granted for a limited period, which is 20 years in almost all the cases, and sometimes less; in this period, only the patent owner has the rights to give permission to or licence other parties to use the invention on mutual agreed terms, he may also sell the rights to someone else, as he may give them to that new owner; for free. Once a patent expires, the protection ends and then the invention becomes available to commercial exploitation by the others, and the owner no longer holds exclusive rights to the invention. In fact Patented inventions have, in fact, pervaded every aspect of human life, from electric lighting (patents held by Edison and Swan) and plastic (patents held by Baekeland), to ballpoint pens (patents held by Biro) and microprocessors (patents held by Intel, for example) All patent owners are obliged, in return for patent protection, to publicly disclose information on their invention in order to enrich the total body of technical knowledge in the world. Such an ever-increasing body of public knowledge promotes further creativity and Innovation in others. Empirical evidence has shown that there was no relation between a country's score on this index and its economic growth.

Increasing IP rights tend to be correlated with R&D spending, but it turns out the causality goes the other way: first a country starts spending more on R&D, and then later they increase IP rights strength.

In this way, patents provide not only protection for the owner but valuable information and inspiration for future generations of researchers and inventors.

In Algeria a patent may be granted from the INAPI (*Institut National Algérien de la Propriété Industrielle*), which first of all requires the person who asks for the patent to fill up a patent application which contains the name or the title of the invention its self, the indications of its technical field, the background and the description of the invention as well as the drawings, plans, or the diagrams to better describe the invention.

In 2006 the **INAPI** received 477 patent demands from national companies, while the whole demand for patents was 514 demands, which is really limited comparing with other countries, and even though for that raise in patents demand, from a year to another in the last decade, patenting is still need to accelerate further; the case was the same for trademarks demand from the INAPI office because it was only 2682 demands in September 2006; with a raise of 244 demands comparing with 2005. the same organization received 2875 trade mark demand to extend into the Algerian market from foreign companies, while the number of these demands was counted by

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3665 demands, 31 patents was the number of the accepted patenting demands in 2006 by the INAPI, from the whole 477 demands, sometimes the rejection of these demands was because of the missing files or the uselessness of the invention its self, while some of them was because of the policy of the INAPI, and the wasted time concerning each of the preparation and the patents' demands studies, and so on...

through some interviews with local enterprises from which have already asked for their patents as well as the local commerce chamber, there was obviously a huge gap in time between the demands and the acceptance/rejection of the files, which is counted as a main problem and obstacle for enterprises to get the industrial property rights of their invention. Foreign companies have asked for patents in Algeria through the INAPI office, such as France who was and still is the leading country in trademarks registration in the INAPI office in 2006 the most by the number of 559 registrations and 752 renewals, while Germany came second with 338 registrations and 567 renewals, Italy was third by 254 registrations and 360 renewals, Switzerland was fourth by 198 registrations and 295 renewals and china came fifth by the number of 193 registrations and 13 renewals, the sixth place was for Spain by 103 registrations and 123 renewals; other countries have registered less numbers of trade marks in the Algerian office of patents and industrial property rights, including morocco with 54 registrations, and Egypt by 15 registrations, other countries are considered to be less interested by the Algerian market and some others do not have any interests to the Algerian patents and patents' offices.

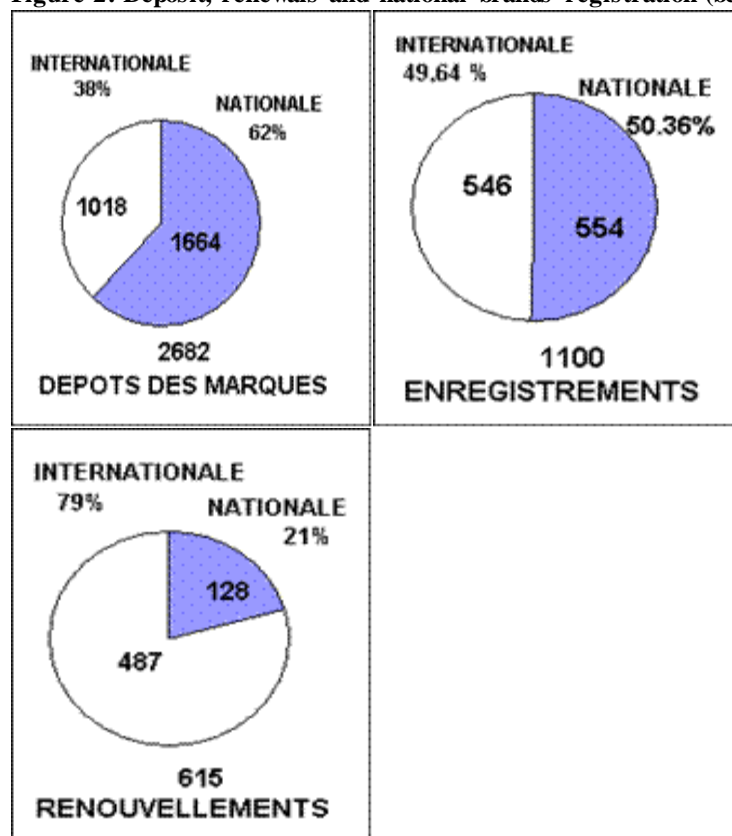
The next Table (Table 1) illustrates the patents' demands, registrations and renewals for national trade marks in the INAPI office in the first three trimesters of 2006(the period between 01/01/06 and 30/09/06) concerning national and foreign companies, this table shows that 554 demands was accepted from the number of 1664 demands of trade marks from national companies, while 546 trade mark was registered from 1018 foreign demands, while only 128 national trade mark have renewed their patents in that period in addition to 487 foreign ones have been renewed in the same period of 2006. In 2007, the WIPO received 84 Patent applications from the Algerian office of patents, while it was 58 applications only in 2006 and in 2008 the number was planned to be extended but data are not available neither at the WIPO's nor at the INAPI's official web sites. It was 59 in 2005 and 58 applications in 2004. (See the WIPO Statistics Database, December 2009)

Table 1: Deposit, renewals and national brands registration (between 01/01/06 to 30/09/06):

Country of Origin	Deposit	Registrartions	Renewals
Nationales	1664	554	128
Etrangers	1018	546	487
Total	2682	1100	615

Source: the INAPI web site, June 2010.

Figure 2: Deposit, renewals and national brands registration (between 01/01/06 to 30/09/06):



Source: the INAPI web site; June 2010.

Table 1 which is below demonstrate some statistics of patents taken from the INAPI offices, and web site, it illustrates the number of Patents delivered for national enterprises by the INAPI, and the number of patents demanded in the period between 1988 and 2007, we have asked the INAPI offices for recent statistics of this kind, but each time we called they kept saying that it is still confidential and that they cannot offer us such information, because they do not concern the INAPI itself but also the local enterprises which have asked about the patents of their products and services, as well as the ministry of the industry, However; was 214 in the date of 2007, while it was 590 patents in 2006 and 550 in 2005, with the exception of the drop of the number of patents in 2007, comparing with the previous year, patents number was raising by time in the last decade, while it was not steady in the 1990s; mainly because of the social, political and economic situations in that period. Algeria now is in the right way to strengthen the patents policies within

the local market, with so many laws and texts through which companies will be able and sometimes obliged to register their inventions and marks.

Table 3: Statistics of the Algerian patents until 31/12/2007

Year	Total of deposits	Certificats	Deposits of nonresidents		National Deposits	Delivered Patents	Actual Patents
			Via a National way	PCT			
1988	206	01	201	/	05	/	00
1989	204	00	200	/	04	/	10
1990	235	00	229	/	06	/	12
1991	176	01	170	/	06	/	11
1992	174	00	164	/	10	/	14
1993	146	01	138	/	08	/	07
1994	145	00	118	/	27	/	16
1995	162	00	134	/	28	/	15
1996	200	02	150	/	50	91	32
1997	241	01	207	/	34	121	52
1998	309	03	267	/	42	184	106
1999	284	06	248	/	36	143	96
2000	159	02	127	/	32	78	42
2001	147	07	38	56	51	69	61
2002	334	04	41	250	43	119	167
2003	328	02	16	280	30	250	200
2004	393	01	30	304	58	290	322
2005	514	01	34	431	59	550	498
2006	669	04	47	564	58	590	669
2007	852	03	31	734	84	214	852
Total	5876	39	2590	2619	671	2699	3553

Source: the INAPI web site.

Comparing with other African countries the Algerian Resident patent filings per \$billion of Gross Domestic Product in the period between 1995 and 2007 seem to be very much low than these of the other countries in the table even the countries which have the same and even a lower income, such as Zambia, Kenya, Madagascar, and even Tunisia, the less than 0.35 billion from the GDP is considered to be low comparing with Egypt which gives more than 1.35 billion for the same year

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(2007), while Tunisia gave 0.87 \$Billion in 2005 for resident patent filings, that may be because of the reason that in Algeria this kind of expenditures is financed by public sector only, which is the case in Saudi Arabia, and Morocco.

Table 4: Resident patent filings per \$billion Gross Domestic Product (1995-2007)

Country of Origin \ Year	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
Algeria	0,18	0,30	0,20	0,24	0,20	0,17	0,27	0,22	0,14	0,26	0,25	0,24	0,34
Egypt	1,88	2,21		1,97	2,02	1,91	1,60	2,11	1,61	1,20	1,29		1,35
Kenya		0,40	0,58	0,69	0,63							0,74	
Madagascar	1,83	0,60			0,68	0,50		0,31	0,21	1,08		0,25	
Malawi	0,15	0,28	0,27	0,26	0,12	0,37							
Saudi Arabia	0,08	0,07	0,15	0,12	0,19	0,19	0,11	0,15	0,13	0,17	0,24	0,24	0,24
Tunisia	0,78	1,06	0,92	0,81	1,35	0,90	0,40	0,81	0,60	0,74	0,87		
Zambia	0,43	0,60			0,48		0,53						

Source: WIPO Statistics Database and World Bank (World Development Indicators), June 2009

Note: Gross Domestic Product (GDP) data are in billions of US dollars, based on 2005 purchasing power parities.

Innovation and R&D:

The theoretical background of Innovation, and Research and development (R&D) considers R&D as a main driver of Innovation performance and is then a determinant of the Innovation level of any country, R&D comprise creative work undertaken on a systematic basis in order to increase the stock of knowledge, including knowledge of man, culture and society, and the use of this stock of knowledge to devise new applications. R&D is a term covering three activities: basic research, applied research, and experimental development. Basic research is experimental or theoretical work undertaken primarily to acquire new knowledge of the underlying foundation of phenomena and observable facts, without any particular application or use in view.

Applied research is also original investigation undertaken in order to acquire new knowledge. It is, however, directed primarily towards a specific practical aim or objective. Experimental development is systematic work, drawing on existing knowledge gained from research and/or practical experience, which is directed to producing new materials, products or devices, to installing new processes, systems and services, or to improving substantially those already produced or installed. The main aggregate used for international comparisons is gross domestic expenditure on R&D (GERD).

This consists of the total expenditure (current and capital) on R&D by all resident companies, research institutes, university and government laboratories, etc. It excludes R&D expenditures financed by domestic enterprises but performed abroad. OECD (2007)

Economic development and National Innovation systems:

Since the first appearance of National Innovation Systems (NIS) concept it has internationally started changing the goals and directions of Innovation policies, this concept highlights the role of the co-operative interaction between individual innovative enterprises and other innovative organizations. Hence, this concept would be promoted especially when businesses, financial system, and research and academic bodies are included within a general system. Research group headed by Nelson (1993) compared the NISs of 15 countries, discovered that the dissimilarities between them reproduced different institutional arrangements, including: systems of university research and training and industrial R&D; financial institutions; management skills; public infrastructure; and national monetary, fiscal and trade policies. By the late 1990s, **OECD** had initiated broad comparative countrywide study of national Innovation systems (OECD 1997, 2002), which produced support to the ideas of Charles Edquist et al (2001) and Jack Metcalfe (1995), that national Innovation system is a comparative concept – there could not be an ideal NIS, which fits different nations with their specific socioeconomic, political and cultural background (Urmas Varblane & all, 2007).

However; a recognized model of a NIS does not exist and it is so hard for a particular NIS to be useful to another country by the same degree of performance. By the way, through case studies, Nelson and Rosenberg have emphasized that "*we have been impressed by the diversity of 'national systems' that seem to be compatible with relatively strong, and week, economic performance in particular contexts...partly is may be because the performance of the Innovation system is a larger factor behind economic performance in some contexts than in others.*"(Nelson and Rosenberg); moreover they (Nelson and Rosenberg) have declared that "*... since considerable differences exist when even comparing countries with similar economic conditions. The differences are caused by historical and cultural differences including the process of industrialisation, and have a role in shaping the legal systems and policies of a particular country.*"

As Schumpeter (1939) said « *Innovation is possible without anything we should identify as invention and invention does not necessarily induce Innovation, but produces of itself no economically relevant effect at all* », and by the way, entrepreneurs are ones of key creator of Innovation within the economy, whatever it is their degree of activities or performance, and even if they don't have such huge capacities or tools to innovate they can do it without anything.

The Arab World has been trying to improve its S&T system over the last few years. In the educational component of this system there are more than 175 Universities (1996) and the level of increase in number is quite high especially in the new millennium. The Arab World spends more than 7 billion dollars yearly on higher education; and by the way, there are more than 50 thousand Professors in S&T and an accumulated total of about 10 million University graduates of which there are more than 700000 engineers.

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Many argue that education system is a main barrier to the development in the Arab world because it produces quantities of university graduates with lower set of skills. Statistics indicate that Arab countries have invested less in human capital, have less engineers and technicians per capita, and are less equipped for today's labour market.

Many researchers in this domain have brought to light many terms of exploring the usefulness and the limits of NIS in various countries all around the world; for example, they have discussed the different structures of R&D, and the dissimilarities of the role played by the universities, the companies, and institutions in the U.S, France, Germany, China, The U.K and do on.

R&D intensity in Africa fell from an initial 1.3% to 0.8% of GDP spent in R&D. while South Africa accounted for more than 60% of the estimated total expenditure in Africa in 2005, almost all of the African and less developed countries are still behind schedule in GERD terms and measures; and by the way, increasing R&D intensity to a level that is close to that of developed countries will be a giant challenge for these countries. The Table 5 confirms this sight, and furthermore it evaluates GERD for a number of African countries.

Table 5: GERD in some African countries (2005 or latest data available):

Country	Year	GERD ('000) – Local currency	GERD - PPP\$ ('000)	GERD – as % of GDP	GERD per inhabitant (PPP\$)
Algeria	2005*	4,994,000	133,360	0.07%	4.1
Botswana	2005	205,567	84,916	0.39%	46.3
Burkina Faso	2005*	4,914,954	24,547	0.17%	1.8
D.R. of Congo	2005*	16,116,424	75,217	0.48%	1.3
Egypt	2000*	654,600	474,513	0.19%	7.1
Ethiopia	2005*	192,227	85,282	0.20%	1.1
Lesotho	2004*	5,400	1,552	0.06%	0.8
Madagascar	2005*	15,942,004	24,542	0.16%	1.3
Mauritius	2005*	690,030	47,014	0.38%	37.9
Morocco	2003	3,144,000	618,758	0.66%	20.7
Mozambique	2002	501,580,800	52,267	0.50%	2.7
Senegal	2005*	4,090,000	16,252	0.09%	1.4
Seychelles	2005*	15,271	4,551	0.38%	54.9

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South Africa	2005	14,149,239	3,654,269	0.92%	76.2
Sudan	2005	19,284,000	179,085	0.28%	4.9
Tunisia	2005	384,000	660,607	1.03%	65.4
Uganda	2006	33,082,120	51,365	0.19%	1.7
Zambia	2005*	9,272,025	3,840	0.03%	0.3

* partial.

Source: UIS S&T Database, 2008

The table above shows the progress made in few countries such as South Africa, Morocco, Tunisia, Botswana, D R Congo, Mauritius, Mozambique, and Seychelles. We can see also that the Algerian GERD are much less than those of related countries such as Tunisia and morocco, even if the data concerning morocco were collected on 2003, parenthetically 0.07% of GERD– as a percentage of GDP is the lowest on in all the selected countries except Zambia and Lesotho and by the way, the estimated average of the GERD expenditure in the African countries must be at least 0.4 - 0.5 per cent. Furthermore the medium of \$4.1 US of GERD per inhabitant must also be improved in the next few years. The Arab countries constitute around 3.5% of world GDP and more than 4% of world population, but Arab countries consume around only 0.4% of the Gross Domestic Expenditure on R&D (GERD) and then The Arab world is not investing enough of its economic resources in technology, and was ranked last – even lower than African countries. By the way, a most recent statistics reveal that 89-97% of R&D expenditure in the Arab world is funded by the public sector. By contrast, more than 50% of R&D expenditure in developed economies is funded by the private sector. (Abdallah Alnajjar, 2002). Since 2000, R&D expenditure relative to GDP (R&D intensity) has increased in Japan, and it has decreased slightly in the United States.

In 2004 and 2005, Sweden, Finland, and Japan were the only three OECD countries in which the R&D-to-GDP ratio exceeded 3%, well above the OECD average of 2.3%. Since the mid-1990s, R&D expenditure (in real terms) has been growing the fastest in Iceland and Turkey, both with average annual growth rates above 10%.

R&D expenditure for China has been growing even faster than GDP, resulting in a rapidly increasing R&D intensity, growing from 0.9% in 2000 to 1.4% in 2006.

Statistics of university graduates in the labour force is roughly 12 to 15 millions in an adult population (about 150 million). From which about 30 to 40 percent of these are in applied & basic sciences.

This is a significant proportion when compared with world's leader, US, whose equivalent proportion is 20%. Potential researchers in the Arab World were about 60,000 in year 2001. Research output per faculty varieties from 0.5 papers annually to less than one publication per 10 "potential researcher". An analytical study indicated that, on average, only 5 percent of university

teachers' load in the Arab is utilized for research related activities while this percentage tops to 40% in advanced countries.

The majority of foreign-invested companies in advanced countries, even in medium- and high-tech industries, engage in manufacturing activities and perform little R&D in those countries. In the last decade, many governments worldwide just like the Chinese government have adopted policies to improve the quality of the R&D personnel and at the same time to reduce the number of government research institutes and employees. The higher education sector in advanced countries is one of the key pillars of the NIS and especially that it plays a significant role in Science and Technology diffusion, moreover as a supplier of S&T human resources, and particularly while the linkage between academia and industry is getting increasingly strong.

Algeria is facing quite a lot of structural challenges concerning the national Innovation system; here we count for example the Knowledge and technology diffusion through industrialization of S&T products. In fact the knowledge and technology barriers are associated with poor Innovation abilities within the country and an inefficient market mechanism with a lesser amount of moral rights properties' and brands' protection. There exists also the gap between national and foreign actors which makes the Innovation processes much difficult.

Moreover; there are also the gaps between regions which are getting wider, with large regional inequalities in R&D activities as well. This could be a serious challenge, which is evident in other areas such as human resources, high-technology industries and the openness of regional economies. In the last decade, some advanced countries have launched various strategies designed at energising less developed regions and accelerating union through a combination of regional, financial and S&T policies, and so the African governments including the Algerian one should plan to do the same and especially that these strategies have brought a really massive profit for those countries. Algeria needs also to reward through the international standards of S&T; actually China for instance has made so many reforms and institutional changes, in the 1990s, these reforms can be cited as follows:

- Restructuring of government research institutes through downsizing, and organizational reforms and re-orientation of governmental support towards basic and applied research.
- Expansion of the higher education sector by increasing the number of new entrants at both the undergraduate- and the graduate level, and stronger, but more concentrated financial support to the key research-intensive universities.
- Strengthening the Innovation capacity of enterprises.
- Increasing openness of the market by introducing advanced technology and by generating spill-over effects in various forms at the intra- and inter-sector level.
- Creation of a technology market to facilitate the interaction among key performers.
- Encouraging science-industry linkage among key performers.

Conclusion:

Enterprise's innovativeness relies on several characteristics of the enterprise itself such as the enterprise size, employees skilfulness, internal activities, R&D activity, and R&D intensity as well as other environmental features and factors that can determine the level of innovativeness and

Innovation performance of the enterprise, thereby any business owner or manager or even a simple employee must understand at least few of these concepts and how each of them works to foster or depress the Innovation process, we have given a simple literature review of Innovation in ways to help readers collecting even a smallest amount of knowledge about this subject.

In addition to technological and financial resources, Innovation requires further knowledge and resources such as expert know-how in a lot of areas such as management, production, the Innovation process, intellectual property rights, marketing, and cooperation skills and so on. The literature of Innovation is more concerned by the Innovation's borders in the developed countries than the adaptation capacity in the developing countries, this literature shows that Innovation is becoming (not only in developed countries but also in developing ones such as the north African ones) one of the most important assets for corporations, but the case is a little different between the north and the south, the case of north African countries including Algeria shows us that Innovative activities are almost totally held by governments and public sectors in these countries while in developed countries those activities rely to a massive part on private sectors contribution.

The innovative and research activities in north African countries are still late but they have been some changes and developments in the last decade, which has brought so much development to the region, but the governments in these countries are still hoping for more development concerning Innovation activities and thus they are still gathering the local efforts to realize their planned goals in the middle/long terms.

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