

Innovation and linkages “university-industry” in Algeria

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Abstract:

The paper highlighted the case of Algeria by studying the national innovation system of Algeria, and it discussed the situation of universities in Algeria through their most important reforms, then it illustrated the patents and R&D expenditures diffused in Algeria. In the final section, we interviewed 13 people, they were: professors, project leaders, laboratories leaders, researchers, deans of faculties from the economic and managerial field and some of them were from the technical field. They were from institutions from the east, the west and the center of Algeria e.g. CDTA, CREAD, CRAPC (research centers), Batna University, Biskra University, Tizi Ouzo University, preparatory school of Oran, M'sila University, Constantine 1 University, Media University, and Annaba University. We aimed at presenting and analyzing the university-industry linkages in Algeria based on their point of view.

Key words: Innovation, National Innovation System, university-industry linkages, Algeria.

المُلخَص:

تبرز هذه الورقة البحثية حالة الجزائر من خلال دراسة نظام الابتكار الوطني، وتناقش وضعية الجامعات الجزائرية من خلال أهم الإصلاحات التي خضعت لها، كما توضح براءات الاختراع والنفقات D&R في الجزائر. كما تم استجواب 13 شخصا من أساتذة ومشرفين على المشاريع، قادة مختبرات، باحثين وعمداء كليات من المجال الاقتصادي والتسبيري وبعضهم من المجال التقني. أما المؤسسات المبحوثة فكانت من الشرق والغرب ووسط الجزائر على سبيل المثال CREAD، CDTA، CRAPC (مراكز بحث)، جامعة باتنة، جامعة بسكرة، جامعة تيزي وزو، المدرسة التحضيرية وهران، جامعة ولاية المسيلة، جامعة قسنطينة 1، جامعة مديّة، وجامعة عنابة. كما عمدت الدراسة أيضا إلى تقديم وتحليل واقع الروابط بين الجامعة والصناعة في الجزائر بناء على وجهة نظر الفئة المبحوثة.

الكلمات المفتاحية: الابتكار، نظام الابتكار الوطني، الروابط: الجامعة-الصناعة، الجزائر.

Introduction

The research university plays an important role as a source of fundamental knowledge and, occasionally, industrially relevant technology in modern knowledge-based economies. In recognition of this fact, governments throughout the industrialized world have launched numerous initiatives since the 1970s to link universities to industrial innovation more closely. Many of these initiatives seek to spur local economic development based on university research (Mowery and Sampat, available online, [Accessed 05th March 2015].)

Universities have long been considered important institutions in national innovation systems (NIS). The NIS perspective highlights the fact that countries organize innovation differently. Not unexpectedly, the role of universities in each NIS differs significantly. The NIS perspective has been criticized by scholars who have asserted that innovation processes in industries and regions differ even within the countries (Rahali and Bendiabdellah, 2015).

This research aims to examine the main question: *What is the situation of universities, the national innovation system, and linkages university-industry in Algeria?*

To answer this problematic, we structured our paper in the following way. First, a theoretical part is carried out to define innovation and National Innovation System (NIS) with a specification to the national innovation system of Algeria. Second, a discussion about universities in Algeria and its most important reforms, then we illustrate the patents and R&D expenditures diffused in Algeria. In the final section a case study is presented based on the university-industry linkages in Algeria.

I. Literature review:

1-Innovation:

Innovation may be defined as an act of propagating an idea and transforming it into a new product, service, or business model that can be useful to customers. There are two important segments of innovation, namely: product innovation and process innovation. It should be noted that innovation can also be pursued radically (i.e, sudden change of modus operandi) and incrementally (i.e, incremental with step-by-step improvement) (Soliman, 2011).

Innovation separates into two parts. One part is the “proactive innovation,” and the other part is the “reactive innovation.” Proactive innovation shows that innovation comes from the condition of business and develops from the ability or schedule of the organization. It doesn’t materialize from competitive pressure. Further, reactive innovation means that innovation begins from competition. Businesses encounter the pressure of the environment or competitors and feel forced to innovate (Chang et al, 2006).

2-National Innovation System:

The National Innovation System (NIS) depends on the understanding the linkages among the actors involved in Innovation and technical progress. These actors are primarily private enterprises, institutions, policies, and agents supporting and sustaining scientific and technical advance, universities and public research institutes and the people within them. The linkages between the actors or especially between Universities and industry can take the form of joint research (R&D projects), technology licensing, consulting, internships, , personnel exchanges, cross-patenting, purchase of equipment and a variety of other channels. There is no single accepted definition of a national system of innovation (available on: <http://www.oecd.org/science/inno/2101733.pdf>). Three core actors to an NIS are Universities, industry, and government (Rahali and Bendiabdellah, 2015).

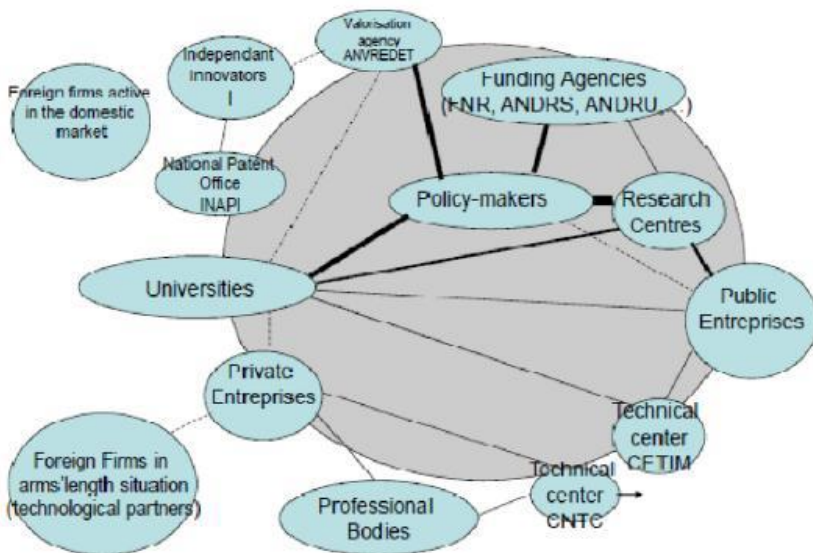
3-National Innovation System of Algeria:

In developing countries, innovation is widely inaccessible because the performance of innovative activities is weak and the public efforts are not strong enough to make it happen. The NIS in developed countries is not the same in developing countries, and we could not assume the existence ex-ante of NIS: often NISs exist in a preliminary form, are unstructured, disorganized and fragmented, and mostly incomplete, with weak or missing links and weak incentive systems (Djeflat, 2004).

In Algeria, most key players appear to be excluded from the national innovation sphere (foreign firms, professional bodies, independent innovators who constitute incidentally more than 84% of patents holders). Only a small group can be considered a being fully included: these are policy-makers, research centers, and research funding

agencies (Djefflat, Devalan, and Ettoumi). This fragmented and often excluding innovation system feature seems to be quite common in many Developing Countries (see figure. 1).

Fig. 1. The current national innovation system excludes most key players.



Source: A. Djefflat, P. Devalan, and F. Youcef Ettoumi, —Evaluation des Politiques et Programmes d’innovation dans le secteur industriel, *Final Report, European Commission - Ministry of Industry*, Brussels: EC, 2007.

The efficiency of a NIS depends on more than just the level or R&D investment (or the portfolio of spending across the innovation spectrum from scientific discovery to product development). It is also important that the organizations within the innovation system have appropriate configurations, capabilities and linkages. In particular, intermediate translational research and technology organizations which bridge the gap between public research and industry may play a critical role. The effectiveness of international models of intermediate institutions is highly dependent on the configuration of the NIS and national industrial structures. This systems context needs to be fully understood before any particular institutional model is adopted or adapted by another country (Andersson and Djefflat, 2013, p240).

To answer our problematic we develop two hypotheses:

H₁: *The level of patents and R&D expenditures diffused in Algeria is weak.*

H₂: There are no linkages between university-industry in Algeria.

II. Methodology of the study:

The study was applied on the case of Algeria by studying: the national innovation system, the situation of universities through their most important reforms, and the patents and R&D expenditures diffused in Algeria based on analyzing second data which gathered from other researches and websites.

Also, we have interviewed 13 people, they were: professors, project leaders, laboratories leaders, researchers, deans of faculties from the economic and managerial field and some of them were from the technical field. They were from institutions from the east, the west and the center of Algeria e.g. CDTA, CREAD, CRAPC (research centers), Batna University, Biskra University, Tizi Ouzo University, preparatory school of Oran, M'sila University, Constantine I University, Media University, and Annaba University. We aimed at presenting and analyzing the university-industry linkages in Algeria based on their point of view.

The study adopted the qualitative and quantitative approach.

III. Case of Algeria:

1-Universities in Algeria:

The French established the first Algerian university –Algiers University – in 1909, and most of the students at the time were French. In 1962, there was only one university in Algeria with offices in Oran (for the West of the country) and Constantine (for the East) with 500 students. Today, there are 95 institutions of higher education: (48) universities, (10) university centers, (19) national high schools, (05) high schools, (10) Preparatory schools, (03) preparatory classes integrated. With more than 1.5 million students were registered for the academic year 2012-2013. The Education in (primary, middle and high schools) is now completely free and supported by the state and the HE institutions cover the whole Algerian territory (West, East, centre and south).

After the Algerian independence in 1962, significant changes were introduced in order to facilitate access to higher education for a greater number of Algerians. One of the most important reforms, introduced in 1971, sought to mobilize the full potential of the Algerian

universities so that they would be in a position to support the ambitious economic, social and cultural transformation and development of the newly independent country. The 1971 Reform proposed a change of teaching and learning methods, including assessment methods, teaching contents, structure, organization and management of the university and creation of new specialties, options and modules in order to better respond to the development needs of the country.

The next major reform was in 1999. This Reform was aimed at improving quality of output and preparing Algerian universities to support the transition from a centralized to free market economy and to address the threats and opportunities of globalization.

The 1999 Reform provided for universities to forge links with industry and to be integrated with 'actors' in the local environment in order to play a more active role in regional development. The number of researchers increased from 5000 in 1996 to 15000 in 2002. With the 1999 Reform, S&T policy shifted from a centralized to a decentralized approach and institutional networks emerged through a greater community involvement of universities in liaison with local actors. This process involved relationships and joint actions within and between government, industry and university and research institutions both at national and regional levels. Such networks and relationships helped promote innovation through knowledge creation and dissemination. However, the Reform did not provide for sufficient power to be devolved to local actors, so that the potential gains expected to derive from the articulation of institutional networks is still far from fully realized (Esau and Khelifaoui, [Accessed 15th May 2014]).

Universities do not control their budgets, curricula and direction of specialization. Their lack of autonomy has prevented independent scientific research and hampered universities from taking initiatives, generating new creative ideas and introducing innovations. Instead, they have passively absorbed political orientations and guidelines. As a consequence, they have little ability to connect to their local neighborhoods, to develop bridges and a sense of relevance. This problem is more acute in the Maghreb countries and Egypt than in the rest of Middle East countries (Andersson & Djeflat, 2013, p177).

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2-R&D expenditures and Patents diffusion in Algeria:

Universities in Algeria are under the control or direct supervision of Algerian government. To illustrate this point we provide data on two indicators: *patents and level of public funding of university-research (R&D expenditures)*.

2-1-Patents indicator:

In Algeria a patent may be granted from the INAPI (Institut National Algérien de la Propriété Industrielle= national Algerian institute of industrial propriety).

The next Table (Table 01) illustrates the patents filed by research centers and universities from 1987 until 2010 by INAPI office. This table shows that the most patents come from the research centers (A) all over the study period. So research centers in Algeria are more involve in research and innovation more than universities (B) because researchers in research centers are working full time in research on contrary to teacher-researcher in universities spend more time in teaching.

Table 01: patents filed by research centers and universities

Year	Research center (A)	Universities (B)	Total (A)+(B)	Total of the whole sector (c)	(A+B)/ C En %
1987-1990	6	0	6	22	27%
1991-1995	4	0	4	79	5%
1996-2000	7	1	8	203	4%
2001-2005	14	2	16	232	7%
1987-2005	31	3	34	ND	-
2010	7	8	15	806	1%

Source: INAPI statistics cited by (Kerzabi .A, Kerzabi .Z, 2012)

We can also compare the patents filed by Algeria and its neighboring countries, Algeria is preceded by Morocco and Tunisia respectively registered 561 patents in Morocco in 2004, and 579 in Tunisia between 1990 and 2005 (Djeflat Med, 2007). In Algeria, the number of patents disposed by inhabitants does not exceed 0.1%, compared to 68.1% in France, 30.3% in Italy and 8% in Spain. These weaknesses come from that Algerian firms attribute to the unfamiliarity with the system of patents, technical constraints as (lack of specialists in patent drafting and weakness of structure in charge of proceedings deposits) and lack of awareness among economic entities and lack of training at the university level.

2-2-R&D expenditures indicator:

R&D expenditures are known as all money spent on research and development activity by the government in higher education sector and in research centers. In addition, to the expenditures of the industry, without distinction between the public sector and the private one, add to that the expenditures of the private sector non-profit character. However, the numbers adopted in the case of Algeria belong only to expenditures of the scientific research sector in universities and scientific research centers involving under the tutelage of the ministry of higher education and scientific research (**MESRS** =Ministre d'enseignement supérieur et la recherche scientifique = ministry of higher education and scientific research). Without mention, the expenditures of scientific research in research centers belonging to other ministries; as well as, the expenditures of industrial enterprises in public and private sectors in this activity. We should mention also that the case of statistics in many developing countries as it was highlighted by the UNESCO report on science in 2010.

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 Industries but performed abroad. In Algeria, for instance, the GERD has been improving by time in the last decade, but even though that enhancement it (GERD) represented only 0.35% from the GDP in 2004; and research is almost 98% funded from public organizations

but there are not any tools or programs to make it concrete and valuable. In Algeria also, the creation of innovating Industries is exclusively the mission of large enterprises such as Sonatrach, Sonelgaz, Electricité d'Algérie, SAIDAL... Moreover; Algeria possesses only few patents in the European offices of patent while its patent applications are totally absent in the American Office of patent (OST 2006) (Metaiche and Maliki , 2012).

In Algeria, the objective of the law of research in 1998 has been allocated a budget of 1 % of GDP for scientific research but they never reached this level. Later the pilot project of 2006 has proposed to reach that level by the beginning of 2010. Also it is worth mentioning that the R&D expenditures have reached more than 12 billion Algerian Dinars (12825200900.00 Dinars) which is equal to 111.551671 million Euros according to FNRSDT¹.

H₁: The level of patents and R&D expenditures diffused in Algeria is weak (is proved).

3-Linkages “university-industry” in Algeria:

3-1-University-industry partnership in Algeria:

We can say that it does not exist any “demand pull” or “technology push” between industry and Algerian universities. The contractual research and partnership research do not exist in Algeria because the Algerian industry shows a little interest (if not at all) to research universities; also it does not help in the financing of projects that realized in the university, and it does not responds to the needs of university beside the rejection of the products that are invented in university laboratories.

Furthermore, the Algerian researchers are often free to choose their research topics and promote in some cases those who were closer to the concerns of foreign laboratories, thus constituting a barrier to adequate development of scientific research and industry in Algeria.

¹ **FNRSDT** : Le Fonds National de la Recherche Scientifique et developpement technologique.

Bilan de la 2e loi sur la recherche scientifique: Plus de 10% de production-brevets par rapport à la première programmation, Publié le: 18-03-2013 sur: <http://www.elmoudjahid.com/fr/actualites/39391>, [Accessed 06th April 2013].

The activities of consultancy can do by university (teachers/researchers) but unfortunately teachers/ researchers in Algeria cannot sign legally that kind of expertise because we still do not have any administrative measure that allow teachers/ researchers to practice a second activity beside the teaching which limit their linkages with the industry.

3-2-Interviews about Linkages “university-industry”: Algerian case

The thirteen people we have interviewed were: professors, project leaders, laboratories leaders, researchers, dean of a faculty from the economic and managerial field and some of them were from the technical field. They were from institutions from the east, the west and the center of Algeria e.g. CDTA, CREAD, CRAPC (research centers), Batna University, Biskra University, Tizi Ouzo University, preparatory school of Oran, M’sila University, Constantine1 University, Media University, and Annaba University.

Based on the results shown in the table n02, some of these institutions do not appear to share any meaningful relationship (direct interactions) with the industry e.g: CREAD, CRAPC, Batna University, Biskra University, Tizi Ouzo University, M’sila University. However, we have found that other institutions have direct interactions with the industry e.g: CDTA, Preparatory school of Oran, Constantine1 University, Media University, Annaba University.

The access to industrial sites is very difficult as well as obtaining scientific data (equipment, measures, etc.). That’s why most of relationships with the industry (formal or informal links) were established based on personal relationships. The direct interactions with the industry are: Receiving students for training, solving some problems with mechanics, quality control of products, sponsoring seminars and symposia.

Based on the interviews, that the linkages between university and industry have been growing sometimes and declining sometimes because it always depends on the personal relationships and they do not go too far in such links. In general, university provides periodic meetings to build relationships and subsequently conventions with the industry but they are very limited. May be the theoretical organisational structure that the university has to develop linkages

with the industry has caused this, but it is obvious there is a problem somewhere that prevents developing and getting some real results on this stage.

University and Industry do not share linkages because many reasons: they do not appear to share the same concerns, the lack of confidence between both of them, the lack of understanding, the lack of incentives to academics and underestimation of the benefit of the partnership. The implementation of the LMD system for example was revitalization of this relationship, but we see it is failed because the industry does not offer even the data for PhD students to do their research, despite that the university can offer the industry many things as: continuing high level training, workers training, consulting, scientific research, innovative projects, physical and chemistry analysis, solving technical problems, organizational, and socio-emotional ones.

The organizational structure in the university does not help for industry linkages because the universities and research centers belong to the government and they get their most funding from the government. It means that these institutions are not looking for funding or benefit because they get paid and funded by the government (except the case of organizing conferences they look for funding from the industry). If these institutions become independent and belonging to the private sector they will look for funding by themselves and they will become more effective to develop a new organizational structure to get funding from the industry and to apply a serious research.

H₂: There are no linkages between university-industry in Algeria (is not proved).

Table n02: university-industry linkages: case of Algeria

N	Institutions In Algeria	Field of interviewers		Meaningful relationship with the industry / direct interactions	Formal Links	Informal Links
		Technical	Management & economics			
1	CDTA (Research center)	X		Projects in socio-economic partnership on http://www.cdta.dz/fr/projetspartenariat.asp	Yes	No
2	CREAD (Research center)		X	No relationship	No	No
3	CRAPC (Research center)	X		No relationship	No	No
4	Batna University		X	No relationship	No	No
5	Biskra University		X	No relationship	No	Yes
6	Tizi Ouzo University		X	No relationship	No	No
7	M'sila University		X	No relationship	No	No
8	Preparatory school of Oran		X	No relationship, because (their mission is preparing students to pass exams in others schools and universities)	No	No
9	Constantinel University	X		with companies focused on mechanics (eg SONACOME) and pharmaceutical companies (SAIDAL and private firms)	Yes	No
10	Media University	X		various agreements with industrial operators (SAIDAL, KAHRFI ...)	Yes	Yes
11	Annaba University		X	The university has conventions with industry to help students in their thesis.	Yes	Yes

Source: established by the author based on interviews.

IV. Conclusion:

The present paper finds that universities in Algeria that operate under the power of government are not effective in developing linkages with the industry. We propose some solutions to improve the links between the university-industry in Algeria among them (Kendel, 2007):

- Improve the public support for research and technological innovation;
- Improve the profession of researchers and support the link university-industry;
- Redirect public funds towards research and innovation: the protection of intellectual property, competition rules, financial markets, and take in consideration the research in corporate governance and accounting field.
- Improve partnership Research Centers and R&D labs with economic institutions;
- Provide reception and communication structures (intermediate structures within universities) such as: post offices and studies that contribute to strengthening the ties between the university and

industry, and benefit from foreign expertise in innovation and technology transfer centers;

- Develop tax incentives and mechanisms for the financing of academic research projects to encourage institutions on the use of research results, and to provide the operational budget for the universities and the allocation of part of it for the inventions and innovations protection;

- implementation of laws relating to industrial property, which force the various institutions on research and valuation to move forward quickly in the protection of inventions and innovations offered by laboratories;

- Universities should establish an information system on various research projects that can attract economic partners (Filali, 2005).

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