

Higher Education and Scientific Research Sector in Algeria: What Kind of Challenges and Changes That Are Required for A Better System?

Souleh Samah, (PhD, senior lecturer)
University of Biskra, Algeria

Abstract

This paper highlighted the main reforms of the Higher Education and Scientific Research sector in Algeria from the independence (1962) until now (2016), as well as the reality of its scientific production (graduated students' quality, publication, universities ranking, patents, and research) in the knowledge based economy. This sector needs some serious changes to function better that is what the paper has suggested.

Keywords: Higher Education, Scientific Research, Algeria

Introduction

The human capital¹ accumulation in any country or company is based on the investment in: education, health and training. The education is one of the most powerful investments which effects the human capital development. That is why in many nations government policy and scholarly work have identified the growing role of Higher Education (HE) and scientific research (SR) in the world-wide knowledge economy. The role of HE is not limited to fostering the economic development of nations and providing opportunities for individuals, it extends also to promotion of cultural diversity, political democracy and trade (Marginson, 2007).

Nowadays, the competitiveness in the knowledge based economy is based on the human capital capabilities. HE sector in Algeria has an estimable human capital that can achieve competitiveness, innovation and it can offer new research (products, programs, and patents ...etc) based on the good management of their knowledge and competencies, thus it will enable the HE and (SR) sector to adapt to the needs of Algerian economic enterprises.

¹ The human capital can be defined as “the stock of knowledge, skills, competencies, and abilities embodied in individuals that determine their level of productivity. In principle, it includes innate abilities and skills acquired through education, training and experience” (Djomo and Sikod, 2012).

HE and SR sector in Algeria has achieved many improvements in the last years but it still suffer from many problems, thus, this study has focused on analyzing the reality of HE and SR sector in Algeria. Based on the experience of the author in teaching at university and doing PhD on the management of researchers in Algeria, the study gives some remarks on: *The main challenges facing the HE and SR sector in Algeria? The main reasons why the HE and SR sector are not fulfilling its potential? And what are the changes that are required to make the HE and SR system work better?*

Higher Education sector in Algeria

The French established the first Algerian university –Université d’Alger– in 1909 and it was the only university in the country till 1962, with 500 students. After the Algerian independence in 1962, significant changes were introduced in order to facilitate access to HE for a greater number of Algerians (Esau and Khelfaoui, [Accessed 15th May 2014]). In 2016, there are 112 HE Institutions comprising of 50 universities, 11 centres universitaires, 20 écoles nationales supérieures, 11 écoles normales supérieures, 12 écoles préparatoires and 4 classes préparatoires intégrées (02 ans premiers de la formation dans l’école nationales)².

Education is completely free for all the cycles and supported by the state and the HE institutions cover the whole Algerian territory. The number of enrolled students is nearly one million three hundred thousand in 2014, and probably it will reach two and a half million in 2025 (Bouhali, 2014). The next table shows the evolution of students enrolled in the period 1962-2011.

² In Algeria, **centre universitaire** : is a kind of small university, contains 2 or 3 departments, where they have few specialities and they give license diploma only most of time, they are created in far and isolated places.

École nationale supérieure : is a higher institution specialized in something like trade, management; they are divided into 2 catégories: human science and technical science like polytechnical school, public affairs... where they accept only very highly skilled students.

École normale supérieure: is an institution where they prepare and train students to be teachers at primary, secondary and high schools.

École préparatoire: is a preparatory higher institution where they prepare students for two years with an intensive program to make them able to take the test and study in the Ecole National Supérieur.

Classe préparatoire intégrée: is an annexe for the Ecole preparatoire where they are created to do the same mission as “École préparatoire” where students will take class for 2 years and then the best students will be choosen after doing a test to study in Ecole preparatoire which transformed recently to École nationale supérieure.

Table 02: The evolution of students enrolled in the period 1962-2011

Year	1962/63	1969/70	1979/80	1989/90	1999/00	2009/10	2010/11
Student enrollment in graduation	2725	12243	57445	181350	407995	1034313	1077945
Student enrollment in post graduation	156	317	3965	13967	20846	58975	60617
Total	2881	12560	61410	195317	428841	1093288	1138562

Source : MESRS (2012), p. 36.

Also, the number of teachers responsible for supervising has grown during these five decades. It went from 298 permanent teachers in 1962 to over 40 000 teachers in 2011. This quantitative development is not sufficiently as soon as the top university of Algeria came in 1725 position in the world ranking universities and this shows the gap (Souleh, 2015). Table 3 shows the evolution of the number of teachers and supervision rate.

Table03: Number of permanent university teachers and supervision rate during (1962-2011)

Year	1962/63	1969/70	1979/80	1989/90	1999/00	2009/10	2010/11
Number of permanent teachers	298	842	7497	14536	17460	37688	40140
Total students enrolled in graduation	2725	12243	57445	181350	407995	1034313	1077945
Supervision rate	9	15	8	12	23	27	27

Source : MESRS (2012), p. 56

With the increased number of graduated students has decreased the quality of education because the lack of credibility and loss of confidence in the public and economic role of the university to effect meaningful transformations (Andersson and Djeflat, 2013, p177).

Scientific Research institutions in Algeria

Algeria has undertaken a strengthening of its research facilities and taken steps both to promote financial and institutional knowledge production, and especially to increase its links with the economic and social development (Khelfaoui, 2007). Unable to return to the entire device, institutions and legal texts that support research in Algeria, we will be limited in presenting the Law 08-05 (Loi n 08-05 qui modifie et de complète la Loi n° 98-11) Which aims to complete the institutional procedure outlined in the previous law and revitalize the various agencies and research communities. The law is interested in human resources development, in providing and facilitating all the physical, social, materials and scientific investments. Table 4 provides some indicators on the evolution of research workforce.

Table 04: Number of researchers and research projects during (2008-2012)

Year	2005	2008	2009	2010	2011	2012
Teacher-researcher	13720	14720	18863	25079	26579	28079
Permanent- researcher	1500	2100	2700	3300	3900	4500
Total	15220	16820	21563	28379	30479	32579
Number of new research projects	2000	2000	3200	3650	1732	3732

Source: Loi n° 08-05.

Currently ongoing reforms for (2014-2018) or what they called the *third law of research* aimed at building linkages between university and industry, motivating researchers to develop their results in research units within enterprises, to motivate the innovation thinking and to innovate products. Recently, Algeria has 27000 researchers and nearly 45,000 academic staff. The thousands of research laboratories contain only 2083 permanent researchers. These researchers have published only 11,000 research papers between 2010 and 2012 (Souleh, 2015). Nowadays, Algeria has a research network of 30 institutions supervised by MESRS which combine:³ (12) centres de recherche, (12) unités de recherche and (6) agences de recherche⁴. These research centres contain more than 930 researchers (table 05).

Table 05: Research Centres presentation

N	Initials	N of researchers	Denomination+ place
01	CDER	234	Centre de Développement des Énergies renouvelables (Alger)
02	CERIST	63	Centre de Recherche sur l'Information Scientifique et Technique (Alger)
03	CDTA	250	Centre de Développement des Technologies Avancées (Alger)
04	(CRTI) ex (CSC)	74	Centre de Recherche en Technologie Industriel (Alger) <i>before it called</i> : Centre de Recherche Scientifique et Technique en Soudage et Contrôle
05	CRAPC	61	Centre de Recherche Scientifique et Technique en Analyses Physico – Chimiques (Tipaza)
06	CRSTDLA	29	Centre de Recherche Scientifique et Technique sur le Développement de la Langue Arabe (Alger)
07	CREAD	52	Centre de Recherche en Economie Appliquée pour le développement (Alger)
08	CRASC	55	Centre de Recherche en Anthropologie Sociale et Culturelle (Oran)
09	CRSTRA	60	Centre de Recherche Scientifique et Technologique sur les Régions Arides (Biskra)
10	CRBT	46	Centre de Recherche en Biotechnologie (constantine)
11	CRTSE	(NF)	<u>Centre de Recherche en Technologie des Semi-conducteurs pour l'Energétique</u> (Alger)
12	(NF)	(NF)	Centre National de Recherche dans les Sciences Islamiques et de Civilisation (Laghouat)
-	Total	930	-

Source: Data established based on the web site of MESRS and Research Centres, (2016).

³ Cited on: <http://www.dgrsdtdz/index.php/fr/centres-de-recherche>, visited on 25/11/2016.

⁴ (12) research centres, (12) research unity, (06) research agency.

Scientific production of HE and research sector Publication and citation ranking

Based on the SJR ranking (Table n06), Algeria comes in the 55th position from a 239 ranking country where Morocco comes directly after Algeria and Tunisia didn't appear in the ranking. France also comes in the 6th position and as we all know that France is full of researchers from (Algeria, Tunisia and Morocco). The first 5 positions of the Ranking go to (USA, China, UK, Germany and Japan).

Table n 06: Country ranking based on SJR (2014)

Rank	Country	Documents	Citable documents	Citations	Self-Citations	Citations per Document	H index	
01	United States	8626193	7876234	17743493	5	83777658	23,36	1648
03	United Kingdom	2397817	2103145	44011201	10321539	21,03	1015	
05	Japan	2074872	2008410	27040067	7619559	13,79	745	
06	France	1555629	1468286	24700140	5516943	17,95	811	
55	Algeria	36490	35871	174096	34065	7,66	97	
56	Morocco	35962	34027	235287	43346	8,52	117	

Source: available on : <http://www.scimagojr.com/countryrank.php>, [Accessed 05th April 2016].

Patents indicator

The role of Algerian Universities is still limited in terms of carrying out R&D and patents for industry. Contractual and partnership research do not exist in Algeria because the industry shows little interest in such projects. Consultancy opportunities are also scarce as university teachers and researchers cannot enter legally into such contracts. According to DGRSDT⁵, we can illustrate patents number of national Algerian researchers and Algerian researchers living abroad in the period (2011 to 2013) as follows:

Table08: Comparison between national Algerian researchers and Algerian researchers residing abroad in terms of patents in (2010 – 2013)

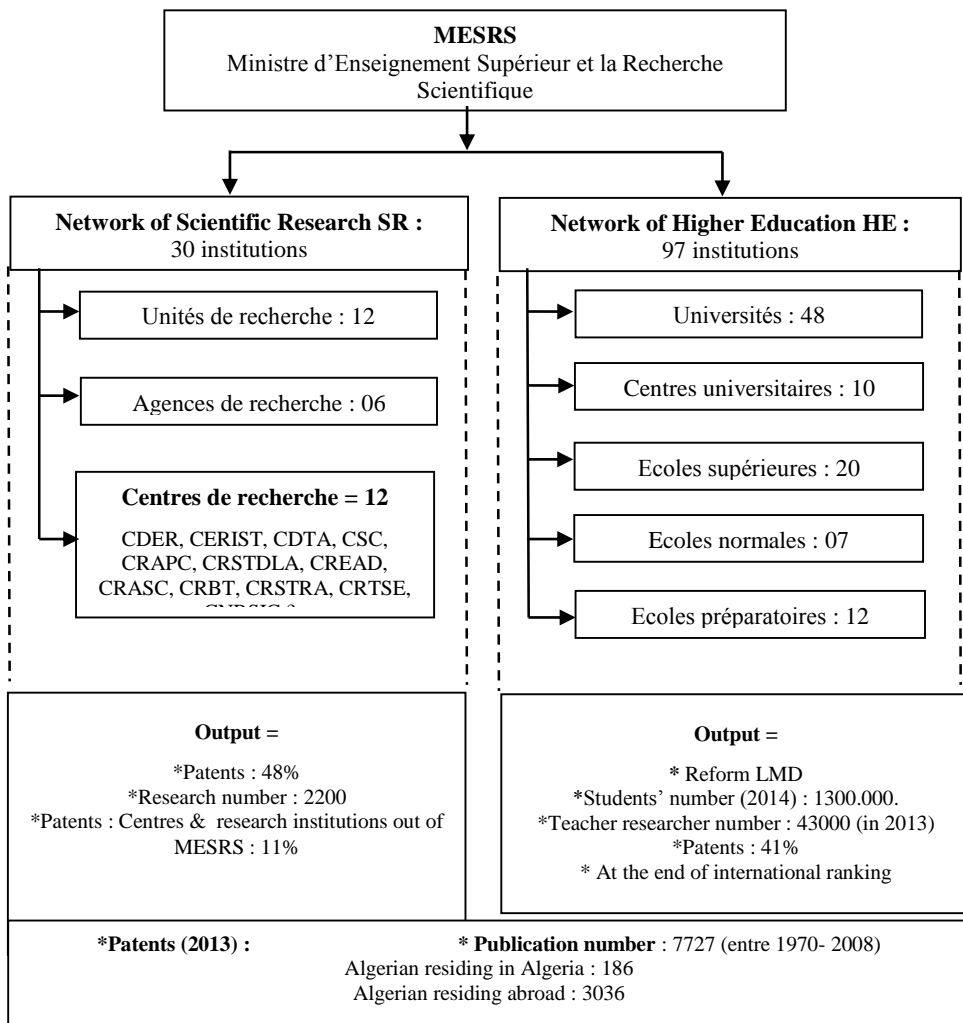
N	Institutions & Research Entities	Patents number of national Algerian researchers					Patents Number of Algerian researchers residing abroad		
		2010	2011	2012	2013	%	2011	2012	2013
01	Universities	-	-	66	69	41	-	-	-
02	Publics Centres	-	-	52	81	48	-	-	-
03	Other Centres	-	-	16	18	11	-	-	-
Total of patents		96	116	134	168	100%	2744	2833	3036

Source: Established by the author based on the data of: recueils des brevets d'invention, 2^{ème} et 3^{ème} édition, Alger, 2012-2013

⁵ DGRSDT= Direction Générale de la Recherche Scientifique et du Développement Technologique= General Direction of Scientific Research and Technologic Development

The patents production has increased in recent years. Algeria has more than 500 Algerian inventors established abroad (residing in 23 countries) which they represent less than 1% of total Algerian researchers. But these researchers produce almost twenty times more than all the national researchers. This reality is the result of two different phenomena, the most inventive researchers are attracted by top international research centres (with the higher salaries and the best work environment) and national researchers are not always well tutored, supported and encouraged to produce patents. Foreign companies, professional organizations, and independent innovators are also more than 84% of patent holders (Souleh, 2015). We can establish the portrait below for the HE and SR sector:

Figure 01: Portrait of HE and SR sector in Algeria (2016)



Source: established by the author based on the investigation data (2016).

The main challenges facing the HE and SR sector

Knowledge based economy challenges: The research university is an important knowledge sources and innovation partners for industry (R&D collaborations, innovation partnerships, use of facilities, informal knowledge exchange); However, the key importance of universities has still to be seen in the traditional roles of providing highly qualified graduates, doing excellent scientific work, providing basic science and R&D (Tödting, 2006).

Private education sector: Bigger shares must be given to the private sector: complementary schemes for teaching exist at pre-school, primary and even secondary levels, over 200 institutions: since 2008 for universities (Miliani, [Accessed 12th May 2014]).

Competitiveness and innovation: Nowadays, the competitiveness in the knowledge based economy is based on the intellectual capital management (Carmen Cabello-Medina et al, 2011). HE sector in Algeria has an estimable human capital that can achieve competitiveness, innovation and it can offer new research (products, programs inventions, patents, methods and procedures ...etc) based on the good management of their knowledge and competencies, thus it will enable the HE sector (universities and research institutions) to adapt to the needs of Algerian economic enterprises.

SMEs and clusters: universities and research institutions play an important role in the emerging and development of regional clusters and their contribution to the collective learning within regions (e.g. science parks, business incubators, spin-offs, informal personal contacts, consulting, research consortia, etc.) (Stankeviciute, Jolanta; Jucevicius, Robertas, 2003). Understanding the nature of relationships between universities and SMEs is important because the current theories on regional development suggest that concentrations of SMEs in certain regions, clustered around one or more university centres, can be effective locations for accelerating this process (Hendry, Brown and Defillippi, cited online). Based on that, the Algerian HE system is facing the challenge of being strong and effective to help in the emerging and formation of SMEs and clusters.

Create an endogenous research field: Based on the third law of research “the research has to take in charge different fields related to agriculture, fishing, water resources, education, health and employment promotion, fundamental research, basic research, social and human sciences, renewable energy, environmental protection...” (Journal Elmoudjahid, 2013). HE sector needs to create an endogenous research field by orienting researchers to search in the fields that benefit the Algerian economy.

After the hydrocarbon economy!: One of the biggest challenges in front of universities and research institutions is developing research (products, programs inventions, patents, methods and procedures ...etc) in

the renewable energy and agriculture field to help the Algerian economy now and after the hydrocarbon area.

The main reasons why the HE and SR sector in Algeria is not fulfilling its potential:

Centralized education system: the state is the dominate manager of HE sector which make the management process more complicated as it takes too much time, lose control and money, and the lack of credibility which can affect the quality of HE productivity. The centralization of decisions coming from the top of the structure “Trusteeship” encourages the emergence of some imbalances with regard to the reality which often differs from the vision of the decision maker.

Informal management: the centralized education system has its ups and downs, because the behaviors of the sector’s managers which are sometimes justify and sometimes are not. Also, the existing of the pushing and pulling in the management process, specifically, a lot of bureaucracy and corruption, where we found that many managers and professors even students use the power of their positions to enhance what they want, by using also the empty circles in the laws and devices which mange the HE sector.

Matter of reforms: since the Algerian independence in 1962, the state has struggled a lot to set up an education system. For example we can notice a lot of reforms and rules in terms of some aspects in one hand, and the lack of applying this rules and reforms in the other hand, besides the lack of new effective rules and applications in the sector’s management.

Instability of researcher: The weaknesses, related to the status of researchers in terms of compensation and social performance, encourages the emergence of some behaviours of opportunist type which threaten innovation and creativity processes. Also, the researcher’s management strategy is not homogeneous with the individual initiatives evaluation. Some researchers witnessed a drop in their motivation because they work for others.

Quality of teaching, learning and thinking of teachers and students: because the HE is a free system, students (many of them) will not show commitment. Because the HE is a centralized, well paid and less control system, teachers will never leave their jobs for any reason so if they teach well or not it does not matter because they get paid any way! It is only up to their conscience to do the right thing!

Financing research projects by industry: if we want to develop the research we must have a strong industry which collaborate with researchers. It is a serious mistake that researchers are doing their research and publishing it just to get their PhD theses done. The Algerian researcher should get his thesis done at least by participating in the improvement and solving industrial or technological problem which does not exist in Algeria because

our industrial prefer foreigners to solve their problems instead of funding PhD theses to do it. It is also, a political, social and trust problem as well.

The changes that are required to make the HE and research sector system work better

Make the HE sector a *paid system*, so student should pay for their studies at least they will show more commitment.

Uncentralized the HE system and open the door for *private sector* to manage universities in Parallel with the public sector.

Continuous evaluation for teachers and managers is a good approach to set up a culture of competitiveness and credibility for universities.

Settle for good, the principle of *Quality education* for universities and the *Productivity of research institutions*.

The HE management needs *new governance and new methods* especially the honesty in management or *the management by Ethics*.

Increase budget for internships, training, international cooperation, scientific research and technological development with keeping eye on the effective management of this budget and make sure that this kind of investments enhance its goals.

Improve individual assessment methods and encourage collective work between managers, teams, researchers, universities to support the links with industry.

The modeling of the compensation system, the promotion and the patents pricing in regarding the area of each research institution / university.

Improve legal and organizational texts that manage researchers, universities, research institutions in Algeria.

The centralization of decisions from the top structure does not help the progress of research projects, that's why universities and research institutions need to be independent in their management.

The researchers are called to focus on research by ethics because the scientific rigor is the real victim.

Conclusion

We have to notice that both the HE and SR sector in any country are ones of the most important standards of sustainable development. In the case of Algeria, HE and SR sector still facing problems in their ways to be more effective and innovative, and even the government is helping them in so many ways, there does exist a lot of problems and obstacles that must be faced and resolved by the sector itself, which mean that the managers, teachers/researchers, and students are all concerned.

We have highlighted as well the main reasons behind the weak performance of the HE and research sector. We have suggested also some

changes that are required to make the system work better mainly that the system should work on good linkages with the governmental, non-governmental organizations and specially firms.

References:

Andersson, T., & Djeflat, A. (2013). *The real issues of the Middle East and the Arab spring: addressing research, innovation and entrepreneurship*, Springer edition.

Bouhali, R. (2014). l'enseignement supérieur en Algérie entre le nombre et la qualité, *colloque G3 : la qualité dans tous ses états*, du 16 au 18 octobre.

Cabello-M, C., Lopez-C, A. & Valle-C, R. (2011). "Leveraging the innovative performance of human capital through HRM and social capital in Spanish firms", *The International Journal of Human Resource Management*, February, Vol. 22, No. 4., pp 807-828.

Djomo, J. M. N., & Sikod, F. (2012). The effects of human capital on agricultural productivity and farmer's income in Cameroon. *International Business Research*, 5(4), 149–159.

Esau, S., & Khelifaoui, H., (2006), "Algeria", cited on: <http://portal.unesco.org/education/fr/files/55529/11998887155Algeria.pdf/Algeria.pdf>, [Accessed 15th May 2015].

Hendry, C., Brown, & J., Defillippi, R. (2000). Understanding relationships between Universities and SMEs in emerging high technology industries: The Case of Opto-electronics, *International Journal of Innovation Management*, Vol. 4, No. 1, pp. 51-75.

Journal Elmoudjahid (2013). Avant-projet de la 3e loi sur la recherche scientifique 2014-2018: L'innovation au service des entreprises, Published at: 25th of March 2013 on: <http://www.elmoudjahid.com/fr/actualites/39602>, [Accessed 05th April 2013].

Khelifaoui, H. (2007). «La recherche scientifique en Algérie: Entre exigences locales et tendances Internationales», available on: <http://portal.unesco.org/education/en/files/53297/11797117335Khelifaoui.doc/Khelifaoui.doc>, [Accessed 11th May 2015].

LA DIRECTION GENERALE DE LA RECHERCHE SCIENTIFIQUE ET DU DEVELOPPEMENT TECHNOLOGIQUE, (2013-2014), *recueil des brevets d'invention*, 3^{ème} édition, Alger.

LA DIRECTION GENERALE DE LA RECHERCHE SCIENTIFIQUE ET DU DEVELOPPEMENT TECHNOLOGIQUE, (2012), *recueil des brevets d'invention*, 2^{ème} édition, Alger.

LA DIRECTION GENERALE DE LA RECHERCHE SCIENTIFIQUE ET DU DEVELOPPEMENT TECHNOLOGIQUE (2016),: <http://www.dgrsdtdz/index.php/fr/centres-de-recherche>, [Accessed 25th november 2016]).

Loi n 08-05 du 16 Safar 1429 correspondant au 23 février 2008 modifiant et complétant la loi n98-11 du 29 Rabie Ethani 1419 correspondant au 22 août 1998 portant loi d'orientation et de programme à projection quinquennale sur la recherche scientifique et le développement technologique 1998-2002.

Loi n° 98-11 du 29 Rabie Ethani 1419 correspondant au 22 août 1998 portant Loi d'Orientation et de Programme à Projection Quinquennale sur la Recherche Scientifique et le développement technologique 1998-2002.

Marginson, S. (2007). Higher education in the global knowledge economy, *Beijing Forum*, 2-4 November 2007.

Milaini, M., Towards a University Ranking System in Algeria: rank ordering the notorious, the old and ... the others, cited on: <http://www.mqa.gov.my/aqaaiw/slides/Prof%20Miliani/CAIRO%20PAPER.pdf>, [Accessed 12th May 2015]

MINISTRE D'ENSEIGNEMENT SUPERIEUR ET LA RECHERCHE SCIENTIFIQUE (2015), Alger, Algérie, <www.mesrs.dz>.

Souleh, S., (2015). L'évaluation de la recherche scientifique en Algérie: réalités et défis dans les organisations publiques, *conference l'Acfast*, Rimouski, Canada, 28-29 Mai 2015.

Stankeviciute, J., & Jucevicius, R. (2003). The role of universities in the development of regional knowledge-based clusters: The collective learning perspective, *the European Conference on Educational Research*, University of Hamburg, 17-20 September 2003.

Tödtling, F. (2006). The role of universities in innovation systems and regional economies, *Expert meeting on The future of academic research*, Vienna, 19-20 October 2006. Available on: <http://www.oecd.org/innovation/research/37592074.pdf>. [Accessed 25th November 2016]).