

# Review of the Challenges of Scientific Research in the Arab World and Its Influence on Inspiration Driven Economy

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**Abstract** This paper reviews the challenges facing scientific research in relevance to an inspiration driven economy, specifically in the Arab world. The paper reviews first the situation of scientific research and development (R&D) in different countries of the world. Then the researchers focuses on the situation of the R & D universities and research centers in the Arab world. A review of the outputs of scientific research in relevance to the expenditure on research is taken into account in relevance to inspiration driven economy that targets to optimize the capacity of discovery in every field and specifically in creating an influence on the socio-economy. The paper compares the situation between the scientific research in the World and situation in the Arab world and give recommendation for the way forward of the creation of an inspiration based economy.

**Keywords** Research & Development, Arab World, Inspiration Economy, Developing Countries, Socio-Economy

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## 1. Introduction

The progress of any society depends on the amount of progress it has made in the field of research and development. What confirmed over time the validity of this statement is the amount of achievements made by societies and countries that used research and development to achieve their goals. Therefore one could say that societies and countries differs on the basis of their achievements in the field of research and development (R&D). In view of history we find that science is the main engine of progress and development began in the Pharaonic era, Greek and Roman and through the Islamic civilization prosperity and achieve a great thing in various fields and then the European Renaissance, which reported much of the civilization of Islam and the great achievements up to the modern era, Overcoming challenges of R&D has become therefore a standard distinction between developed and underdeveloped or developing countries.

Arab countries have witnessed remarkable activity during the last two decades in the establishment of public and private universities and public and specialized research centers based on models popular in developed countries in the early second half of the last century. In the industrial

countries, most of these models underwent a radical development in many aspects, resulting in the emergence of new institutional structures of cities, science parks, technological incubators, centers of excellence and industrial clusters based on best practices of R&D and high technology. While in the Arab World, even though most of the countries had developed initiatives that are generally at the beginning of effective R&D that moves the socio-economy. Therefore, the R&D in the Arab countries would be characterized to be rather quantitative rather than qualitative in nature and without declared and known results of their achievements. It is a R&D with no qualitative breakthroughs that are still modest and questionable for the advancement of all Arab World capabilities.

However, say that we can see that different developing countries in the Arab World started to put in their Constitution, the importance of R&D. Many countries vision has been in line with the modern global trend in the developed countries which depends on strategic thinking and future knowledge based planning. In this context, we look forward to reviewing the experiences of the world in this field and to address the problems and challenges facing scientific research and researchers in the Arab world through what we discussed earlier from the research and the hope that we come to some recommendations through which we can achieve a glimmer It is hoped that practical research will take its place in the development and development processes at various levels and in various fields.

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## 2. Scientific Research in Different Countries of the World

Investment in scientific research requires the availability of a number of essential elements, including human resources, universities and research centers, finance, the structure of the labor market, in addition to the protection of intellectual property rights and the general investment climate.

The basic scientific research, which aims to introduce the general principles of the Organization of Applied and New Knowledge, which aims at reaching new and specific solutions to a particular issue or developing new products and methods, is an important element of production. The outputs of scientific research. On the areas of production only, but to increase the total productivity of the elements of production from contact with modern production techniques and thus enhance production in quantity and quality.

**Table 1.** List of countries by research and development spending for nations

Rank	Country/Region	Expenditures on R&D (billions of US\$, PPP),	% of GDP PPP	Expenditures on R&D per capita (US\$ PPP),	Year
1	United States	473.4	2.742%	1,442.51	2013
2	China	409	2.1%	298.56	2015
—	European Union	388.3	2.03%	764.3	2014
3	Japan	179.8	3.584%	1,413.9	2014
4	Germany	109.4	2.869%	1,351.1	2014
5	South Korea	91.6	4.292%	1,518.47	2014
6	India	66.5	0.85%	39.37	2015
7	France	60.0	2.256%	905.8	2014
8	United Kingdom	44.8	1.701%	692.9	2014
9	Russia	42.6	1.187%	290.21	2014
10	Canada	25.7	1.612%	723.5	2014
18	Israel	12.7	4.3%	1,361.56	2015
21	Turkey	15.3	1.007%	198.36	2014
24	Poland	11.6	1.004%	301.06	2014
33	Pakistan	2.4	0.29%	13.29	2013
36	Malaysia	7.6	1.13%	256.92	2012
<b>37</b>	<b>Saudi Arabia</b>	<b>1.8</b>	<b>0.25%</b>	<b>60.01</b>	<b>2012</b>
<b>45</b>	<b>Egypt</b>	<b>6.2</b>	<b>0.68%</b>	<b>73.18</b>	<b>2013</b>
46	Slovenia	1.5	2.386%	712.63	2014
<b>47</b>	<b>Morocco</b>	<b>1.5</b>	<b>0.73%</b>	<b>47.59</b>	<b>2010</b>
48	Indonesia	2.0	0.08%	8.09	2013
50	Iran	0.7	0.12%	9.08	2014
<b>52</b>	<b>Tunisia</b>	<b>0.78</b>	<b>0.68%</b>	<b>72.83</b>	<b>2012</b>
58	Kazakhstan	0.67	0.17%	39.24	2013
61	Philippines	0.48	0.11%	5.4	2007
66	Sudan	0.18	0.23%	4.74	2007
67	Algeria	0.16	0.07%	4.13	2007
70	Azerbaijan	0.33	0.21%	35.98	2013
72	Ethiopia	0.79	0.61%	9.08	2013
76	United Arab Emirates	4.28	0.70%	470.7	2014
77	Qatar	1.3	0.47%	698.50	2012
81	Bosnia and Herzegovina	0.12	0.33%	31.73	2013
82	Kuwait	0.83	0.30%	214.16	2013
83	Oman	0.07	0.23%	25.40	2013
85	Bahrain	0.06	0.100%	45.2	2014
87	Hong Kong	2.7	0.73%	373.09	2012

Reviewing list of countries by research and development spending for nations which annually spend more than 100 million dollars have been included. The world's total nominal R&D spending was approximately one trillion dollars in 2010 (OECD, 2017). As we can see in Table 1 United States is in the top with India as emerging country is number six, first Arab country Saudi Arabia number 37, then Egypt number 45, while Bahrain is number 85 and in the last of GCC countries. The vast difference between the first 36 countries and rest of the Arab World is that most of the universities and research centers plays a source of inspiration for the socio-economy and for the decision making in the industrial countries. It is an R&D that have great achievements and in the development of countless new products and methods of production, compared to the rest of the groups of developing countries, and may come through the provision of structures for research. The research centers as institutions carry out many research programs with allocated funds and large budgets that are linked to actual socio-economic development activities.

The review of the economic forum statistics shows the great achievements by developed countries US and EU in the field of scientific research, where the important part of them is the presence of a large number of institutions that look forward to the task of scientific research.

### 3. Outputs and Expenditure of Scientific Research in the World

Output of countries today is measured by the amount of published scientific papers. Looking at the top 40 country for example, Switzerland has 21,372 papers, while only Egypt is in this list with 5,592 paper.

**Table 2.** Top 40 countries by the number of scientific papers published

	Country	GDP (Million USD)	Papers	Papers Per Capita*1000	GDP/Paper
1	Switzerland	631,183	21,372	2.673	29.533
2	Denmark	314,889	11,787	2.109	26.715
3	Sweden	523,804	18,645	1.959	28.094
4	Norway	499,667	9,207	1.834	54.270
5	Netherlands	770,067	29,296	1.747	26.286
14	Israel	241,069	10,492	1.327	22.976
27	Poland	489,852	17,186	0.446	28.503
28	Turkey	788,299	19,753	0.267	39.908
30	Iran	551,588	17,598	0.230	31.344
31	Malaysia	304,726	6,565	0.225	46.417
39	Egypt	254,671	5,592	0.069	45.542
40	India	1,875,213	39,640	0.032	47.306

(Practitioner and Olson, 2015)

Many research in the Arab remained not published for reasons related to maintaining the confidentiality of scientific research. Many research contributions in

developed countries have managed to have their commercial uses in the industry which rarely happens in the Arab World.

In terms of expenditure on research and development, we can clarify the differentiation of countries in the field of scientific research according to the saved material resources to finance this activity, in addition to the provision of other elements of specialized research centers and qualified cadres and others.

Data show major industrial countries to finance spending on research and development, and the proportion of expenditure of GDP in total, knowing that Israel is in number 14 as shown in Table 2.

Private sector contributes a large share of funding, and we note the high number of patents in these countries as a direct result of the intensity of research programs to provide funding and qualified scientific staff. The role of the private sector in supporting scientific research in the industrialized countries is very clear and enormous. The larger the enterprises, the greater their ability to contribute to the financing of R & D to provide new methods through which to improve their competitive position compared to other establishments.

As concluded from this comparison size in the establishment and the importance of a significant and critical research activity development, and large companies would not maintain their status in the world markets without the huge resources spent on the development of their products and methods and the rise from time to time.

### 4. Expenditure on Education in the Arab World

The Arab countries must introduce qualitative changes in the educational systems and focus on the scientific research which is the feature of the present, because of the role it plays. Is important in accelerating growth rates, especially after the centers of scientific research and development of the infrastructure of various aspects of development.

The Arab countries have made significant efforts to provide allocations to meet the needs of education and auction during the decade, but yet we cannot see any Arab countries in top 30 country and only four Arab countries are within top 70 country as shown in Table 3. (2000-2010), where the percentage allocated by the Arab countries of gross domestic product (GDP) 5.5%, the highest rates in the world if the world rate and match The percentage of North American and Western European countries (5.7%), but the rise of this indicator, and the fact that there is a real interest in education, should be adjusted and adjusted in view of the size of the Arab countries' GDP, which remains modest if not surpassed by Spain alone (ALECSO).

If we compare the Arab world with the industrialized world in terms of the percentage of adults who can read and write the population, the gap widens significantly, if the data by 1990, the proportion of illiterates in the Arab world 51%, while most of the industrialized world, 99% The average

literacy rate for adults was 78% in 2012. In other words, 22% of the adult population lacks literacy skills of 52 million. The illiteracy rate was expected to decrease by 39% Between 2000 and 2015 but not including that State to get to achieve the fourth goal, which aims to reduce levels of illiteracy among adults by half by the year 2015 (UNESCO, 2015).

**Table 3.** World education ranking

	Country Name	Reading score	Maths score	Science score
1	Shanghai-China	556	600	575
2	Korea-South	539	546	538
3	Finland	536	541	554
37	Israel	474	447	455
41	Turkey	464	445	454
<b>42</b>	<b>United Arab Emirates</b>	<b>459</b>	<b>453</b>	<b>466</b>
<b>55</b>	<b>Jordan</b>	<b>405</b>	<b>387</b>	<b>415</b>
<b>56</b>	<b>Tunisia</b>	<b>404</b>	<b>371</b>	<b>401</b>
57	Indonesia	402	371	383
59	Kazakhstan	390	405	400
60	Albania	385	377	391
<b>61</b>	<b>Qatar</b>	<b>372</b>	<b>368</b>	<b>379</b>
64	Azerbaijan	362	431	373
65	Kyrgyzstan	314	331	330

(OECD, 2009)

This percentage is also below the recommendations of the UNESCO report "Education Treasure Treasures", which urged countries to allocate at least 6% of their gross output to education. The efforts of Arab countries to benefit from education are reflected in the share of the education budget from the state budget. The average rate for the Arab countries in 2009 was 20.5%, which is slightly higher than the recommendations of UNESCO (20%). However, we have noticed an important indication from one Arab country to another in the amount of five or more points. The United Arab Emirates (23%) and Tunisia (22.4%) (UNESCO, 2015).

Among the few Arab countries available, public expenditure on education ranged from less than 3% in Bahrain, Lebanon and Sudan to 6.5% in Tunisia. In most of the countries available, the share of education expenditure out of GDP increased between 1999 and 2012, especially in Mauritania and Sudan. In Mauritania, spending on education increased from 2.4% to 3.9% between 1999 and 2011 (UNESCO, 2015).

## 5. Universities and Research Centers in the Arab World

The message of universities in the present era plays a very important role in the lives of nations and peoples at different stages of their economic and social development. In this sense, the mission of the universities lies in three main functions: the first function of the university to share and disseminate knowledge, Technical and managerial level of

higher in the various disciplines needed by the community.

The second function is to play a key role in the scientific research in the various fields of human knowledge and its scientific and technological applications and science to develop them. The third function is to serve the society through its educational and advisory role and to participate in the provision of social services and awareness to the public.

The universities also contribute to the achievement of the requirements of comprehensive development, especially in raising the effectiveness of planning in the development of human resources, on the basis that the human element, and what is possessed of creative energies is a factor no less important than the physical capital. Much of the scientific progress and development is due to the researchers' efforts where scientific research is defined as "an organized process of thought by the researcher to investigate the truth about a problem or problem called the research problem by following an organized process called" Suitable solutions for treatment or results that are valid for generalization on similar problems called (search results)" Mohamed Sadiq Ismail (2014).

Indeed, universities in the Arab world, if they do not have scientific research and academic freedom, will remain simple schools that have no value or no active presence in the world and have no effect on their societies because they cannot make any radical change in these societies. In the Arab world of its inability to contribute adequately to the development of the Arab reality and raise the economic and technical capabilities of the Arab man.

In order to give an approximate picture of the reality of Arab scientific research, from the perspective of the quantitative criterion of the number of universities and research centers, the number of scientific journals and the number of researchers of high scientific degrees and the budget allocated for the administration and development of scientific research, the following are the relevant points for conducting the contract between the Arab world The framework of the research system in the world.

This are clear indication that most of these Arab universities are meant for education not for scientific research. The number of universities in the Arab world until 1996 was one hundred and thirty universities, about 92% of which were established after 1950, and about 75% of them were established in 1970 or later (Arab Thought Foundation, 2011). In recent years, there has been a remarkable development at all levels of higher education in the Arab countries. This growth is characterized by an increase in the enrollment rate, expansion of capacity and changes in the educational curricula, but this expansion does not meet the new commitments of the possible governments to raise the performance of university institutions and meet university demand without compromising quality requirements. The Arab countries share the same problems of R&D in higher education when it come to linking the outputs of education to the market and sustainability of funding to focused effective research.

Despite the importance of the efforts in the field of higher education, there are many evidence of inadequate government spending, especially in countries with limited financial base, of the deficit recorded in the budget of universities and research institutions, so there was a need to find new sources of funding and rationalization of expenditures by linking funding Performance or through the development of competitive funds for quality improvement and the creation of tax incentives to bring in donations from the private sector.

In the last two decades, private universities in the Arab world have witnessed remarkable numerical growth. This trend was linked to an objective time context characterized by the influx of expatriates in higher education, the tendency of some emitters at home and abroad, as well as some organizations, including the World Trade Organization, to regard higher education as a kind of service that could be conducted within the framework of globalization of the economy and exchange of services (Arab Thought Foundation, 2011).

Table below ranking went beyond universities ranking only, as it considered both element by counting top universities by each country then ranked the countries, this was ranked from 26368 universities from all over the world are included. First Arab country is Saudi Arabia to be 38, while Bahrain is 110.

**Table 4.** Countries arranged by Number of Universities in Top Ranks

	COUNTRY	Top Universities
1	United States of America	3281
2	United Kingdom	285
3	Canada	352
4	Australia	199
5	Netherlands	136
10	Finland	44
25	Israel	41
35	Iran	605
37	Malaysia	403
<b>38</b>	<b>Saudi Arabia</b>	<b>56</b>
46	India	4004
47	Indonesia	487
<b>50</b>	<b>Egypt</b>	<b>61</b>
<b>55</b>	<b>Lebanon</b>	<b>42</b>
64	Pakistan	315
<b>66</b>	<b>Algeria</b>	<b>86</b>
<b>70</b>	<b>Jordan</b>	<b>35</b>
<b>73</b>	<b>United Arab Emirates</b>	<b>51</b>
<b>75</b>	<b>Morocco</b>	<b>181</b>
<b>78</b>	<b>Palestine</b>	<b>18</b>
<b>79</b>	<b>Iraq</b>	<b>75</b>
81	Bosnia and Herzegovina	77
82	Ethiopia	59
83	Kazakhstan	106

<b>89</b>	<b>Kuwait</b>	<b>12</b>
<b>91</b>	<b>Tunisia</b>	<b>189</b>
<b>93</b>	<b>Oman</b>	<b>33</b>
<b>99</b>	<b>Sudan</b>	<b>37</b>
<b>105</b>	<b>Syrian Arab Republic</b>	<b>23</b>
106	Mongolia	25
<b>107</b>	<b>Qatar</b>	<b>7</b>
109	Nepal	27
<b>110</b>	<b>Bahrain</b>	<b>15</b>
116	Azerbaijan	41
117	Kyrgyzstan	29
<b>119</b>	<b>Libya</b>	<b>15</b>
<b>121</b>	<b>Yemen</b>	<b>25</b>
150	Albania	36
151	Uzbekistan	69
152	Cambodia	46
155	Afghanistan	48
<b>156</b>	<b>Somalia</b>	<b>23</b>
173	Tajikistan	14
177	Mauritania	4
<b>188</b>	<b>South Sudan</b>	<b>2</b>
<b>196</b>	<b>Djibouti</b>	<b>1</b>
209	Vanuatu	1

(CSIC, 2017)

## 6. Outputs of Scientific Research in the Arab World

In terms of published scientific research, the Arab Republic of Egypt topped the list in terms of the number of published researches by 5559 in 2008, followed by Tunisia with 3116 researches, followed by Saudi Arabia with 2725 researches and Algeria with 2154 researches. The number of researches was modest in some countries such as Yemen by 32 in 1996 and increased to 115 in 2008. Similarly, in the Kingdom of Bahrain, there were 95 published researches in 1996. Which indicates the modest number of research compared to the countries of the world (Third Arab Report on Cultural Development, 2010).

In spite of the increase in the number of published Arab researches, its content indicates that scientific research is still far from innovation. Most Arab publications are applied 32% in medicine, health and life sciences, 19% in applied chemistry, 49% in agriculture and engineering, and 10% in the field of astronomy, mathematics, chemistry and physics according to statistics in 1995 (Third Arab Report on Cultural Development, 2010).

The number of patents is an indicator of technical activity because it means the transfer of scientific knowledge and research results to technology. The measurement of this indicator is based on the statistics of the World Intellectual Property Organization (WIPO). However, the statistics

adopted here by the United Nations Development Program and the World Science Report in 2005 refer to The comparison of the total patents between the Arab countries for the period from 1980 to 2000 and we find that Saudi Arabia ranked first with 171 patents followed by Egypt 77 and Kuwait 52 and then converge the rest of the Arab countries and gradually decrease until it reaches Yemen by land T invention only during 20 years (UNDP, 2003).

## 7. R&D needed in Inspiration Based Economy

Inspiration Economy (IE), based on intrinsic power, which targets to create influence without power. However IE is based on enhancing development that only can be done through applied research, that depend mainly on certain method and tools such as the methods of targeted observations that help in investigating problem and solution through different multi-disciplined approaches. The target of R&D in inspiration based economy is using lots of other methods and techniques that always explore for new opportunities through measuring and comparing indicators with a spirit of curiosity that targets to create outcomes and legacy on the socio-economy. (Buheji, 2016).

## 8. Discussion & Conclusions

In conclusion, we conclude from the above that the investment in scientific research in the Arab world is very weak compared to the rests expected in any socio-economy. The R&D in this part of the world is not clearly directed to create any inspiration in any type of field including the socio-economy.

There are many type of reforms needed to address the gap of Arab R&D and to align it towards influencing the socio-economy. However, the most important seems to be more in the reform of the early education years where we need to embed R&D in the mindset of the coming generations and increase interest in scientific research, particularly in pre-university education. Inspiration economy need mindsets that consider scientific curiosity as part of its inspirational resources.

To prepare the Arab World for an inspiration based economy focused efforts need to be directed towards strengthening research centers through various partnerships that would increase their contributions to their community's needs. This also can be supported then by the creation of scientific periodicals that are translated into all languages in the world to increase the contribution of Arab scientific research in various scientific aspects.

Investors need to be encouraged to invest in fruitful scientific research that would lead to better results on the industry, the market and the communities. This would help to raise the competition for the quality of research and would minimize the current direction that focuses on the quantity of R&D rather than the quality of its outcome. Once this occurs

R&D in the Arab world would be ready to be a source of inspiration based economy.

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