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Dr. Mohamed Abdulla Mohamed; Bimal Krishna Banik

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The Role of Research Centers in Saudi's Universities in Supporting Creativity and Innovation: Descriptive Study

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Abstract

This research aims to present the role of research centers in supporting the creativity and innovation in Saudi's Universities. The research activities and scientific innovations of these centers are also described. This paper also explores the feasibilities of social-economic development by paying attention to create a knowledgeable society in light of implementing Saudi vision 2030.

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Introduction

The leadership of the Kingdom of Saudi Arabia has recognized the importance of creativity and innovation. Therefore, the Institute of Innovation is established in King Abdulaziz City for Science and Technology which has contributed into the designing of the Technical innovation centers programs in Saudi's Universities for achieving the economic and social development objectives. KACST (2019), the Research Center Networking and Technical offices of ARMACO also represents the strategic focal point for innovative and research competencies in many regions around the World. Thus the "Open Innovation" feature of the research networking has aimed to utilizing the technology into the field of energy by providing an access to the best ideas to the employees and partners around the World (ARAMCO 2019) .

The research centers in all educational and research institutions are responsible for innovations registration, and finding solutions to social-economic problems of the society through applying scientific research. These are thoroughly associated to the development of the countries from social and economic viewpoints. Therefore, the importance of recent study in exploring the role of research centers in supporting the innovations and creativity of Saudi's Universities and their roles in achieving the Kingdom's vision of 2030 is highly crucial. There are many universities in the Kingdom that focus on teaching only and are not interested in scientific research. But, research is an important part of progress and it reflects social and economic development. In view of the important role of research centers in supporting creativity and innovation for achieving social-economic development, this study reports the current situation of research centers in Saudi's Universities. This type of study may prove to be helpful for advancing research facilities and productivities in Saudi Arabia. ([2019](#))

Method

This research used descriptive analytical method which was considered as the most appropriate for this study. It was based on the reality of the problem from different dimensions, analyzing their causes and factors in order to reach the necessary solutions. It utilized two methods as the followings:

- Theoretical approach: theoretical framework was determined. In addition, previous research, studies, papers, books, articles and relevant materials in the internet websites were reviewed.
- Practical approach: It utilized scientific research tools (interviews and direct observations). It also examined the websites of research and innovations centers for analyzing and evaluating the contents to identify the current status.

Literture review

The Kingdom of Saudi Arabia had desired for establishing research centers in different fields in order to develop and facilitates conducting scientific research, directed to national priorities for social-economic development. These centers are affiliated with universities, colleges and higher institutes, also research centers affiliated to ministries and agencies, and others are independent and specialized in different fields of research.

scientific research in Saudi universities has witnessed great changes in the past few years, the rate of expansion in higher education and the opening of new universities, those universities has sought to promote the movement of scientific research, innovative research, as one of the main functions of universities, and doubled the interest of universities and scientific research, patents, and diversified sources of income and expenditure on scientific research and development in Saudi universities as a result of the great support the offering by King Abdulaziz City for Science and technology ([KAUST](#)) through the National Science, Technology and Innovation Plan ([NSTIP](#)), as well as the support that comes from the private sector represented in scientific endowed chairs, "SABIC chair " in Saudi universities is the best example, and a

network of research centers and technical offices manage by ARAMCO around the world which represent the Axes of competencies innovative and research strategy in the desirable areas of The World.

Among the efforts made by the government to support and promote scientific research and the Ministry of Education has established team work to design the indicators to measure and evaluate the reality of scientific research in the Saudi universities in order to identify sme facts about scientific research in universities, and producing research to learn the strengths and weaknesses, the ministry has followed the best international standards, and sought to be these indicators are consistent with the current reality and nature of Saudi universities, the team desined six themes included (researchers and competencies. financial support. Scientific research, rehabilitation and training. Graduate Studies. and infrastructure), also contributing to give accurate and realistic image of the research activity, thus contributing for the future plan of scientific research activity in terms of addressing deficiencies Existing shenanigans based on scientific reading realistic, as well as enhancing aspects of the Force and its support to achieve the maximum benefit from the scientific research activity. ([Al-jazirah,2012](#))

The number of graduate students (MA & Ph.D.) increased, where the number of students enrolled in master's level of 9.768 students in 2006, bringing in the year 2009 to 19.592 students and the number of students in the doctoral level of 2.410 in 2006 to 2,565 in 2009, but that this number has decreased slightly, according to the latest statistics published by the Ministry of Education for the year 2014 - 2015 a number of 18.741 students for all graduate students, the researcher noted that the State has paid special attention to scientific research as the port to move to Knowledge Society. King Abdulaziz City has established a strategic program for the national research and development support system, to raise the kingdom's position within the map of leading countries in the field of science, technology and innovation. The aims of this program to provide financial and technical support to Saudi graduate students, to implement thier master's and doctorate research, In order to encourage outstanding them to conduct original research in different fields of science according to the latest international scientific knowledge. And to develop thier practical skills to raise the kingdom's position as a leader in the fields of science, technology and innovation. ([KACUST,2020](#)) the follwing chart shows:

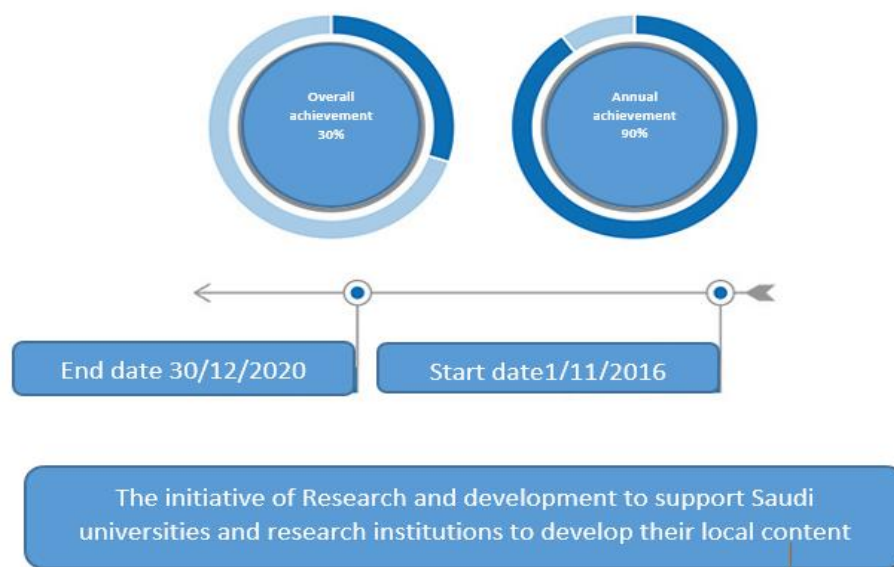


Figure 1. Chart Source: <https://www.kacst.edu.sa/arb/srs/Pages/Graduate-Research-Program.aspx>

Indicators of innovation and research centers in Saudi universities:

The Saudi National Plan for Science and technology and Innovation aimed at strengthening the role of scientific research and support to innovation and creativity. The National Plan included many of the programs and projects that support the resettlement and development of techniques in the Saudi kingdom. The programs to develop the capacity of scientific research, innovation and research centers in Saudi universities was stressed. The establishment of outstanding research centers, programs for the transfer and dissemination of technology and innovation are required to realize the Saudi vision 2030. A number of Saudi universities strategic program within the national research and development support system and strategic investment of national capacities are interested in the development of postgraduate students. In the Kingdom of Saudi Arabia, many reports indicated that the great majority of research depends on the experimental research and development. These aim to innovate and benefit from the knowledge and information in the development of products that are marketable research in the field of engineering and science.

The initiative of Research and development to support Saudi universities and research institutions to develop their local content

According to the global innovation index rankings for the year 2019, Saudi Arabia ranked 68th, while Output rank was 85 and Input rank was 49. The global innovation report indicated that there is a weakness in national income. In general, global economic growth is losing momentum compared to 2017/18. Global productivity growth has reached a record low. For many reasons, commercial battles are brewing. Economic uncertainty is high (WIPO [2019](#)).

Table 1. presents the number of patents filed in the U.S. patent and trademark office.

Economy	Innovation Index (2019)		Innovation Index (2018)		Change	
	Rank	Score	Rank	Score	Rank	Score
Saudi Arabia	68	32.9	61	34.3	-7	-1.4

Table (1) Source: <http://statisticstimes.com/ranking/global-innovation-index.php>

The number of patents submitted in the past few years is shown here: 2014 (141 patents), 2015 (109 patents), 2016 (105 patents), 2017 (104 patents), and 2018 (122 patents) (USPTO 2018). Out of these 334 patents were granted to king Abdulaziz city for science and technology at the Saudi Patent Office. These were approved in the following fields: chemistry (177 patents), mechanical engineering (62 patents), electrical engineering (39 patents), tools (32 patents) and other fields (24 patents).

Saudi Arabia ranked 23rd in the world out of 92 countries with (664 Saudi patents) registered in 2017, of which 409 patents were registered in 2015 and 517 patented in 2016 ([2019](#)). The figure (2) shows the total number of patents filed to the Saudi Patent Office for the year 2018. There are more countries to submit patent applications to the Saudi Patent Office in accordance with the table (2).

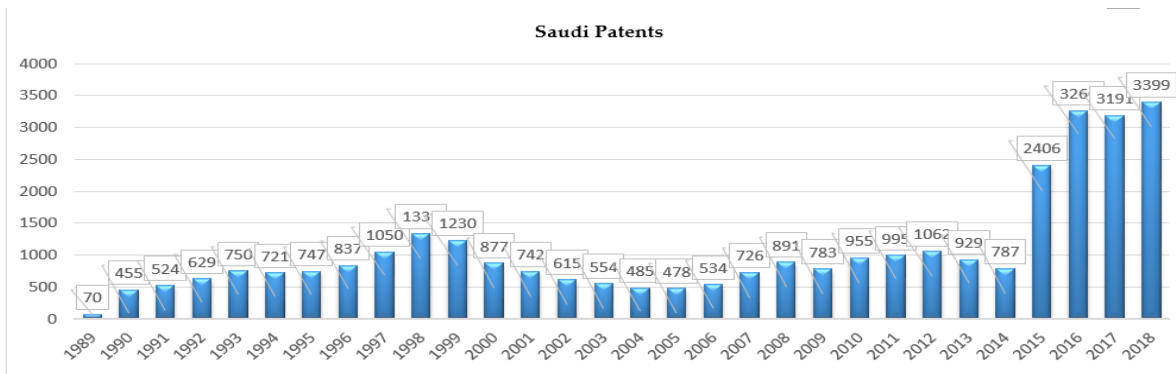


Figure 2. Chart Source: Saudi Patent Office website - applications fields annually <https://www.kacst.edu.sa/eng/IndustInnov/SPO/Pages/Statistics.aspx>

R	Country	Applications
1	Saudi Arabia	345
2	United States	125
3	Japan	83
4	China	74
5	France	45

Table 2: Source: <https://www.kacst.edu.sa/eng/IndustInnov/SPO/Pages/Statistics.aspx>

Five countries have submitted industrial design applications to the Saudi patent Office during 2018. The diagram, figure 3 shows the number of approved patents by the Saudi Patent Office for the year 2018.

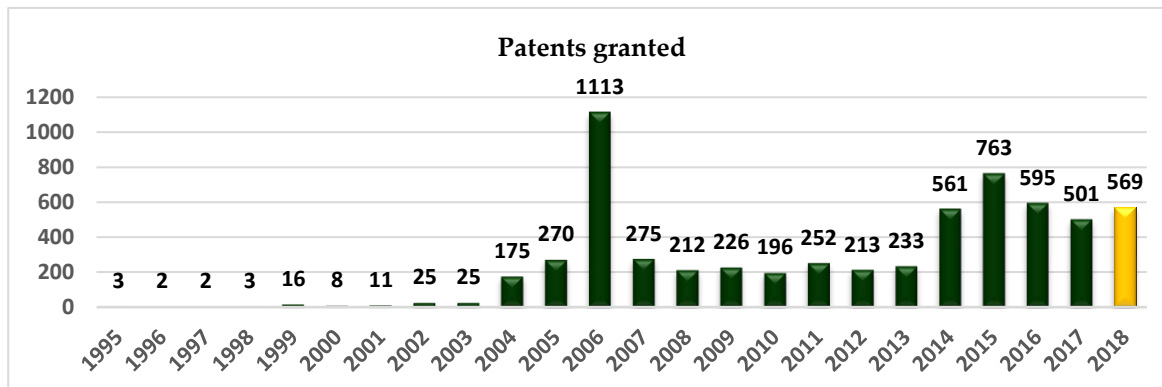


Figure 3. Chart Source: [Saudi Patent Office website](https://www.kacst.edu.sa/eng/IndustInnov/SPO/Pages/Statistics.aspx)

The figure (4) shows the number of industrial models issued certificates with the Saudi Patent Office for the year in 2018.

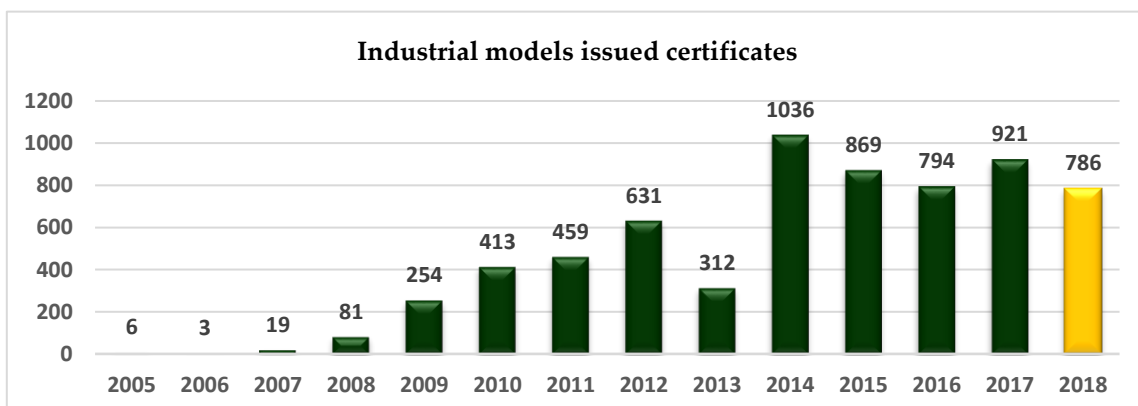


Figure 4. Chart Source: [Saudi Patent Office website](https://www.kacst.edu.sa/eng/IndustInnov/SPO/Pages/Statistics.aspx)

The figure (5) illustrates the applications filed by universities in Saudi Arabia Saudi Patent Office. The figure (6) illustrates the patents granted to national research institutions originated from Saudi Patent Office. The figure (7) illustrates the patents submitted to the Saudi Patent Office for the years 2011 to 2015.

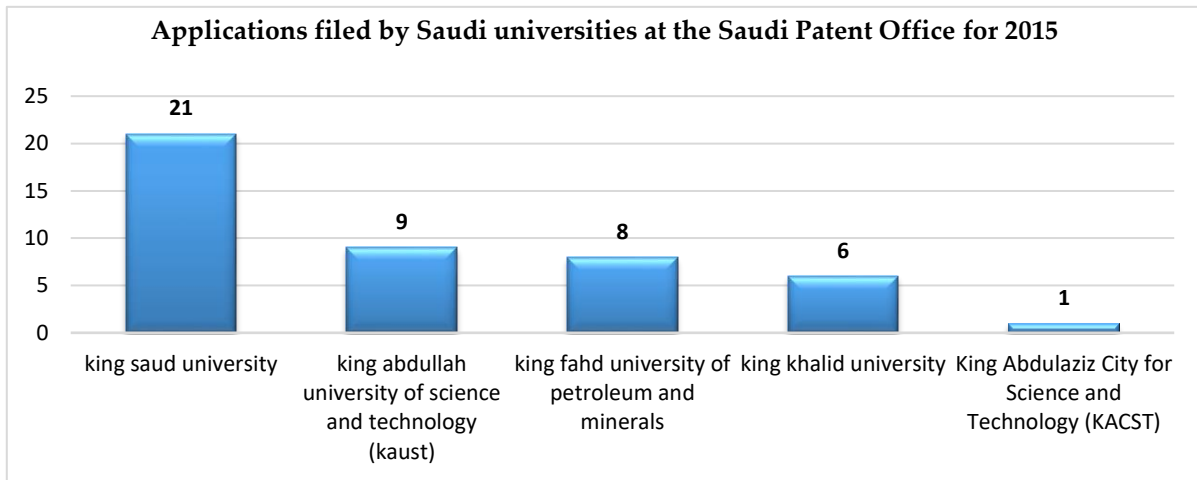


Figure 5. Chart Source: Annual Statistical Report 13436-1437 H - Saudi Patent Office

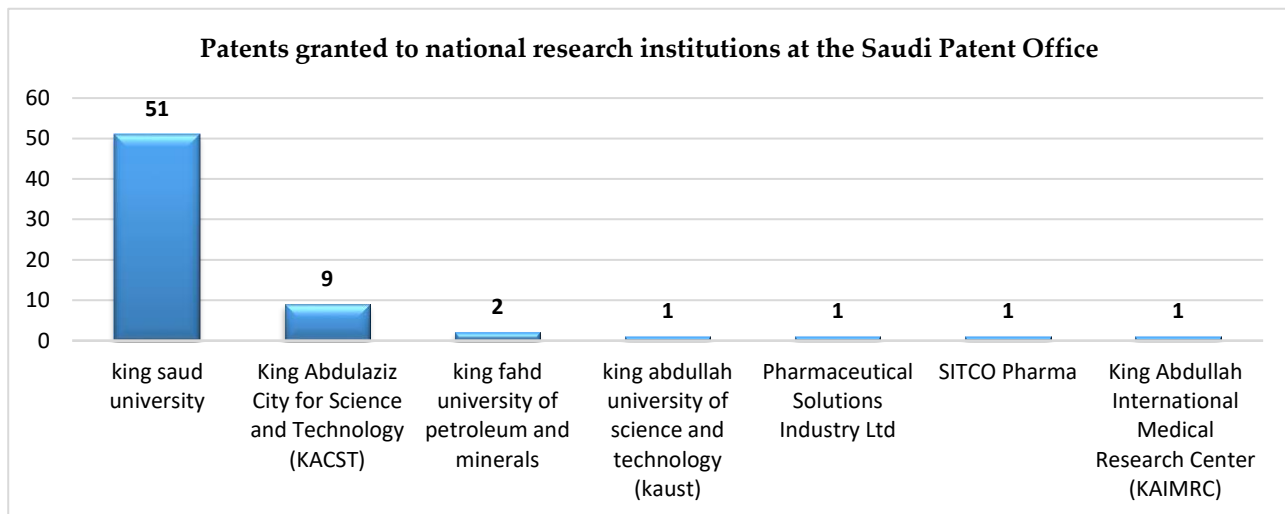


Figure 6. Chart Source: Saudi Patent Office

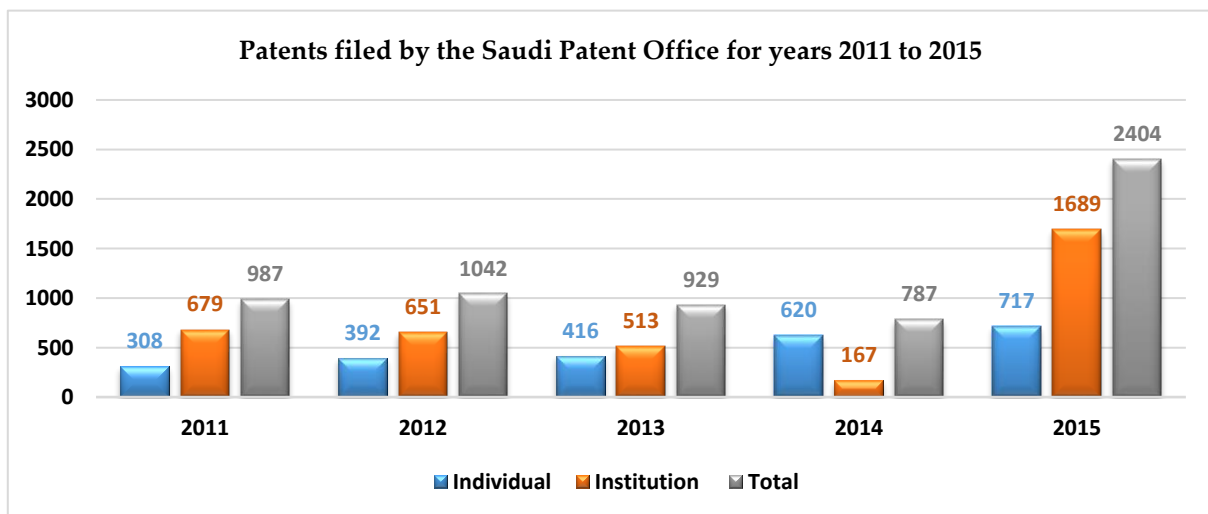


Figure 7. Chart Source: Saudi Patent Office

The comprehensive development plan witnessed many of the programs that encourage the research centers in the Saudi kingdom in the support of innovation. King Abdulaziz City for Science and technology adopts some activities for the care of the talent and innovation. Toward the goal, the city has established 7 Institutes, 4 centers and 5 national programs for research, development and innovation. Some of the centers and units are as follows. (Abdulaziz M Al-Swailem 2014):

1. **Innovation and Industrial Development Institute:** This was established in 2013 with a view to supporting the transition to a knowledge-based economy, in line with the Saudi Vision 2030. This Institute aims to achieve a number of objectives as follows:
 - Lead in the development of the infrastructure of technology transfer to identify intellectual property investment and support Saudi Inventors.
 - Stimulate technical innovation in the industry through the support and cooperation and effective participation with the industrial sector and the private sector.
 - Support technical innovation centers in Saudi universities and national research centers.
 - Support the establishment and development of technical projects and large commercial scalability for growth and sustainability through enhanced placement industry technical support entrepreneurial environment
- 2- **National Center for Industrial Development:** ([KACST 2019](#)) The Center was established to provide support services for projects of King Abdul Aziz City for Science and technology, The (NCID) has made great efforts to provide support services for King Abdulaziz City projects by measuring the level of technological readiness, providing basic facilities for the prototype manufacture and linking it to the public and private sectors in Saudi Arabia, eliminating all difficulties. Facing KACST researchers and interested parties, and working to introduce KACST products to the local and international market in order to increase the efficiency of the city results.
- 3- **Technology Innovation Centers:** This program aimed to achieve the goals of economic and social development in the Saudi kingdom through innovation and creativity. Technology and Innovation Plan in the kingdom of Saudi Arabia is funded and managed by [KACST](#). The goals of the Technology Innovation Centers are to promote Saudi universities, the local industry, and KACTS Institutions through research collaboration and technology transfer in Saudi Arabia.
- 4- **Intellectual Property and inventors support Unit:** This center was created to maintain and exercise laws and regulations for the protection of the intellectual property rights of individuals and providing the suitable environment for investment that stimulate the establishment of industries based on innovation.
- 5- **Saudi Patent Office:** The Office established with a view to the protection of inventions layout designs of integrated variety, plant varieties and industrial designs in the kingdom
- 6- **Badir program:** Is one of the King Abdul Aziz City for Science and Technology programs, which was founded in 2007, the term Badir means (the initiative), this program is one of the most important national and creative environments in the field of innovation and support, for the establishment and growth of business and developing projects, which was established in 2007 by King Abdulaziz City for Science and Technology, with the aim of supporting the opportunities of business projects based on technology, Developing entrepreneurship in the technical field.

The most challenges and constraints facing the research centers in Saudi universities:

The studies of research centers became the focus of Arab attention since 1952 when the Arab Research and Studies Institute of the Arab League were founded. In recent decades, Arab's interests in Research and study centers have grown in quantity and quality. The number of centers has increased significantly in the last 10 years. Despite this growth, it is still limited, compared to its counterparts in other regions of the world, with 580 research centers accounting for 7.49% of all Centres around the world (SABAQ newspaper, 2018).

Arab research and studies centers face many challenges. One of them is mainly independence. The vast majority of research centers belong to government, Saudi Arabia, like other Arab countries, suffers from a lack of research and studies centers, for many reasons addressed in this paper in some detail below: (Telal Abdulla Hussain [2015](#))

1. The agreements and partnerships to develop the framework for cooperation in order to create channels of communication between universities, scientific research institutes, and industrial enterprises.
2. Saudi Arabia has supported the research institutions, King Abdulaziz City for Science and Technology, which conducts applied scientific research. This institution provides scientific advice and plays a key role in the Saudi vision 2030, through the national transformation program. They also develop the necessary strategies in the fields of research, support research programs and scientific projects for applied purposes, work to develop mechanisms to convert the research outputs and develop industrial products. ([KACST](#))
3. Most of the Saudi universities did not provide a service to the community in particular and to the Kingdom in general, despite the presence of endowed chairs in universities. But their roles were very limited due to a number of problems that do not enable them to achieve their roles. In fact, some of them suffered from adequate funding and others suffered from the lack of a clear plan. Advertising and propaganda were also involved. ([2019](#))
4. Although the research centers in Saudi universities have adopted important studies and researches, some of those departments responsible for monitoring the research performance in the universities do not function properly, which turns the performance of these research institutions to be low and weak.
5. The research centers in the Saudi universities face a lot of financial and administrative constraints which lead to the recommendations that research may not be implemented. So the researchers should work for marketing their research results.

Role of Saudi universities research center in supporting the creativity and innovation:

Saudi Arabia has demonstrated great importance to the national development plans to achieve substantial progress in research. It is realized that this progress should be measured by the number of published research papers in scientific international journals as well as patents approved. Universities with enriched scientific research capabilities are ranked internationally. The quantity and quality of research outputs are judged by the Saudi universities and King Abdul Aziz City for Science and technology and some governmental bodies or semi-governmental organizations and departments. These support Saudi community-related studies, issues and interests, particularly in relation to the implementation of the Saudi Vision 2030.

According to the Saudi Economic Journal, statistics were cited by 5 Saudi universities and 54 research centers to study economic, social, medical and technological issues. The following are the best research centers in Saudi universities for (2018):

- **Institution of Consulting Research and Studies - Umm Al-Qura University,**

The institution offers research, development services, studies and consultation to the public and private sectors, through the members of the faculty of the university and the potential sources available to the various colleges and institutes. The institution aims to develop studies and advisory services and provide them to Saudi community, and contribute to research and development efforts. These are aimed to Saudi economic and social development, to develop an integrated system at Umm Al-Qura University, to develop it for education and vocational training for the public, private and community sector. The Center also operates in the following areas: Communication Engineering, Electrical Engineering, Mechanical Engineering, Architecture and Planning and computer in addition to the basic sciences. There are 200 full-time researchers and faculty members in this center. (2019)

- **King Fahd Center for Medical Research - King Abdulaziz University:**

King Fahd Center for Medical Research is the first research center in the Kingdom to provide cooperative services with all health facilities and health colleges in Saudi Arabia. It is worth mentioning that the center enhances its presence and excellence in the field of advanced medical research that deals with Saudi society as well as facilitate academic communication in all aspects of health and social according to the priorities and concerns of the society. The center has completed a number of distinguished medical research centers, as well as the development of policies and plans for scientific research and higher studies in the university. This center consists of (16) Research Units which include 70 full-time researchers. (2019)

- **Alfaisal Centre for Research & Consultancy Studies - King Faisal University:**

The Center is to promote research cooperation and channeling research, educational training and contract projects as well as consulting studies between external organizations, and the faculty members of Alfaisal University. They find ways to strengthen and diversify the sources of the national economy through industrial investment and guide them to serve the objectives of economic and social development in the Saudi Kingdom. The Institute carries out several activities and provides many services in the areas of consulting, research, scientific studies as well as training courses, and aspires to promote partnerships and investment opportunities that allow the transfer and localization of technologies, knowledge and expertise to the local and national community. They attempt to create experts in King Faisal University and try to distribute the resources for the needs of external organizations and institutions. (2019)

- **The Research Center of the Faculty of Applied Medical Sciences, King Saud University**

The center cooperates with a number of governmental bodies to determine the planning, implementation and evaluation of research activities. They have a provision for advisory services in the field of research and development to governmental and non-governmental organizations. They contribute effectively to the health development in Saudi Arabia as well as to develop and

facilitate the development programs of the College of Applied Medical Sciences and related bodies on the health of the community. ([2016](#))

- **Research Center of the Faculty of Engineering - King Saud University:**

The Center submitted many projects in the various fields of engineering and applied sciences. The faculty members conduct research in collaboration with external parties and build a practical application to serve development in the kingdom. This research is financed by the King Abdul Aziz City for Science and technology or some other sectors outside the university.

- **Al-Qassim University Research Centers:**

Al-Qassim University currently has 53 colleges, 12 deans and 5 research centers, which are one of the best research centers in Saudi universities. The deanship of Research has been able to support a number of programs and research projects. The University has adopted development projects within the framework of the university's strategic plan for the period 2009 to 2019 to shape the future of the university, and to achieve partnership with the community. The deanship of research offers endowed chairs that aim to achieve the consistency between the university and research possibilities. This provides financial support to encourage research and field studies in addition to consulting that helps in many of the Social and developmental problems. The deanship of research also provides its services and advice to government and private sectors. The Deanship includes a number of 500 full-time faculty members and researchers. ([2019](#))

Role of SABIC endowed chairs in supporting the creativity and innovation:

Saudi Basic Industries Corporation (SABIC) "endowed chair" in Saudi universities is a partnership between SABIC Company and Saudi universities to provide annual grants that serve the purposes and objectives of the research, science, technology, and innovation in Saudi Arabia. The company is seeking, through this partnership to benefit from the experts working in Saudi universities, research centers and other advanced research centers inside and outside the Saudi Kingdom. The main idea to continue developing their industries and promoting their integration, and to increasing the quality of the products and services provided by the SABIC, as well as for building long-term relationships with its clients. SABIC's relations with Saudi universities through many topics, including providing grants to universities to conduct scientific research in areas relevant to the SABIC activities, and support the participation of Faculty members in local and international conferences and forums are well established. It should be noted that SABIC has signed (12) joint research agreements with Saudi universities, and the company has financed three Endowed Chairs in three universities as following: ([SABIC 2019](#))

- University of King Saud in research polymers
- King Abdulaziz University in research catalysts
- King Fahd University of Petroleum and Minerals and corrosion materials

With annual financial support for each endowed chair and renewal possibility create distinctive research centers. This attracts experts from inside and outside the Saudi kingdom. Therefore, development of the applied programs in cooperation between "SABIC" and Saudi Universities can be possible.

Role of ARAMCO in supporting the creativity and innovation:

Research and development efforts focus in Saudi Aramco on several areas, such as exploration, production, refining, processing, marketing and sustainability create significant competitive advantage for ARAMCO work and assistance. This helps to grow new businesses, as part of the efforts to Aramco in research and development. Aramco also established the Global Research Network, which consists of three research centers in the Kingdom and eight research centers and offices of foreign technology. All of these are working for the development of technologies to address energy challenges at the global level and to contribute to the development of vital and effective techniques in the Saudi kingdom. (ARAMCO [2019](#))

Aramco seeks to establish research center at King Abdullah University of Science and technology to be a nucleus of the integrated cooperation between Aramco and the Saudi universities. In order to take advantage of the international network of academic institutions associated with the Saudi Universities, The Aramco has sought to find technical solutions to reduce greenhouse gas emissions and increase sustainable supplies of energy, and also has contributed to the company in cooperation with local and international technological centers of excellence in promoting research capacity within the kingdom with Saudi universities and research institutes to support its new techniques in the fields of exploration and production, refining, processing and marketing. The company has also sponsored research partnerships and cooperation between academia and industry through cooperation with leading energy services companies in the compounds research and innovation. (KAUST [2016](#))

Results

The Ministry of Education has launched a series of initiatives to achieve the goals set by The Saudi Vision 2030, and the National Transformation Program for Public and Higher Education. In addition to strengthening the ecosystem of high institutions, assets and activities dedicated to scientific research and development in Saudi Arabia. Based on the Saudi government's approach to contribute to support sustainable development in society to build knowledge economics a society, some Saudi universities have been interested in supporting Entrepreneurship and the development of its curriculum in line with local and international trends and in accordance with international academic standards. In addition, the establishment of specialized centers in universities concerned with entrepreneurship has direct contact with support providers such as The Tasleef Bank, Riyadh Institute and other related centers. One of the experiences of Saudi universities in this regard led by several universities such as King Abdullah University of Science and Technology ([KAUST](#)), where academic departments and research centers support the research objectives of the University by bringing faculty, researchers and graduate students from Various disciplines together, to benefit from the interconnection between science and engineering to develop a multidisciplinary approach to addressing fundamental and targeted problems. The University also provides laboratories and facilities equipped with the latest research devices operated by more than 100 scientists and experts engineers, to support the research community. Another experience at Um al-Qura University through workshops and summer courses, and the benefits from the experience of the global leading centers in Britain and Japan, as well as the experience of King Saud University by introducing entrepreneurship courses into the student curriculum.

Discussion *

Education and Scientific research is witnessing a qualitative shift and is receiving a lot of attention from the government, education leaders and decision makers in the Saudi Arabia, this positive impact is clearly demonstrated through the financial budgets that have been allocated to scientific research from the government budget in recent years, and also from support to the scholarship program and the support of government and private universities.

Saudi Arabia has taken a great deal of interest in the localization of technology, and has made great strides in the field of education and the formation of Saudi cadres capable of localization of technology, so that Saudi faculty and researchers make up a large majority in Saudi universities, and scientific research centers have increased in Both the public and private sectors have increased steadily, most notably King Abdulaziz City for Science and Technology, Aramco, SABIC, The General Organization for Technical and Vocational Training, as well as many other academic and university institutions.

Conclusion *

The role of research centers in Saudi universities is very limited as it implements researches for graduate students and faculty members. The universities have not addressed the needs of Saudi society adequately. Therefore, Saudi universities should take responsibility for building the creativity and innovation in order to implement the Saudi Vision 2030. The development of the Saudi society and its support with new knowledge is very important because Saudi Arabia at this stage needs creative productivity. There is no doubt that outstanding education is the backbone of the creativity and innovation projects. Certainly, the university will be able to foster creativity through appropriate education.

There are efforts to link the research in Saudi universities to the social and economic development in the Kingdom. But the level of research output does not meet the aspirations of the Saudi society. Also most technology comes from companies that have produced progressive thinking. Therefore, research centers in Saudi universities must cooperate with them so that they can be linked to skilled persons.

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