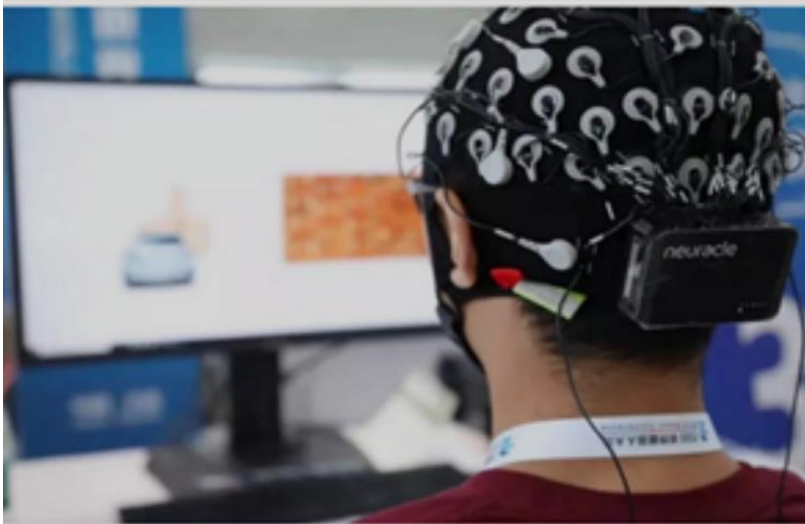




The Kingdom of Bahrain

STI Profile of the OIC Member State

Science, Technology and Innovation Indicators



COMSTECH

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FOREWORD

It gives me great pleasure to share the *Science, Technology and Innovation Profiles of OIC Member States*, as prepared by COMSTECH. These profiles of member states are being printed, as well as shared on the COMSTECH website. A few words are therefore presented to explain the wider aims and purposes of this exercise.

The member countries of the OIC are vigorously engaged with science, technology and innovation, both as a pursuit of knowledge and in harnessing the forces of nature for human betterment. Depending on their circumstances they have advanced to different levels, but much needs to be done, in general, to catch up with the attainments of the more advanced countries. However, there exists a well-defined need to catalogue national efforts in this direction. In particular, to identify respective strengths, achievements and shortcomings, as well as the institutions and policies that are shaping the scientific research and development profiles of OIC member states.

It is with the above goals and purposes that COMSTECH has ventured on this ambitious task viz. preparing a summarized version of the science, technology and innovation landscape of each member state. We have initiated this effort starting with the profiles of countries leading in this area, and will be continuing and sharing as we proceed onwards.

Undoubtedly much more could be said about each country than the summary that we have presented, but our emphasis is on the essentials and on maintaining brevity. COMSTECH welcomes feedback from member states on this effort and will be happy to update the website profiles on the basis of information received officially.

I hope that the scientific community as well as the planners and administrators of member states will find these profiles both useful and inspiring.

Prof. Dr. M. Iqbal Choudhary
Coordinator General COMSTECH
UNESCO Chair

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Bahrain

Officially the Kingdom of Bahrain, is an island country in Western Asia. It is situated on the Gulf, and comprises a small archipelago made up of 50 natural islands and an additional 33 artificial islands, centered on Bahrain Island which makes up around 83 percent of the country's landmass. Bahrain is situated between Qatar and the northeastern coast of Saudi Arabia, to which it is connected by the King Fahd Causeway. According to the 2020 census, the country's population numbers 1,501,635, of whom 712,362 are Bahraini nationals. Bahrain spans some 760 square kilometres (290 sq mi), and is the third-smallest country in Asia after the Maldives and Singapore. The capital and largest city is Manama.



Bahrain is the site of the ancient Dilmun civilization. It has been famed since antiquity for its pearl fisheries, which were considered the best in the world into the 19th century. Bahrain was one of the earliest regions to be influenced by Islam, during the lifetime of Prophet Muhammad (PBUH) in 628 AD. Following a period of Arab rule, Bahrain was ruled by the Portuguese Empire from 1521 until 1602. Since 1783 it has been ruled by the Al Khalifa royal family.

In the late 1800s, following successive treaties with the British, Bahrain became a protectorate of the United Kingdom. In 1971, it declared independence. Formerly an emirate, Bahrain was declared an Islamic constitutional monarchy in 2002.

It consequently ranks 35th in the Human Development Index and is recognised by the World Bank as a high-income economy. Bahrain is a member of the United Nations, Non-Aligned Movement, Arab League, Organisation of Islamic Cooperation and the Gulf Cooperation Council. Bahrain is a generally flat and arid archipelago in the Persian Gulf. Extensive land reclamation projects have increased the number of islands and island groups in 2008 to 84. Bahrain's largest islands are Bahrain Island, the Hawar Islands, Muharraq Island, Umm an Nasan, and Sitra. Bahrain has mild winters and very hot, humid summers. The country's natural resources include large quantities of oil and natural gas as well as fish in the offshore waters. Arable land constitutes only 2.82% of the total area.

The state religion of Bahrain is Islam and most Bahraini citizens are Muslim, while Christians Bahrain make up about 14.5% of the population.

Source: <https://en.wikipedia.org/wiki/Bahrain>





A. ECONOMIC OVERVIEW

According to a January 2006 report by the United Nations Economic and Social Commission for Western Asia, Bahrain has the fastest-growing economy in the Arab world. Bahrain also has the freest economy in the Middle East and is twelfth-freest overall in the world based on the 2011 Index of Economic Freedom published by the Heritage Foundation/The Wall Street Journal.

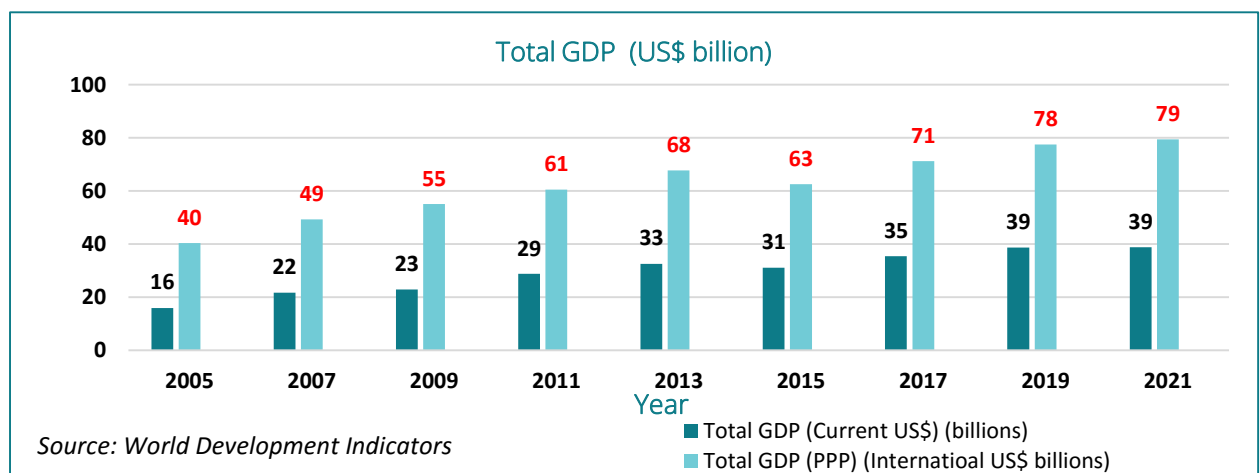
In 2008, Bahrain was named the world's fastest-growing financial centre by the City of London's Global Financial Centres Index. Bahrain's banking and financial services sectors, particularly Islamic banking, have benefited from the regional boom driven by demand for oil. Petroleum production and processing is Bahrain's most exported product, accounting for 60% of export receipts, 70% of government revenues, and 11% of GDP. Aluminium production is the second-most exported product, followed by finance and construction materials.

With its highly developed communication and transport facilities, Bahrain is home to a number of multinational firms and construction proceeds on several major industrial projects. A large share of exports consist of petroleum products made from imported crude oil, which accounted for 51% of the country's imports in 2007. Since only 2.9% of the country's land is arable, agriculture contributes to 0.5% of Bahrain's GDP. In 2004, Bahrain signed the Bahrain–US Free Trade Agreement, which will reduce certain trade barriers between the two nations. In 2011, due to the combination of the global financial crisis and the recent political, its GDP

growth rate decreased to 1.3%, which was the lowest growth rate since 1994.

The depletion of both oil and underground water resources are major long-term economic challenges. In 2008, the unemployment figure was at 4%, with women over represented at 85% of the total. In 2007 Bahrain became the first Arab country to institute unemployment benefits as part of a series of labour reforms instigated under the Ministry of Labour.

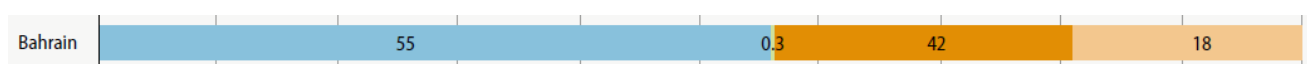
Source: <https://en.wikipedia.org/wiki/Bahrain>



Bahrain's GDP has risen from US\$16 billion in 2005 to US\$39 billion in 2021 (in current US\$), exhibiting an overall increase of 143%. In terms of PPP its GDP has almost doubled to 79 billion US\$ over the same period.

Bahrain shares problems of other GCC members; nonetheless, it presents a slightly different pattern of economic development. Bahraini authorities recognized early on the need for diversification reform of the economy beyond oil and gas. The shift from oil-based economy was initiated through governmental investment in industry, notably an aluminum plant and a ship-repair yard, as well as economic liberalization reforms fostering private entrepreneurship and service sector. Moreover, since the 1980's Bahrain has positioned itself as a banking hub for the region.

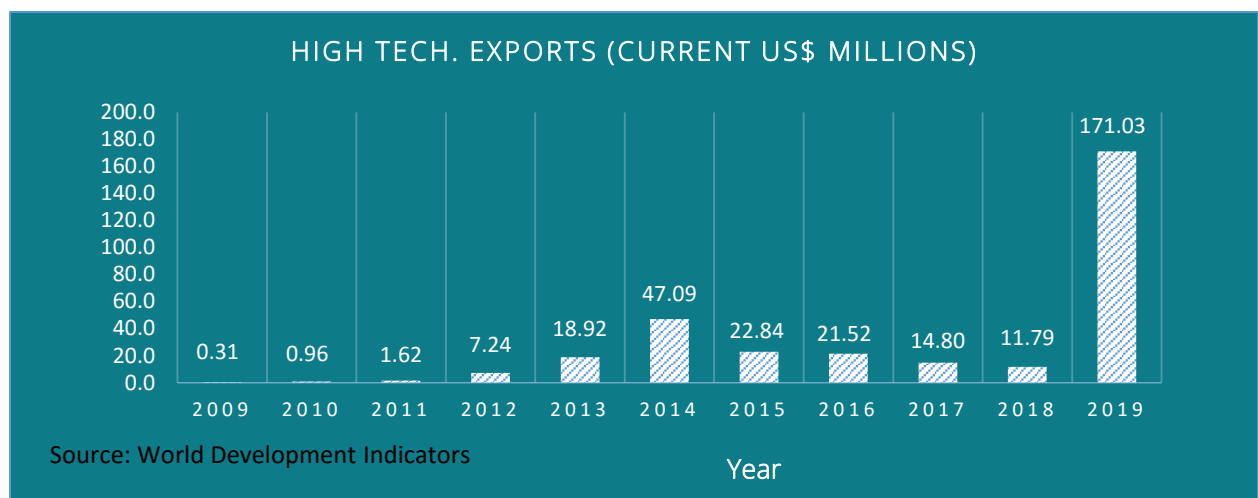
❖ GDP per Economic Sector in Bahrain, 2019 (%)



The largest part of Bahrain's GDP is contributed by the services sector (55%), followed by the industries sector with 42% share. The industries

sector includes 18% contribution to the total coming from the manufacturing sector.

❖ High Technology Exports



The high technology exports of Bahrain have remained small between 2009 and 2018. However, there is a very sharp increase from US\$11.79 million dollars to US\$171 million between 2018 and 2019, as is evident from above graph. They constituted 4.4% of all exports in 2019.

Oil accounts for around 60% of Bahraini export receipts and for 70% of government revenues. Other exports include aluminium, chemical products, transport equipment, electrical equipment and textiles. Bahrain's main exports partners are Saudi Arabia, the United States, the United Arab Emirates, India, Qatar, Australia and the Netherlands.



B. SOCIAL AND HUMAN DEVELOPMENT

Bahrain's main social and human indicators are shown in the table below.

Series Name	2016	2017	2018	2019	2020
Life expectancy at birth, total (years)	76.899	77.032	77.163	77.292	..
Mortality rate, infant, male (per 1,000 live births)	6.6	6.5	6.3	6.2	6
Mortality rate, infant, female (per 1,000 live births)	6.2	6	5.9	5.7	5.5
Individuals using the Internet (% of population)	97.99	95.88	98.64	99.70	99.53
Mobile cellular subscriptions (per 100 people)	210.04	158.26	133.34	115.79	102.77
Mobile cellular subscriptions	2994865	2364477	2092714	1900361	1748672

- With a Human Development Index (HDI) of 0.875, Bahrain counts as one of the high developed economies by UN definition. Considering the purchasing power parity, Bahrain is among the 30 richest countries in the world and, with an average annual income of 22,950 USD is one of the high-income countries.
- Life expectancy is over 77 years, while the mortality rate is 6 per thousand live births.
- Almost the entire population has access to the internet and total number of mobile cellular subscriptions are also over 100% of the population.

Source: <https://hdr.undp.org/data-center/specific-country-data#/countries/BHR>

- In latest available data (2012), 19.3% of Bahrain's total labour force was classified as skilled.

Source: <http://hdr.undp.org/en/indicators/179406#>

- Bahrain is ranked 1st in MENA in school life expectancy as per the 2021 Global Innovation Index released by WIPO.
- Bahrain is ranked as the 2nd top Arab country in the World Bank Human Capital Index 2020, where Bahrain obtained the highest international test scores in the GCC.

Source: <https://www.bahrainedb.com/why-bahrain/empowered-workforce>





➤ **Higher Education Council (HEC):**

➤ **Bahrain Council for Scientific Research (BCSR):**

- Energy and other natural resources
- Transfer of modern technology
- Social studies

The BCSR includes **eight operational departments and programs**, some of which are:

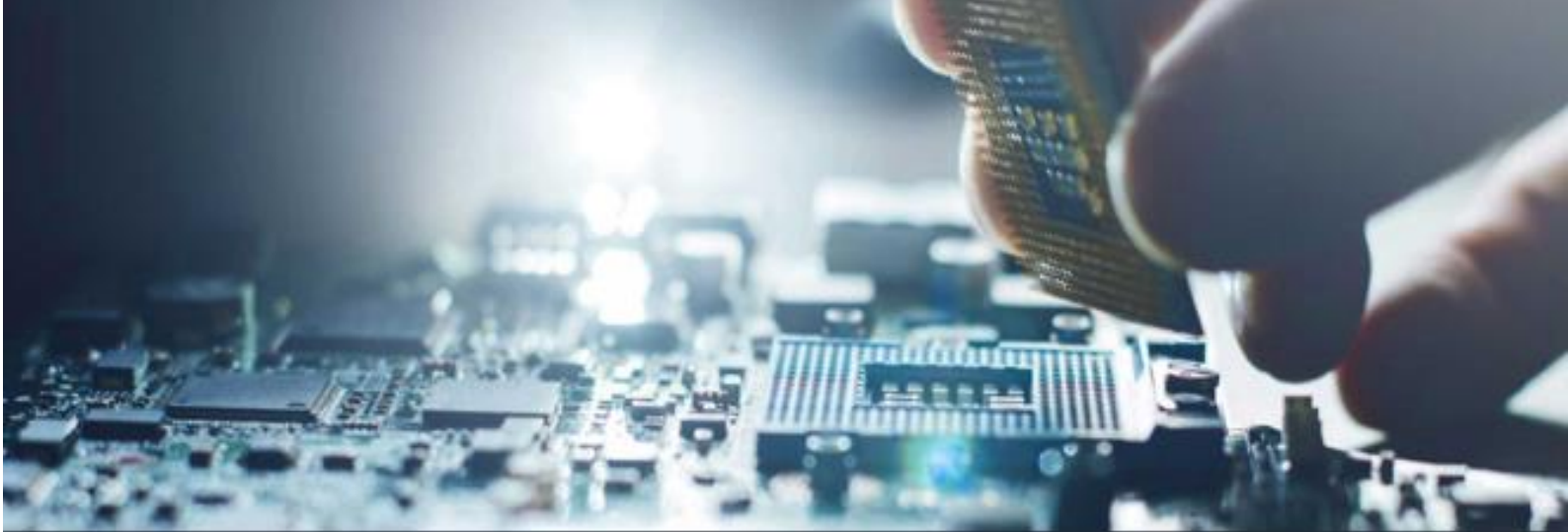
- Information, translation & publications department aims at providing information in support to the research community in Bahrain through its automated library
- Training and conferences department's main task is to manage and coordinate training activities and conferences in line with the Centre's objectives
- Environmental and biological program
- Industrial and technological department, which provides research to help in the development of the industrial sector
- Research grants program whose funds will be directed basically to research that help in developing the knowledge in the fields of science and technology

❖ **Policy Initiatives for STI**

➤ **Science and Technology Vision**

- ***The Economic Vision 2030*** for Bahrain recognizes that research is essential for shifting the Bahrain economy from one built on oil wealth to a productive, globally competitive economy. It calls on the Kingdom to “encourage research and development in universities to create the platform for a knowledge-based economy.” To help achieve this vision, the Bahrain Higher Education Council has developed the **National Research Strategy** for the Kingdom of Bahrain.
- **The main goal of the National Research Strategy** is to contribute directly to the realization of the goals of Bahrain 2030. The National Research Strategy aims to help:
 - Transform the Bahraini economy into a Knowledge Economy
 - Reduce Bahrain's dependence on natural resources.
 - Ensure the long-term social, environmental, and cultural well-being of the Kingdom.

- Improve the application of global health research to the unique medical needs of Bahraini citizens.
 - Advance the prestige of the Kingdom within the region and globally.
 - Provide local opportunities for Bahraini citizens for world-class education and research.
- **Research Strategy Objectives (SO)** targeting Institutional Reforms
- SO - 1 Establish a national research governance infrastructure
 - SO - 2 Strengthen university research capacity
 - SO - 3 Strengthen the integration of academic institutions with international research institutions & with entities focused on Bahrain's economic & social priorities
 - SO - 4 Improve public awareness and understanding of research and innovation Research Focus SO - 5 addresses national research priorities.



D. RESEARCH AND DEVELOPMENT

❖ GERD as a Percentage of GDP

Recent data for the Gross Expenditure on Research and Development (GERD) of Bahrain is not available. The most recent data is for the year 2014 when a net 0.1% of the GDP was being spent on Research and Development. This is definitely a small ratio and well below what is generally accepted as a reasonable national investment in science and technological research. However, until more recent data on GERD becomes available, it is difficult to determine how far Bahrain is investing towards its stated goals of becoming a knowledge economy.

Source: UNESCO Institute of Statistics: <http://data.uis.unesco.org/#>

❖ R&D HIGHLIGHTS

➤ Priority Research Areas

The Bahraini government in its Vision 2030 has identified priority industries and areas. The priority research areas build upon the Kingdom's relevant human capital strengths and recognize the need to promote applied research in areas of relevance to the economic and social needs of Bahrain.

The three highest priority Areas of Focus are:

- Financial Services, Islamic Banking & Finance, Insurance
- Health Services & Public Health, Gulf Region Health & Translational Medicine
- Information and Communications Technology (ICT).

Source: *National Research Strategy 2014 – 2024, Creating a Smart Bahrain Based on Knowledge and Innovation*. Higher Education Council Bahrain.

➤ **Space & Science**

Bahrain has an ambitious plan to position itself in international prominence in the field of space science. A national space policy was developed to translate the royal vision into action.

- **The National Space Science Agency (NSSA)** was established by Royal Decree No (11) for the Year (2014), to achieve this vision. The objective of NSSA is to enhance space-based technology services for governance and development, and work on exciting potential new space missions to advance research and development in space sciences.
- Two members of the Bahrain Space Team of the National Space Science Agency (NSSA) have participated in the construction and designing of the ***Emirati mini satellite "DhabiSat"***, which was launched from the Wallops Flight Facility in Virginia, US and arrived at the International Space Station (ISS). The Bahraini aerospace engineers participated in the implementation of a set of structural tests and analyses to ensure the integrity of the miniature satellite's structure and all its electronic devices.
- **Bahrain's first Satellite:** National Space Science Agency (NSSA) announced the launch of the first Bahraini satellite by the end of the year 2021, designed and developed by team of young Bahrainis. The satellite project mission will be to conduct a first of its kind specialized study about Gamma ray and its effect on aviation, in addition to measuring its effect on the health of professionals working in the field of aviation.
- **Space Research Labs:** A Satellite Laboratory at the University of Bahrain has been established in cooperation with NSSA. This laboratory receives members of Bahrain's space team to complete their post graduate studies specializing in space science engineering to join other Bahraini experts in the design, construction, and operation of satellites.
- The NSSA also established a **lab for processing space data and satellite images**. The lab analyzes and produce spatial data and produces visualizations of geographic data for stakeholders in agriculture, environment, and other sectors.

➤ **Digital Infrastructure**

In 2019, Bahrain expanded its digital infrastructure with the launch of the region's first Web Services data centre, a cloud service platform that offers computer power and database storage, among other things. This follows the government's Cloud First strategy (2017), which commits state entities to adopting cloud technology with the aim of having 1,500 government employees ready to use the cloud by 2019. Digital infrastructure has paved the way to a burgeoning digital economy, which contributed an estimated 8% to GDP in 2018.

Bahrain has one of the Arab States' most advanced telecommunications sectors. The fourth National Telecommunications Plan (2016–2019) foresees the creation of a National Broadband Network providing all businesses and 95% of residences with ultra-fast broadband. A working group has also been set up to develop and deploy a 5G action plan.

➤ **Robotics**

Bahrain launched several initiatives that reflect its willingness to adopt robotics to facilitate customer service delivery. This is particularly evident in the Kingdom's pioneering Fintech industry.

- In 2019, the **Arab Banking Corporation in Bahrain (ABC)** unveiled *Fatema*, the region's first emotionally intelligent digital employee. Bahrain Islamic Bank (BISB) also launched its first virtual employee, Dana.
- **Kuwaiti Financial House (KFH)** Bahrain used the first robotic assistant for loan applications. The "*Baitak Assistant*" handles customer loan applications and autonomously creates credit reports for applicants.
- On the educational level, Bahrain hosted the **8th World Robotics Olympiad (WRO2018)**. The competition saw students from primary, intermediate, and secondary governmental and private schools showcase their ideas for the innovative design and construction of robotics.

➤ **Emerging Technologies in Bahrain**

Bahrain's well-established Information and Communications Technology (ICT) infrastructure is among the most recognized in the region.

- The Kingdom was ranked 1st in the Arab region on the ICT Development Index (IDI) by the International Telecommunication Union (ITU) report, and 4th globally in Telecommunication Infrastructure Index (TII) as per the United Nation e-Government Development Index.
- **Bahrain ranked 4th globally in 'Internet users' category** with 99% penetration, as per the Global Competitiveness Report by World Economic Forum (WEF). Today, the Kingdom is deploying modern technologies and Artificial Intelligence (AI) to further develop government services.
- **EDUNET:** The adoption of modern technologies also enabled the education sector to continue seamlessly during the early stages of the COVID-19 pandemic by offering the remote, cloud-based educational gateway, EDUNET.
- **Bahrain's Emerging Technologies Ecosystem:** The use of emerging technologies will play a major role in achieving the Kingdom's Vision 2030 and supports the implementation of Government Action Plan. The Information and eGovernment Authority (iGA), Economic Development Board (EDB), Tamkeen, the Central Bank of Bahrain (CBB), and other governmental agencies continue to adopt the latest innovations and technologies.
- **Blockchain:** The Economic Development Board, in cooperation with the iGA, has developed a National Strategy for *Blockchain* in the Kingdom, which will set the general directions and support the adoption of *Blockchain Technology* within the public and private sectors. The University of Bahrain (UOB) has adopted *Blockchain technology* to become one of the first educational institutions in the region to award certificates to its graduates through this technology.
- **Data Analytics:** Open Data is the foundation for the government to provide machine-readable data to society as a whole. The *Bahrain Open Data Portal* provides multi-sectorial government data without any restrictions to be reused, analysed, or shared while respecting all personal data privacy rules under the Personal Data Protection law. Dealing with big data has enabled Bahrain to implement several projects that require

analysis of large amounts of data such as the population census and other administrative records of state institutions, saving effort, time, and expenses.

- **Analytica One:** Established in January 1st 2016, Analytica One with Headquarters in Bahrain is a renowned leader in the scientific sector across the GCC and the middle east.

❖ R&D Human Capital

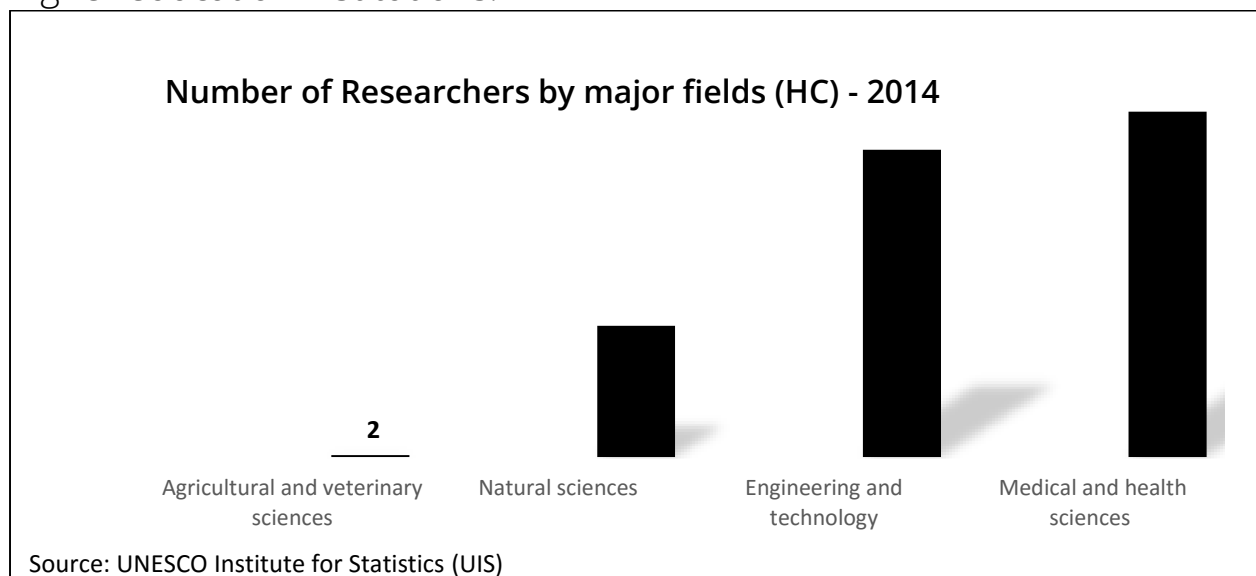
➤ Researchers per Million Inhabitants (FTE)

Data is only available for the year 2014 where Bahrain had **368 researchers per million inhabitants**. This compares unfavorably with data for its neighbor UAE that had 2442 per million or with other advanced OIC member states like Turkey (1775) and Malaysia (740), and illustrates the need for strong increase in Bahrain's R&D manpower.

Source: UNESCO Institute of Statistics: <http://data.uis.unesco.org/#>

➤ Researchers Distribution by Major Fields (HC)

As per the 2014 data, the larger part of Bahrain's R&D manpower was in the field of medical and health sciences (363) followed by the engineering and technology sector (323). Natural sciences had a significantly smaller number of researchers. Almost all the researchers are employed in the higher education institutions.



Bahrain like other Arab Gulf countries has managed to improve the gender balance in science and engineering.



E. HIGHER EDUCATION

❖ Review

Within the Bahraini Vision 2030, education was targeted as the area of primary importance. The program sets a number of goals within the field. It emphasizes the need for "Education and training (...) to be relevant to the requirements of Bahrain and its economy", emphasizing the teaching of applied sciences. It stresses the importance of "accessibility" of education, while meeting the need for "highest possible quality standards (by setting) standards for quality across the education sector, regularly review the performance of (...) educational and training institutions". Finally, it aims at encouraging research as the basis for the development of knowledge-based economy.

- There are 14 universities found in Bahrain. Following is their list with national and global ranking:

University Name	National Ranking	Global Ranking
University of Bahrain	1	1816
Arabian Gulf University	2	3642
Ahlia University	3	4603
Applied Science University of Bahrain	4	4805
The Kingdom University	5	5491
Gulf University	6	6796
Arab Open University Bahrain	7	7442

University of Technology Bahrain	8	7685
University College of Bahrain	9	8864
Royal University for Women	10	10918
Bahrain Institute of Banking and Finance	11	13564
Bahrain Polytechnic	12	14086
Talal Abu Ghazaleh University College of Business	13	23453
Omega College	14	27160

Source: <https://www.webometrics.info/en/aw/Bahrain%20>

➤ **The University of Bahrain**, at Isa Town, has a college of engineering and science, and includes the following S&T related centres:

- Cloud Innovation Center
- Information Technology Center
- Business Incubator Center



University Of Bahrain



Applied Sciences University

The University also has *Renewable Energy Laboratories* with the main responsibility to enhance capabilities and build research and innovation experts in the field of sustainable energy and water technologies.

➤ **The University of Bahrain Cloud Innovation Center (UCIC):**

The UCIC Program provides an opportunity to collaborate with other public sector organizations on their most pressing challenges, test new ideas with Amazon's innovation process, and access the technology expertise of Amazon Web Services. Organizations bring their expertise and work through a challenge engagement, uncover

new ways to solve complex problems, and publish their lessons learned to further drive public sector innovation.

- **The College of Health Sciences** (CHS) was founded in 1976 in collaboration with the American University of Beirut and the University of Illinois at Chicago, under the administration of the Ministry of Health. Initially, the CHS offered AD programs in Nursing and the Allied Health Professions. The College has developed both new facilities and new programs since then, continually responding to the changes in demand from the healthcare sector. Following a royal decree in 2011, the College was merged with the University of Bahrain.
- **Bahrain Polytechnic** is a government-owned tertiary education institute. Established by Royal Decree in July 2008, it is considered a key initiative for the Education and Training Development Committee; a project of the Bahrain Vision 2030 master plan. It delivers applied learning, technical education, skills-based and occupational training. *Tamkeen*, in cooperation with Bahrain Polytechnic and Microsoft Corporation, launched the **Artificial Intelligence Academy** at Bahrain Polytechnic, which provides a platform for youngsters to boost their innovation and creativity capabilities. This academy is the first of its kind in the Middle East and aims to train and qualify students from various schools and universities across Bahrain as well as their teachers.



Bahrain Polytechnic

- **The Arabian Gulf University**, founded in 1980 by the seven Gulf state is accredited by the Ministry of Education, Bahrain, and governed by Gulf Cooperative Countries, and is a member of Federation of the Universities of the Islamic World. Entry into the university is restricted to GCC nationals, with other Arab nationals considered only if vacancies are available.



It consists of:

- College of Medicine and Medical Sciences
- College of Graduate Studies and
- The French Arabian Business School

Source: <https://www.nationsencyclopedia.com/Asia-and-Oceania/Bahrain-SCIENCE-AND-TECHNOLOGY.html#ixzz7vM2rptaf>



F. RESEARCH PUBLICATIONS

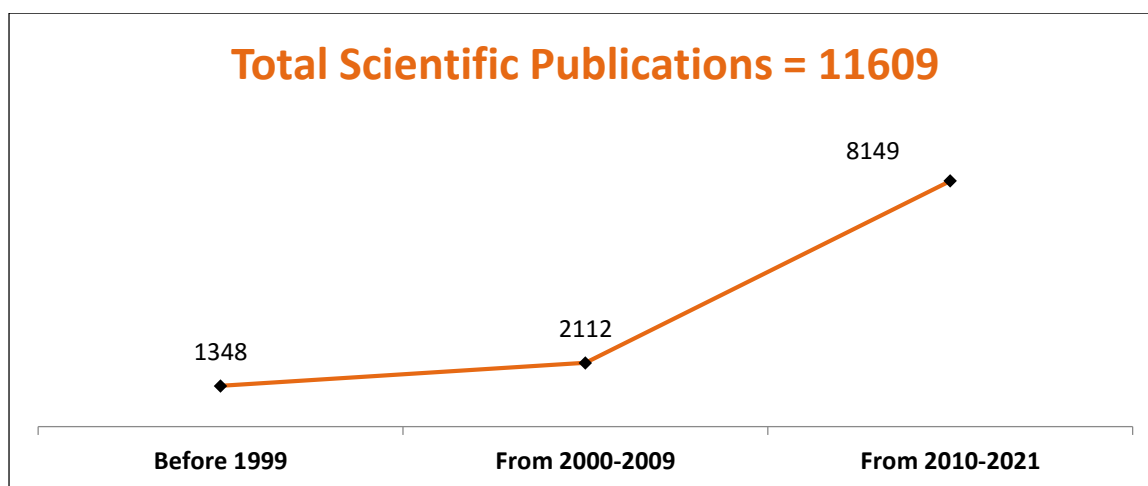
- ❖ **Based on the scholarly output we will provide and analyze the last ten years (from 2012 to 2021) data. We will present:**

In this section, we will provide numerical data about all the science and technology research publications (**Scholarly output**) of Bahrain. Note that the SO includes:

- Journal publications
 - Book series
 - Stand-alone books (including edited volumes, monographs, text books and reference works)
- ❖ Based on the scholarly output we will provide and analyze the last ten years (from 2012 to 2021) data. We will present:
 1. The per year publications.
 2. Quality of publications as indicated by:
 - a) The per year citations,
 - b) Citations per publications and
 - c) Field weighted citation impact.
 3. The quality of publications as represented by the purpose, the publications distribution in different quartile groups.
 4. The number of papers in different subject areas will be provided.
 5. The top ten most productive universities based on the number of publications.
 6. The percent (%) international collaboration and the top ten collaborating countries.

The data retrieved from Scopus was employed for above purposes.

- The scholarly output (2010-2021) comprised of articles (n=8056), conference papers (n=1806), reviews (n=654), book chapters (n=452), letters (n=149), editorials (n=238), notes (n=109), errata (n=38), short surveys (n=56), books (n=49), and one retracted document. The per era publications details are presented in the figure.



1. From 2012 to 2021 the per year number of publications or scholarly output (SO), citations, and citations per publications (CPP) is also presented (as shown in the table).
2. The number of publications per year shows a systematic upward trend with the highest number being published in 2021 (n=1522).
3. The total citations were 158054, with Citations per paper of 20.1, and the Article Field Weighted Citation Impact of 1.86 which indicates that the articles received on average 86% higher citations as compared with global average.

For the last ten years (from 2012 to 2021) we also presented in the table below;

1. The per year publications.
2. The quality of publications indicated by;
 - a) The per year citations, citations per publications and field weighted citation impact).
 - b) The source or journal ranking.
3. The number of papers in different subject areas e.g. medicine, chemistry and social science etc.

4. The top ten most productive universities (on the basis of number of publications).
 5. The percent (%) international collaboration &
 6. The top ten collaborating countries with Bahrain.
- In the table below, the per year (from 2012 to 2021) number of publications or scholarly output (SO), the number citations, and citations per publications (CPP) of 7359 documents are presented. The highest documents are published in 2021 (n=1522), followed by 2020 (n=1201) and 2019 (n=1062). The quality of publications can be presented by citations, which were 148054, or the CPP was 20.1. Article Field Weighted Citation Impact (FWCI) indicates "how the number of citations received by an article compares to the average or expected number of citations received by other similar publications". The total FWCI was found to be 1.86 which indicates that the articles received 86 % higher citations as compared with global average.

S#	Title	Overall	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
1	Scholarly Output	7359	353	486	444	424	534	580	753	1062	1201	1522
2	Citations	148054	4102	6644	8441	22305	27227	20730	24929	10541	15995	7140
3	Citations per Publication	20.1	11.6	13.7	19	52.6	51	35.7	33.1	9.9	13.3	4.7
4	Field-Weighted Citation Impact	1.86	0.69	0.71	1.28	4.17	3.47	2.82	3	1.03	1.58	1.32

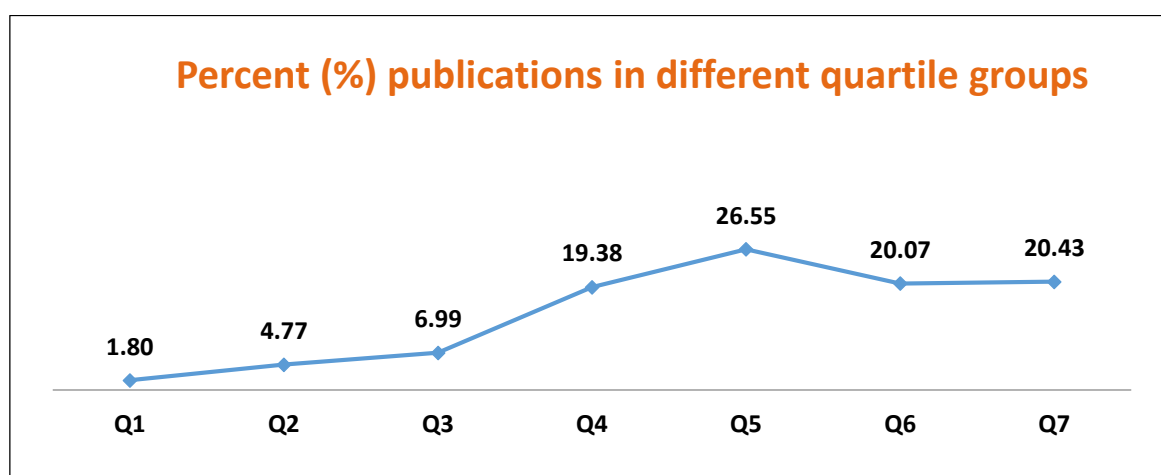
Scopus has categorized all journals in seven quartile (Q) groups (from Q1 to Q7). For example, Q1 is occupied by the top 1%, and Q7 is occupied by journals in the 75 to 100% group, according to quality.

It is noted that 1740 papers in the last ten years were published in those journals/sources, which do not have citescore data. The per year breakup for the remaining 5619 papers are presented in the table.

S#	Title	Overall	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
1	Pub in top 1% Sources (Q1)	101	3	3	8	6	15	13	14	11	14	14
2	Pub in top 5% Sources (Q2)	369	22	29	28	32	41	32	36	31	49	69

3	Pub in top 10% Sources (Q3)	762	27	49	41	47	67	63	82	82	130	174
4	Pub in top 25% Sources (Q4)	1851	79	120	121	109	143	144	181	237	283	434
5	Pub in top 50% Sources (Q5)	3343	132	185	198	189	244	283	338	443	545	786
6	Pub in top 75% Sources (Q6)	4471	193	254	256	244	380	357	452	596	712	1027
7	Pub in top 100% Sources (Q7)	5619	254	362	361	332	418	457	566	775	884	1210

- The above table reflects that a small number (762) of the total (5619) publications are within the top 10% sources. Meanwhile the detailed distribution within each particular quartile is shown in the figure below.



- The number of publications in fifteen (n=15) major subject areas are presented in the table. For example, the highest documents were published in;
1. Medicine (n=2532)
 2. Computer Science (n=1484) and
 3. Engineering (n=1388)

The highest number of citations were noted for;

1. Biochemistry, Genetics and Molecular Biology (n=11786)
2. Engineering (n=11198)
3. Medicine (n=106455)

- The number of authors, citations per paper (CPP) and field weighted citation impact (FWCI) for the top 15 areas are described in the table.

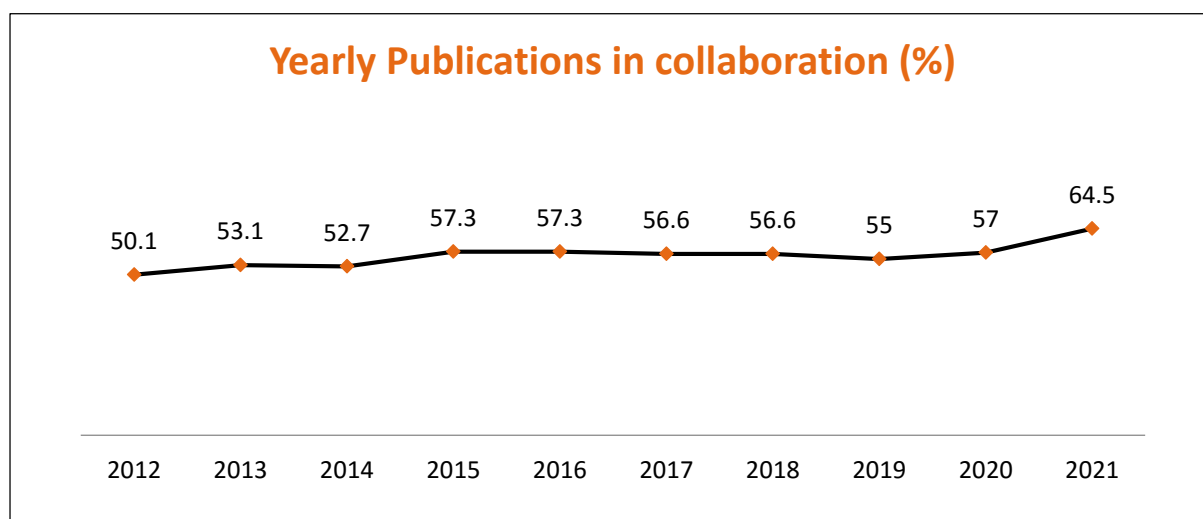
S#	Subject Area	SO	Citations	Authors	CPP	FWCI
1	Medicine	2532	106455	2628	42	3.66
2	Computer Science	1484	7788	994	5.2	0.83
3	Engineering	1388	11198	965	8.1	0.9
4	Social Sciences	940	5351	849	5.7	0.99
5	Business, Management and Accounting	911	5665	675	6.2	0.98
6	Materials Science	623	10241	266	16.4	1.06
7	Physics and Astronomy	622	7635	329	12.3	1.02
8	Mathematics	567	3191	522	5.6	0.85
9	Biochemistry, Genetics and Molecular Biology	502	11786	500	23.5	1.36
10	Environmental Science	490	4898	575	10	0.89
11	Decision Sciences	468	1706	456	3.6	0.68
12	Economics, Econometrics and Finance	416	3151	286	7.6	1.3
13	Energy	405	3149	500	7.8	0.8
14	Chemistry	311	4626	217	14.9	0.94
15	Agricultural and Biological Sciences	283	3094	390	10.9	0.74

NOTE: The total scholarly output (SO) may be different from the sum total of publications (sorted according to Journal classification) because the same publication may be appearing under various classifications, concurrently.

- The list of top ten most productive universities is provided in the table. For example, the highest documents were published by University of Bahrain (n=204), followed by Arabian Gulf University (n=1134), and Ahlia University (n=526). The also table includes the citations, CPP and FWCI for all ten universities.

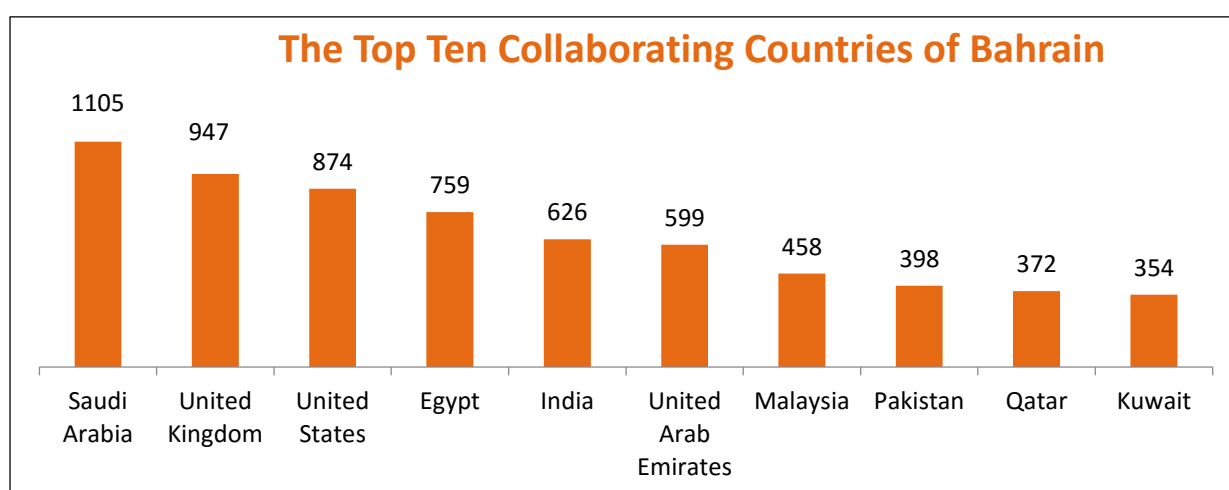
S#	Institution	SO	Citations	CPP	FWCI
1	University of Bahrain	2804	26232	9.4	0.85
2	Arabian Gulf University	1134	86754	76.5	6.82
3	Ahlia University	526	3308	6.3	1.16
4	Ministry of Health, Kingdom of Bahrain	447	5040	11.3	0.73
5	RCSI Royal College of Surgeons in Ireland - Medical University of Bahrain	352	10366	29.4	3.37
6	Applied Science University	301	2416	8	1.2
7	Bahrain Defence Force Royal Medical Services	187	1969	10.5	1.4
8	AMA International University	163	975	6	0.71
9	Kingdom University	160	1237	7.7	1.5
10	Bahrain Polytechnic	79	361	4.6	0.79

- Bahrain has published 57.4% (average of the last ten years) documents in strong international collaboration. The increasing rate of year collaboration (from 2012 to 2021) is presented in the figure.



- The highest documents were published in collaboration with;
1. Saudi Arabia (n=1105),
 2. UK (n=647) and
 3. USA (n=874).

The data of the top ten collaborating countries is presented in the figure.



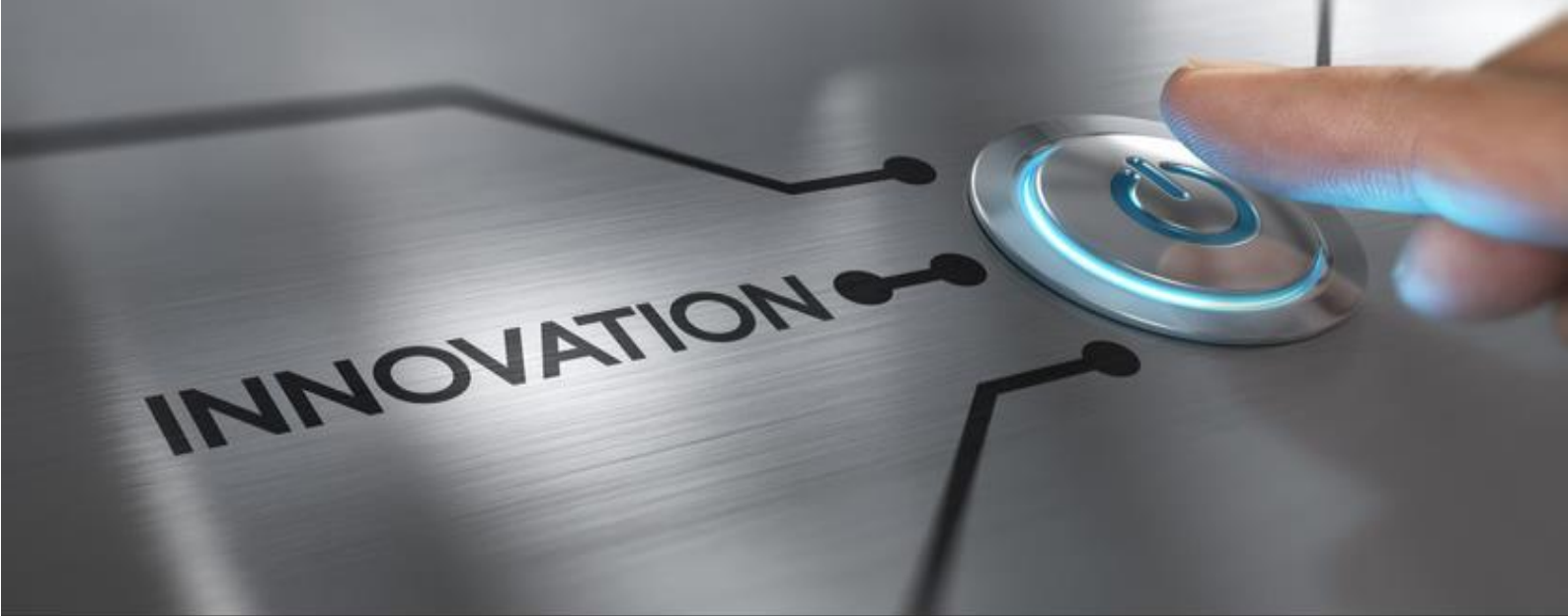


G. International Cooperation and Support Initiatives (selected)

❖ International Cooperation

- [Saudi Irrigation Organization and Bahrain Arabian Gulf University](#) have signed an agreement to work together in the field of scientific research. Both sides signed projects based on scientific research and development. The scope of the agreement will also cover areas such as new initiatives in the field of science and applied advisory studies. Development and technology-related events, seminars and other training programs and workshops will be organized by the two divisions as part of the agreement.
- [Bahrain-EU Cooperation](#): In 2021 High Representative for Foreign Affairs and Security Policy/Vice-President of the European Commission met the Minister of Foreign Affairs of the Kingdom of Bahrain and discussed ways to enhance bilateral relations between the European Union and Bahrain around areas of mutual interest. They signed a Cooperation Arrangement between the European External Action Service (EEAS) and the Ministry of Foreign Affairs of the Kingdom of Bahrain that provides an institutional framework for political dialogue and cooperation in areas such as trade, research and innovation, clean energy and renewables.
- [The UK Science and Innovation Network \(SIN\) in Bahrain](#) is working on the following global objectives:

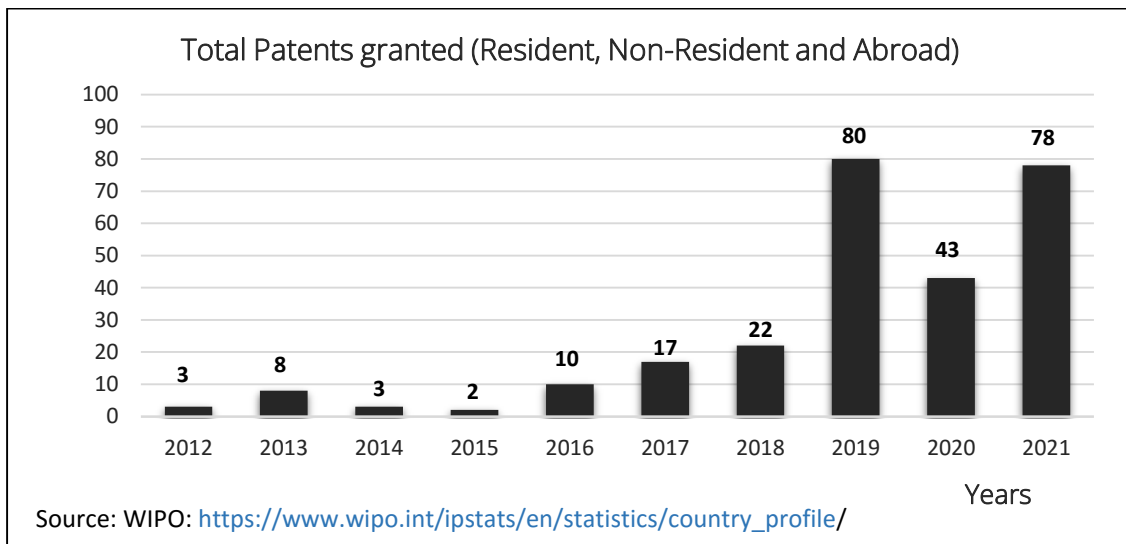
- Establishing the UK as Bahrain's pivotal partner of choice in science and innovation.
 - Supporting Bahrain in enhancing its resilience and security by addressing long-term threats, including emerging health issues and global challenges on water and food security, as well as through building their capacity to deliver evidence-based policies.
 - Increasing trade and investment cooperation in education, healthcare, infrastructure, water, clean energy, cyber security, Science and Innovation, working on higher education, collaborating with the British Council and the Gulf Science and Innovation, Knowledge and Economy programme.
- **CERN, the CMS collaboration and SESAME (Synchrotron-light for Experimental Science and Applications in the Middle East)** were the special guests of the Info Days held at the University of Bahrain on 14 and 15 February 2023. It was an opportunity to showcase the contribution of the Bahraini community to CERN and the CMS experiment, while assessing future opportunities to collaborate with SESAME. The University of Bahrain joined CMS as an associated institute in 2019.
- **UNESCO and Bahrain:** In November 2008, an agreement was signed by the Bahraini government and UNESCO to establish a Regional Centre for Information and Communication Technology in Manama under the auspices of UNESCO. The aim is to establish a knowledge hub for the six member states of the Gulf Cooperation Council.



INNOVATION

H. INNOVATION, ENTREPRENEURSHIP & TECHNOLOGY PARKS

❖ Total Patents Granted (Resident, Non-Resident and Abroad)



• Total Patents granted (Resident, Non-Resident and Abroad)

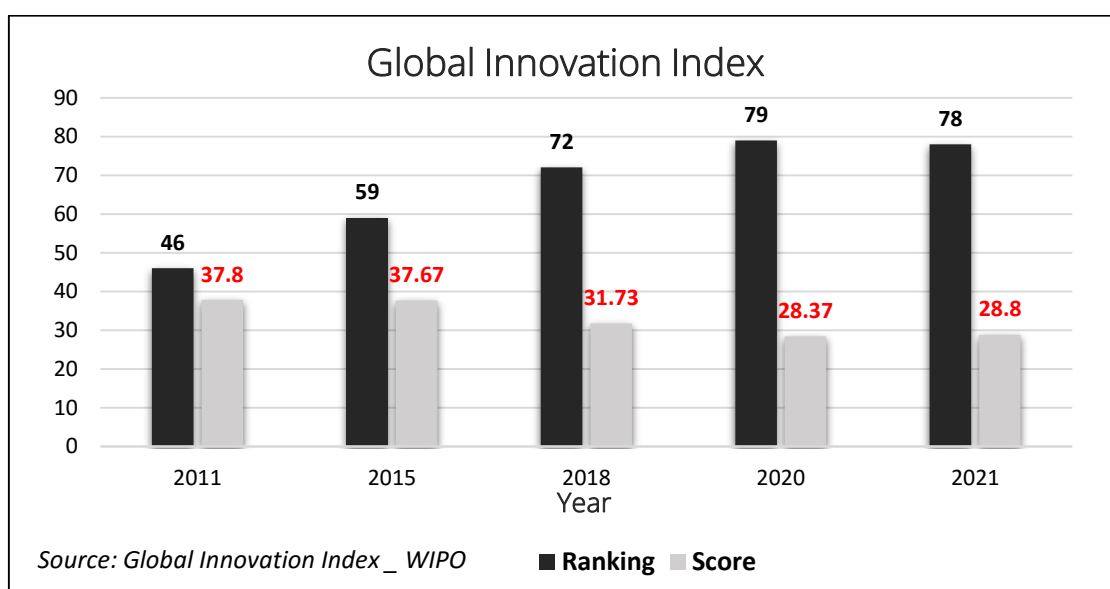
Year	Resident	Non-Resident	Abroad	TOTAL
2012	2	-	1	3
2013	-	-	8	8
2014	-	-	3	3
2015	-	-	2	2
2016	-	-	10	10

Year	Resident	Non-Resident	Abroad	TOTAL
2017	-	-	17	17
2018	-	15	7	22
2019	-	74	6	80
2020	-	34	9	43
2021	-	67	11	78

Source: https://www.wipo.int/ipstats/en/statistics/country_profile/profile.jsp?code=TJ

From the preceding data it is clear that Bahrain's patent output has increased in recent years particularly in the non-resident category, suggesting that research activity by foreign companies or enterprises within Bahrain has increased significantly and is producing new patents.

❖ Global Innovation Index



The Global Innovation Index ranking of Bahrain is currently 78 with a GII score of 28.8. Its ranking has dropped from an all-time high of 46 in 2011 and the score has also decreased from 37.8 to 28.8 in 2021.

GII rank with in OIC countries is 12

❖ Initiatives to Promote Innovation

Bahrain is undertaking a series of large-scale projects to try to establish itself as a regional hub for science and technology innovation. Some of these are:

- **@bahrain:** In 2022 Bahrain announced a project called @bahrain, which will consist of a technology research institute, a technology park and a 'techtainment' centre offering interactive entertainment. It will contain more than one million square meters of business, entertainment and education facilities, and promote investment in key technologies such as transport.
- A **regional ICT hub** will be set up in cooperation with UNESCO. As well as ICT training and research in e-learning it will provide ICT support and policy consultation.
- Bahrain has launched the US\$100 million **Al Waha Venture Capital Fund of Funds**, which aims to invest in promising regional tech startups.
- Bahrain has announced a plan to set up the **region's first state-of-the-art data center** to cater for the needs of the Middle East and North Africa (MENA) region. The project will also be one of the first initiatives in energy efficiency, driving local innovation toward the use of renewable energy. The new technology park will push new boundaries in the digital field and contribute to Bahrain's digital economy in line with Bahrain's Economic Vision 2030. In addition to diversifying the economy, the project will focus on uplifting local talent within the tech field. Furthermore, it will offer benefits to local citizens through the localised storage of data that will be closer to end-users.

Source: <https://www.gulf-insider.com/bahrain-plans-to-set-up-largest-technology-park-in-mena/>

❖ **Incubators, Accelerators and Start-ups Culture**

- The number of Bahraini start-ups grew by 46% over 2015–2018 (BEDB, 2018). The launch of **StartUp Bahrain**, a platform bringing together start-ups, corporations, investors and others, dates from 2016.
- The Kingdom of Bahrain currently has more than 34 accelerators, incubators and co-working spaces which stimulate innovation and the growth of new businesses.
- The **Bahrain Business Incubator Centre** was established in 2003 by the Bahrain Development Bank (BDB) and was the first diversified

incubator in the region. The BDB also created **Riyadat** to promote women entrepreneurs and bridge the gender gap.

❖ **Fintech**

- One of the aspirations of the government's Economic Vision 2030 is to create a robust digital economy. This is reflected through high level investment in financial technology (fintech) and the establishment of Bahrain **FinTech Bay**, the region's largest fintech center which provides laboratories, business accelerators, and educational opportunities. It serves to accelerate early-stage Bahraini fintech companies and entice foreign companies from the same sector to establish regional head offices in the country.
- **Tamkeen** is the country's primary labour fund. Over 2018–2020, it supported 1500 budding entrepreneurs and 4 000 institutions with an annual budget of BHD 60 million (ca US\$ 160 million).





I. COMBATING THE COVID-19 PANDEMIC

➤ **Bahrain Military Hospital Installs Portable Chambers to Isolate COVID-19 Cases**

Bahrain Defence Force Hospital procured the latest protective equipment, including portable isolation chambers designed to isolate and treat suspected active COVID-19 cases.

The BDF emergency department screens all patients by visual triage, identifying and quickly isolating suspected COVID-19 cases within the isolation chamber, which includes a safety measure put in place to



ensure the safety of other patients and allows appropriate treatment to be provided by the medical staff.

The state-of-the-art portable isolation chambers are equipped with medical technology available in standard isolation rooms, including negative pressure, UV light HEPA Filter that kills bacteria and viruses, and a fully equipped ICU bed.

Additionally, the BDF Military Hospital is the first in Bahrain to acquire several isolation transport stretchers, a small-sized moveable isolation device used to safely isolate and transport infected patients.

The chamber has its own negative pressure filtration and several glove portals which allow for safe access to the patients.

Source: <https://saudigazette.com.sa/article/595000/World/Mena/Bahrain-military-hospital-installs-portable-chambers-to-isolate-COVID-19-cases>

➤ **BAHRAIN USES TECHNOLOGY to TRACK HOME QUARANTINE COVID-19 PATIENTS**

Tracker bracelets used to geo-fence self-isolating individuals to fight coronavirus. Bahrain is using tracking bracelets to geo-fence self-isolating individuals in a bid to fight coronavirus.

Bahrain is leveraging technology to ensure that people under compulsory home quarantines do not move away from the confines of their homes. Electronic tracker wristbands that alert authorities to rogue escapees have been rolled out by the island kingdom as it seeks to curb the spread of the coronavirus pandemic (COVID-19).

Self-isolating individuals are obliged to wear the electronic bracelet that will notify the monitoring station when they are 15 meters away from their phone, in which case a warning will be sent. Attempting to remove or tamper with the bracelet is a violation and officials confirmed the bracelet is waterproof. Self-isolating individuals using the application must identify their isolation location, in most cases their home, by selecting "Set Home Location" upon arrival.



Source: <https://gulfnews.com/world/gulf/bahrain/bahrain-uses-technology-to-track-home-quarantine-covid-19-patients-1.70838518>

➤ **Trial of Medical Robots Proving Successful in Bahrain**

The Kingdom's Ministry of Health confirmed that the three devices are being used in order to protect healthcare staff from excessive exposure to the SARS-CoV-2 virus.

A trio of medical robots that have been undergoing trial in a Bahrain COVID-19 isolation unit have been well received by health officials so far, it has been reported.

Earlier this month, the machines comprising three models – the “Robot Net 20”, “Robot Net 21”, and the “Robot Infirmiere Nurse Robot” – were deployed to the Ebrahim Khalil Kanoo Health Centre isolation facility in Manama. The experiment, spearheaded by Bahrain’s Ministry of Health (MoH), is to assess how modern technology can minimise the direct exposure of healthcare workers to the SARS-CoV-2 virus.

The patient can communicate with the physician through the robot which reduces the risk of transmission to medical personnel by 80 per cent and reduces the cost of sanitising the medical team.

Finally, the Robot Infirmiere Nurse Robot – which is also capable of distributing food and medication – can be equipped with devices, such as ventilators, as well as electrocardiogram (ECG) and blood pressure monitors. It also has a thermal camera to transmit the patient’s temperature online and can also be used at reception to prevent any patient with higher temperature from walking in; it gives a warning if the temperature is above 37.3C.

Source: <https://www.healthcareitnews.com/news/emea/trial-medical-robots-proving-successful-bahrain>

➤ Use of Apps to Fight COVID-19

In the wake of the pandemic, Bahrain has taken a series of steps which include the launch of a dedicated tracking app for registered Covid-19 cases, with isolating patients required to wear tamper-proof bracelets monitoring their location.

A quarter of the country has now downloaded the ‘BeAware’ app, which automatically alerts users if they come into contact with an active Covid-19 case. Other initiatives have included converting public buses into mobile testing units and rapidly building field hospitals for the treatment of cases.

Source: <https://gulfbusiness.com/bahrain-deploys-covid-fighting-robots-amid-virus-concerns/>





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