Analysis of
Patenting in Kuwait

A report prepared by Oxentia Ltd on behalf of Kuwait Foundation for the Advancement of Sciences (KFAS)

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About Kuwait Foundation for the Advancement of Sciences (KFAS)

KFAS, a private non-profit organization was established in 1976 by an Amiri Decree under the direction of the late Amir of Kuwait, HH Sheikh Jaber Al-Ahmad Al-Jaber Al-Sabah. His enduring vision has been to create and develop a thriving culture of science, technology and innovation for a sustainable Kuwait. H.H. the Amir of Kuwait Sheikh Sabah Al-Ahmed Al-Sabah continues to chair the Foundation's Board of Directors, with private sector companies contributing 1% of their annual net profits to the Foundation.

The main objective of KFAS is to stimulate creative initiatives and promote the construction of a solid scientific and technological base while at the same time creating an environment that encourages innovation. Current projects include widening the public awareness of science, creating an environment in which innovation can flourish, and enhancing private and public sector research capacities. KFAS also works with talented and gifted individuals and gives them the financial and practical support they need to turn their ideas into reality. This work is partly carried out through six specialist centres, which are:

- Jaber Al Ahmad Centre for Molecular Imaging
- Sabah Al Ahmad Centre for Giftedness and Creativity
- The Scientific Centre
- Dasman Diabetes Institute
- KFAS Academy
- Advancement of Science Publishing

About Oxentia

Oxentia is a successful innovation management and technology commercialisation consultancy that started life as an operating division of Oxford University Innovation, the technology transfer company of the University of Oxford.

Since 2004, Oxentia has delivered services to a worldwide customer base of public and private sector clients in over 65 countries and is a key part of Oxford's innovation ecosystem.

Oxentia helps organisations to identify, develop and enable innovation, we work in partnership with our global clients to build capacity, develop capability and enable innovation for the benefit of economies and societies.

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1. Executive Summary

The Kuwait Foundation for the Advancement of Sciences (KFAS) has asked Oxentia to carry out a review of the patent inventory in Kuwait. The aim of this review is to provide a document that the KFAS can use to better understand the Kuwait patent inventory and how it has evolved over the last 20 years.

Oxentia carried out the patent inventory review using a desktop study of relevant patent literature, databases and organisations. The search was restricted to active patents or patent applications filed between 1998 and 2018. The review identified 394 active simple patent families, with 12.7% of these filed with international collaborators. The top patent producer in Kuwait during this period was Kuwait University, followed by the Kuwait Institute for Scientific Research (KISR), although the Sabah Al-Ahmad Centre for Giftedness and Creativity (SACGC) was the second largest patent producer, but is not listed as an assignee on the patents it supports. These institutions have been rapidly increasing their patent portfolios since 2011. The remaining top ten patent producers in Kuwait are individuals, with no Kuwaiti companies included in the top ten list.

There has been a steady increase in the number of patents in Kuwait since 2005, except for a reduction in 2017, followed by a rise again in 2018. This reduction is also seen in other Gulf states, whose economy is dependent on oil and gas production, and may be linked to a reduction in patent filing after the oil price crash in 2014. Most Kuwaiti patents are filed in the USA and although Kuwait became a member of the international patent cooperation treaty (PCT) in 2016, Kuwait's patent office has not granted a single patent. This may have limited the development of a supportive patenting ecosystem in Kuwait and appetite for patenting outside of the major research institutions.

Kuwaiti intellectual property (IP) producers overwhelmingly produce patents over design rights, typically producing only around 4 registered designs a year (up to 5.6% of the total patents). Design rights in other Gulf countries and the United Kingdom, as comparative examples, make up between 90-97% of the in the countries' portfolios. This may be indicative of a low level of commercialisation and product development activity in Kuwait compared to other countries. The six highly cited patents owned by Kuwaiti nationals or the University of Kuwait may be used as inspirational case studies for Kuwaiti innovation.

The key fields patented in Kuwait are in hygiene and healthcare (CPC Section A: 29%) and may be representative of the life sciences research carried out by the country's research institutions, rather than what companies are patenting in Kuwait. Neighbouring Saudi Arabia's main patenting field is in chemicals (CPC Section C: 25%) and may be more closely aligned with the country's economy, with more prolific patenting by companies in Saudi Arabia.

This review highlights important gaps and trends in Kuwait's national patent portfolio that give insight into the innovation ecosystem in the country. Oxentia's key recommendations are:

1. **Continue to improve research commercialisation in Kuwait**
2. **Start examining patents in Kuwait**
3. **Aim to improve in commercial and state-owned industries.**

2. Introduction

This patent inventory review is intended to identify trends and changes in the Kuwait patent landscape over the last 20 years. This information can support key decision-making processes and provide an empirical basis for future planning. This study analyses patents filed between October 1998 - October 2018

The aim is to provide a document that can be used to better understand the Kuwait patent inventory and how it has evolved over the last 20 years. This information can be used to inform future projects and frame decision making processes.

3. Background and Methodology

Capture and initial analysis of patent data was carried out using the subscription-based patent analytics tools; PatentSight, developed by LexisNexis[1] and PatSnap[2] Kuwait owned patents were identified by searching for patents where any one of the applicant's addresses were in Kuwait. An additional search was used to identify collaborative patents, by searching for: Kuwaiti owned patents (defined as above) AND all other territories excluding Kuwait.

Search results were filtered to show only active patents or patent applications with a filing date of between October 1998 and October 2018. Initial patent searches to build the database were carried out on the 29th November 2019.

4. Report Findings

The primary patent search identified 394 active patent simple families. The additional search for collaborative patents identified 50 active patent families. Therefore, 12.7% of the patents identified had international collaborators.

4.1 Top Patent Producers

The top ten patent producers in Kuwait developed 803 patents and patent applications between 1998 and 2018 (each patent family can have multiple patents). The breakdown by patent producer is shown in Figure 4-1. The top patenting institution in the period chosen for this study was Kuwait University with 315 patents, followed by the Kuwait Institute for Scientific Research (KISR) with 148 patents. The remaining top patent producers are individuals, who own between 15 to 61 patents each.

There are therefore a small number of prolific inventors in Kuwait who are active in patenting and maintaining their inventions. The patent literature does not show what these inventors are doing with their inventions and Oxentia emphasise the eight inventors highlighted in Figure 4-1, for further work needed to understand how they are commercialising their patents and how the innovation system in Kuwait is currently supporting them.

Oxentia are currently working closely with Kuwait University to create impact from their patent

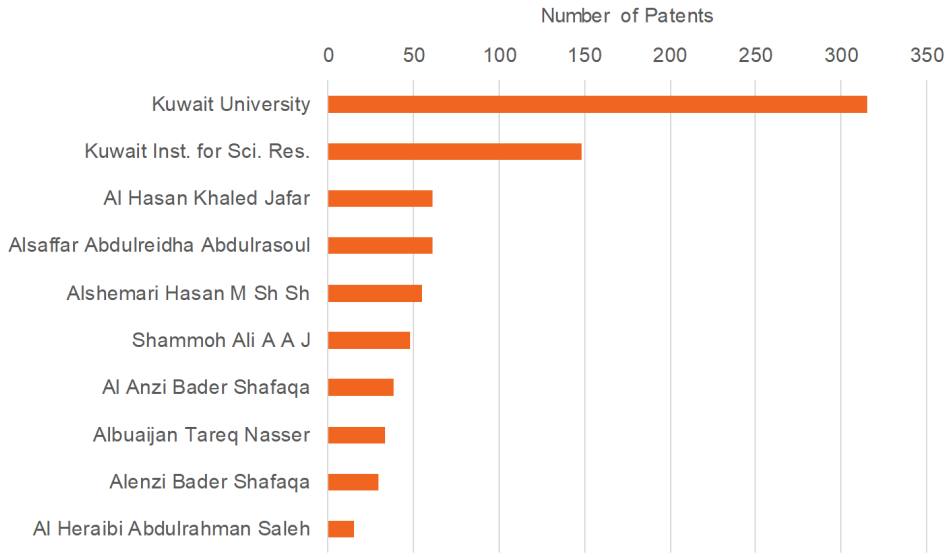


Figure 4-1 *The top ten patent producers in Kuwait between 1998 and 2018. The number of patents represents active patents and patent applications owned by each assignee between October 1998 and October 2018.*

portfolio and develop this further. The Kuwait Institute for Scientific Research (KISR) conducts more applied research compared to Kuwait University and may be expected to have a higher number of patents. However, KISR is much smaller with around 580 researchers and engineers[3], compared to Kuwait University's 1690 teaching faculty (who may or may not be engaged in research)[4]. The innovation rate (when measured by filing and maintenance of patents) is therefore marginally higher at KISR compared to Kuwait University (although there is uncertainty in how many staff are research active at each institution). KISR appears to have a commercialisation division responsible for identifying, assessing and exploiting IP generated from KISR innovations[5] and is a good point of contact to discuss management of IP within KISR. It is worth noting that the Sabah Al-Ahmad Centre for Giftedness and Creativity (SACGC) was established in 2010, and therefore is not included in Figure 4-1. To understand the contribution SACGC have made to the Kuwaiti patenting and innovation landscape, Oxentia carried out a mini review of SACGC's patent portfolio, which is presented in the case study on page 6.

One notable absence from the top ten patent producers in Kuwait is local companies. This may suggest that local companies are not innovating or do not see the benefits from patenting and exploiting their technologies. This finding is supported by the Global Innovation Index prepared by the World Intellectual Property Organisation (WIPO)[6]. The WIPO Global Innovation Index found that while Kuwait ranks relatively highly for its innovation efficiency ratio (which shows how much innovation output a country is getting for its inputs), it ranks low for its business sophistication, including R&D financed by business[6]. It would appear therefore that Kuwaiti companies are not financing R&D in Kuwait at an internationally comparable level and are not producing significant amounts of patents. This is surprising considering Kuwait's developed oil and gas sector, which is heavily reliant on engineering and technology. The number of patents assigned to two private and two state-owned Kuwaiti companies active in the oil and gas sector is shown in Table 4-1. Despite being well-known companies in Kuwait, active in the oil and gas sector, each of these companies has no or negligible patent portfolios. This supports the national portfolio level findings.

The lack of patent filings from Kuwaiti companies should be a key focus for future work in this area. Understanding why local companies are not engaging in funding R&D or patenting technology will help strategists to consider how companies can be assisted to enhance their participation in the innovation economy.

Company	Active Patent Families	Inactive Patent Families
Private Companies		
EQUATE Petrochemicals	2	0
Boubyan Petrochemical Company (BPC)	0	1
State-owned Companies		
Kuwait Oil Company	3	1
Kuwait Petroleum International	2	0

***Table 4-1** The patent portfolios of selected Kuwaiti companies active in the oil and gas sector. The numbers represent simple patent families (containing at least one application or granted patent) assigned to each company between October 1998 and October 2018.*

The filing trends for the top ten patent producers is shown in Figure 4-2. Kuwait University (dark green) filed their first patent in 2006, which has since been abandoned (so does not appear in Figure 4-2). The first patent they filed which is still active was in 2007, and there has been a steady increase since then. This suggests a policy change within the University around this period. KISR carried out low level patenting (i.e. less than five patents per year) between 2000 and 2005. KISR then only filed one patent per year between 2006 and 2011. From 2011 KISR has been patenting at an exponential rate and is likely to exceed the patent filing rate of Kuwait University in 2020, if continuing the current upward trend. The trend with KISR may again be due to changes in policy or direction around 2014.

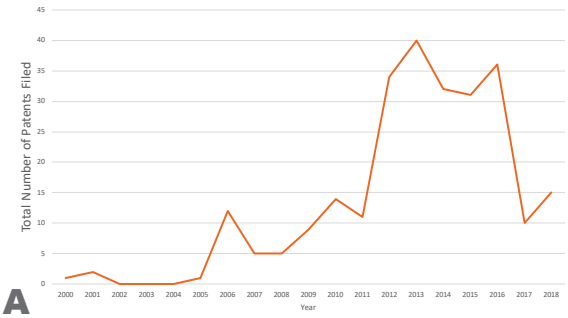
Both Kuwait University and KISR are currently increasing their patent filing every year, suggesting that there is an increasing momentum in each of these institutions for patenting innovation. The remaining eight individual inventors are consistently patenting up to ten patents per year, suggesting that they are patenting their work on a regular basis as it is developed.

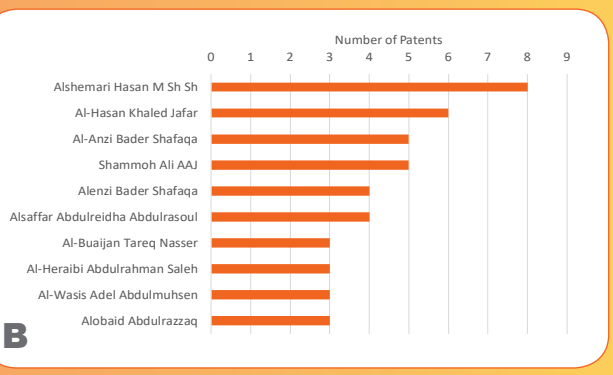
Case Study:

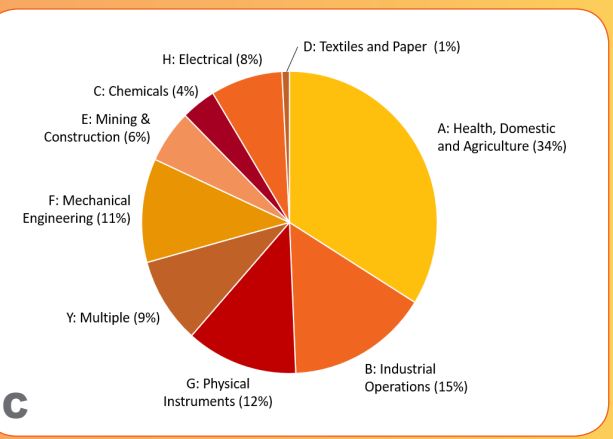
Sabah Al-Ahmad Centre for Giftedness and Creativity (SACGC)

The SACGC is the second largest producer of patents in Kuwait, after Kuwait University, but does not claim ownership of the IP generated by its beneficiaries. SACGC is therefore not the assignee on the patents which have benefited from its support and SACGC is unrecognised in the national Kuwaiti patent portfolio. SACGC supports a total of 277 active patents, belonging to 258 patent families. SACGC was established 2010 and the list of patents includes patents earlier than 2010, which have likely been supported through later development at SACGC. The trend for patent filings over time for SACGC (right box, A) is similar to patenting in Kuwait in general, with an increase up to 2013/14 and a decline after around 2016. This drop in patents has not been seen in patent filing trends for Kuwait University or KISR though (Figure 4-2). The top eight inventors (when measured by number of patents produced) that have benefitted from SACGC's support (right box, B) are also in the list of top Kuwaiti inventors identified in Section 4.1 (although the total number of patents is lower, suggesting that these inventors are also producing patents without SACGC's help). This demonstrates SACGC's key role in supporting innovation and patenting in Kuwait. The technical fields for patents supported by SACGC (right box, C) are overall similar to the types of patents published in Kuwait (Section 4.7), showing that the support is representative of the overall innovation landscape, rather than focused on one particular area.

مـركـز صـبـاح الأحـمـد للـمـوهـبـة والإبـداع
Sabah Al-Ahmad Center For Giftedness & Creativity







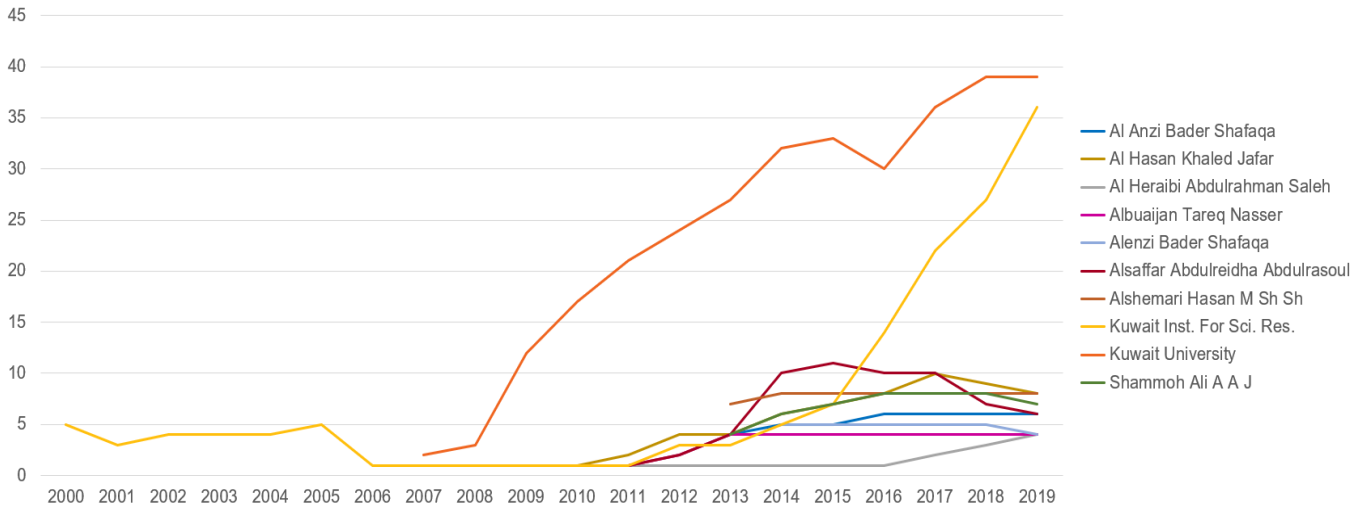


Figure 4-2 *The filing trends for the top ten patent producers in Kuwait between 1998 and 2019. The number of patents represents the active patents and patent applications owned by each assignee filed during that year.*

4.2 Kuwait National Patent Filing trend

The growth in the number of Kuwaiti patent applications and patents each year is shown in Figure 4-3. The number of patents has been increasing steadily since 2004, to a peak of 48 patents in 2015 before falling to 25 patents in 2017.

The number of patents increased again in 2018 to 35 patents and patent applications. This does not seem to be part of a global trend as the number of patents granted worldwide rose from 1,163,200 in 2013 to 1,167,400 in 2014 and again to 1,233,700 in 2015[7]. The drop in the number of patents in 2017 in Kuwait seems to be due to a drop in the number of patent applications in 2014 and 2015, as shown in Figure 4-4A (solid orange line). This trend is also seen in other states in the gulf region such as Qatar, which is shown in Figure 4-4B. The oil price is shown as a yellow dashed line on both charts in Figure 4-4, and traces an oil price crash between 2014 and 2015. It seems possible that the price crash caused a reduction in the amount of spending on innovation and patenting in gulf states whose economies have significant dependence on oil and gas exports, such as Kuwait and Qatar, which had a knock-on effect on patenting in the country.

The top patent producers in Kuwait are academic institutions (i.e., Kuwait University, KISR and SACGC) and their budgets are not directly dependent on oil and gas revenues. However,

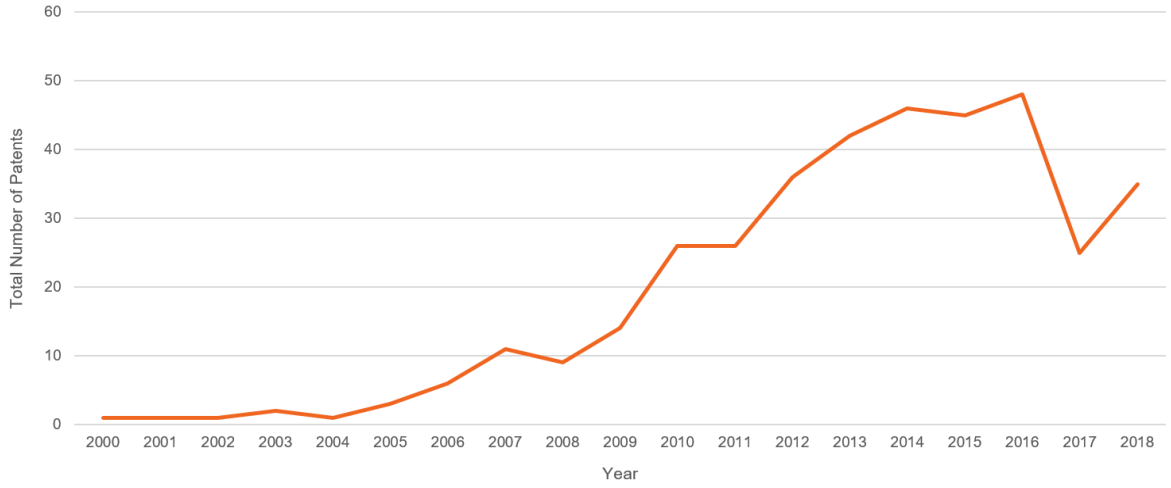


Figure 4-3 *The patent portfolio size for active Kuwaiti patents and patent applications by year from 2000 to 2018.*

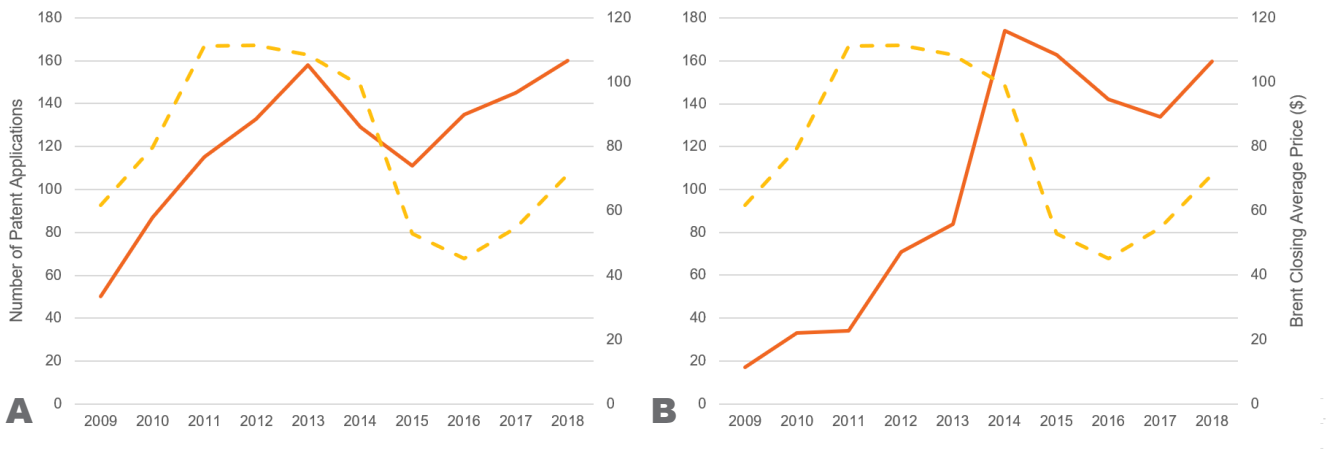


Figure 4-4 *The number of patent applications filed per year (patents filed both in country and internationally) by Kuwaiti patent producers (A) and Qatari patent producers (B) from 2009 to 2018 (orange solid line) and the Brent crude average closing price each year (dashed yellow line). Patent data taken from the WIPO Kuwait country profile.*

these only make up part of the Kuwaiti national patent portfolio and a slowdown in the national economy and decreased government revenues from oil and gas are still likely to have an impact on the availability of research and development budgets in these institutions. For example, there is a decrease in patent applications from Kuwait University in 2015 (data not shown), although this decrease is smaller than the national trend.

This demonstrates that despite efforts to reduce Kuwait's dependence on oil and gas, fluctuations in the oil price may have a significant impact on the country's wider economy. Efforts to shift Kuwait's economic reliance away from oil and gas production should be beneficial to ensure the country's future economic stability. This trend is not present in countries whose economies are less reliant on oil and gas exports, such as the UK or USA (data not shown).

4.3 Patent Registration

The country of registration for Kuwaiti patents, as a percentage of the total registrations, is shown in Figure 4-5. The majority (65.6%) of Kuwaiti patents are registered in the USA, with 6.4% of Kuwaiti patents registered in Australia, 4.1% registered in the UK and 3.3% in India. The remaining 20.6% of Kuwaiti patents are registered in 9 different countries and through the world patent office (WIPO).

Registration of patents in different regions to the inventor's home country is usually done to ensure market protection in those regions. The data presented in Figure 4-5 would suggest that Kuwaiti organisations are primarily expecting their innovations to reach the USA market. However, no active patents have been registered by Kuwaitis at the Kuwaiti Patent Office. The Kuwaiti Patent Office has not started the process of examining, publishing and granting of patents and all patents registered are held in the application stage but are officially protected (and take priority claim) for 20 years from registration[8]. Data from the WIPO country profile for Kuwait[9] shows that 34 patent applications have been filed to the Kuwaiti Patent Office by Kuwaiti residents between 2009 and 2018, with none of these yet being granted. Two-hundred and ninety-three patents have been filed by non-resident applicants in the same time period, with none of these being granted either. Each of these patents are effectively stuck in the application process, with no likelihood of grant until the Kuwaiti Patent Office starts examining patents. The inventors may use the priority date from the filing of Kuwaiti patents when applying in other territories though.

All the patent applications to the Kuwaiti patent Office have been since 2016, the same year that Kuwait joined the Patent Cooperation Treaty (PCT). A fully functioning patent office is a key part of any innovation ecosystem. A key question remains as to whether the geographic distribution of patent filings represent the market opportunities for Kuwaiti patents, or (for example) whether Kuwaiti inventors are motivated to patent in the

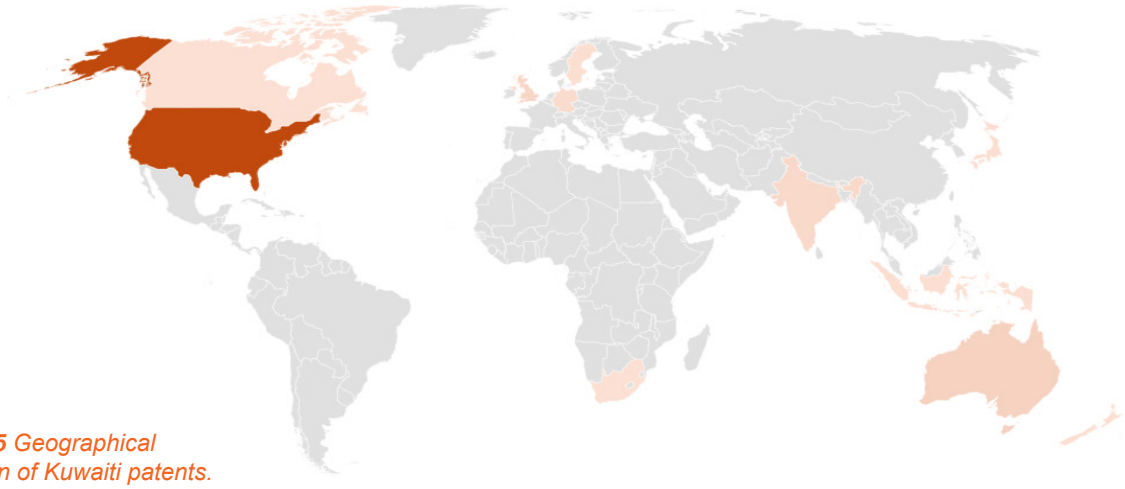


Figure 4-5 *Geographical registration of Kuwaiti patents.*

US due to the lack of an effectively functioning Kuwaiti patent office? Kuwaiti inventors could in the meantime file patents at the Gulf Cooperation Council (GCC) Patent Office in Riyadh, Saudi Arabia but appear not to.

When comparing regional filing trends with other countries, it is useful to compare against similar and aspirational counties' innovation systems. One good metric for measuring innovation is the WIPO's Global Innovation Index[10]

Kuwait scores relatively poorly on the global innovation index relative to GDP per capita (in USD) and is clustered alongside Saudi Arabia, Brunei and Qatar in this respect. Countries scoring highly in the innovation index relative to GDP including the United Kingdom and Malaysia. The geographical filing profile of Kuwaiti patents is very similar to both Qatar (Figure 4-6A) and Brunei (Figure 4-6B). Despite the wide geographical distance between them, patent producers in Qatar and Kuwait predominantly file in the USA, with a small number of filings in potential markets such as Canada, India, Australia and Europe, with very limited patent registration in their own national patent systems.

The geographic patenting profiles for Malaysia and the United Kingdom are shown in Figure 4-6C

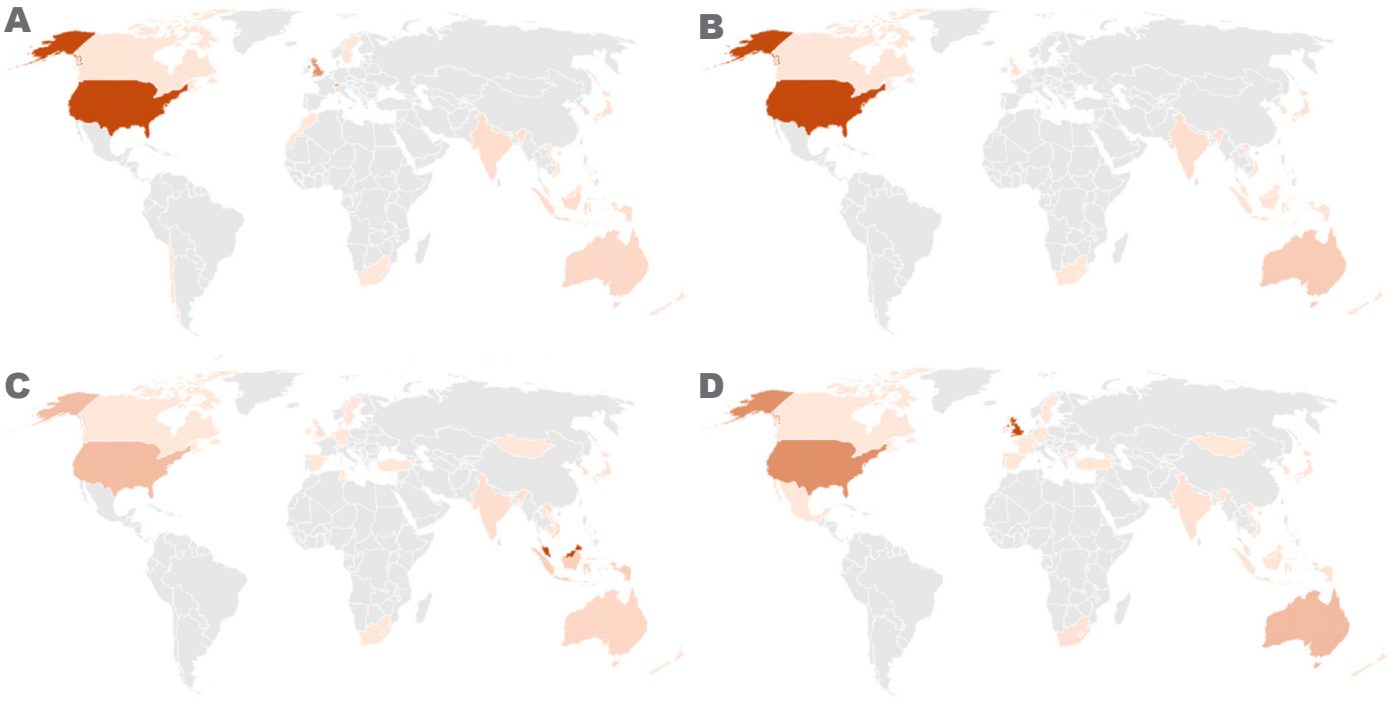


Figure 4-6 *Geographical registration of patents from Qatar (A), Brunei (B), Malaysia (C) and the UK (D).*

and Figure 4-6D respectively. These are different from Kuwait, Qatar and Brunei, with much fewer patent registrations in the USA (as a proportion of the total profile) and far more patent registrations in their own national system. The patent filing profile is similar between the UK and Malaysia (with most patents filed in their own national system), despite the geographical distance between the two countries. This could suggest that one way to increase a country's global innovation index relative to GDP per capita is to increase the number of patent filings in that country's national patent office relative to patent filings abroad. An effective national patent registration office is a key component of high performing innovative economies. However, Oxentia would caution that a national patent office is only one of many components required in a national innovation ecosystem, and that many other structures are required. A full review of the Kuwaiti innovation ecosystem should be carried out, to better understand the strengths and weaknesses and actions required to improve the Kuwaiti innovation ecosystem.

4.4 International Collaboration on Patents

An additional search for collaborative patents identified 35 active patent families out of the total of 394 active patent families where collaborative patents were filed by a Kuwaiti company (excluding subsidiaries of multi-national companies) or a Kuwaiti national. Therefore, 8.9% of the patents identified had international collaborators. This is higher than the world average, which was 7.3% in 2015[11]. The international patent co-inventions for Organisation for Economic Co-operation and Development (OECD) countries between 2012 and 2015 is shown in Figure 4-7. With a percentage of 8.9%, Kuwait is matched with China based on the OECD dataset, in between the USA and Finland. This suggests that Kuwait is relatively well connected but not as much as Malaysia and India who top the list with 30.7 and 27.1% of their patent portfolio with international collaborators respectively.

Collaborative innovation is a growing trend, with 54% of patents registered containing a co-author in the early 2000s, rising to 68% in the second half of the 2010s[12]. International collaboration is focused around global hotspots, with 30 metropolitan hotspots responsible for more than two thirds of

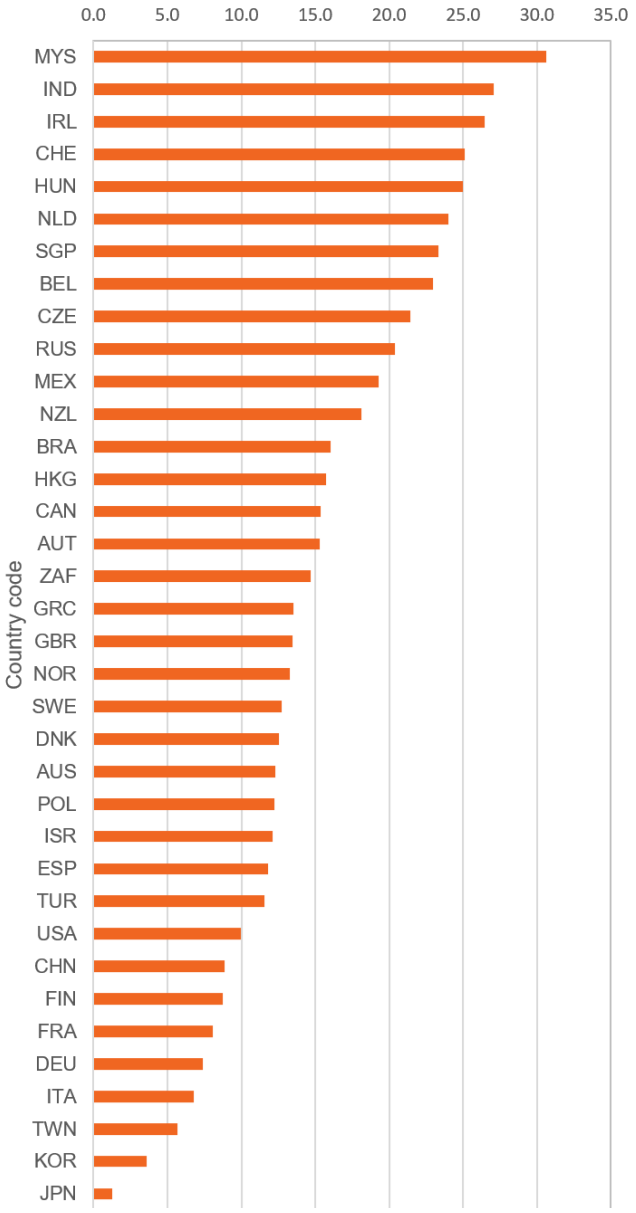


Figure 4-7 *International collaborative patents as a percentage of total patents for OECD countries between 2012 and 2015. Data from, OECD Science, Technology and Industry Scoreboard 2017: The digital transformation, OECD Publishing, Paris, https://doi.org/10.1787/9789264268821-en.*

world patenting activity[13]. Innovation has become more international. The United States, Japan and Western Europe accounted for 90% of patenting activity before 2000; which has reduced to 70% of patenting activity between 2015 and 2017. However, new entrants from other countries tend to collaborate with the USA and Western Europe rather than with other regional or global partners[12]. Kuwaiti patents with international collaborators are shown in Figure 4-8. KISR has the highest number of international collaborative patents, with six patents between 1998 and 2018. Kuwait

University (the country's highest patent filer between 1998 and 2018) has 3 international collaborative patents.

No Kuwaiti companies are included in this list. This is another indicator that Kuwaiti owned companies may need assistance with their innovation efforts, particularly when it comes to international collaboration.

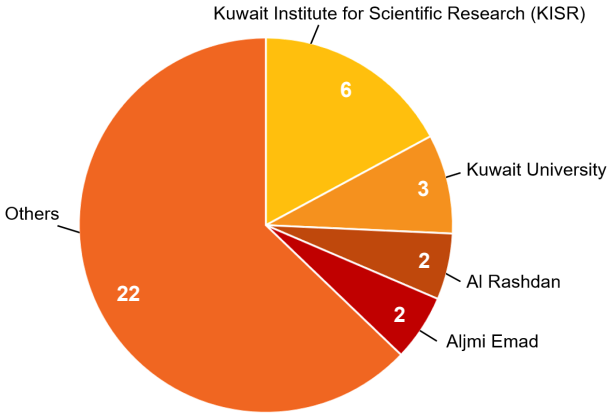


Figure 4-8 *The number of patents with international owners where one or more of the owners is a Kuwaiti company (excluding Kuwaiti subsidiaries of multi-national companies) or an individual. Annotation for each segment represents the organisation based in Kuwait who is a co-owner. N=35.*

4.5 Types of Patents Registered

The primary types of registered IP granted to Kuwaitis between 2009 and 2017 are shown in Figure 4-9A. The maximum percentage of design rights as a proportion of the overall portfolio was 5.9% in 2016, with four design rights granted (there was also a reduction in the overall portfolio size that year, meaning that the four design rights were a larger proportion of the portfolio). Four design rights were granted per year each year between 2013 and 2016, with only two granted in 2017.

The profiles for the three remaining countries in Figure 4-9 are very different, for Qatar (B), Oman (C) and the UK (D). Both Qatar and Oman have a much higher number of design rights relative

Figure 4-9 *The total number of granted IP rights per year to individuals and organisations in Kuwait (A), Qatar (B), Oman (C) and the UK (D) from 2009 to 2017, with design patents in yellow and patents in orange. Data taken from the WIPO country statistical profiles.*

to patents, with design rights making up to 97% of the registered IP for Qatar and 95% of the registered IP for Oman. Design rights in the UK are consistently between 88% and 90% of the total registered IP granted. This suggests that there is an underdeveloped product and industrial design and/or there is limited understanding of the application of design rights in Kuwait. It may also be representative of the overall portfolio in Kuwait, with the top patenting entities being academic research institutions (KISR and Kuwait University), who will register IP for patents rather than design and suggests that these patents are not being commercialised and developed into products. Industrial and product design are a key component of translating innovations from an idea into a product that can be marketed. There appears (from the registered IP at least) to be a low conversion from patent to product, which should be investigated. An investigation into this should aim to validate this assumption, understand how patents can be translated into products more effectively in Kuwait and benchmark the nation's industrial and product design capabilities. This will build up the evidence to support initiatives to increase translation of IP into final products in Kuwait.

4.6 Most Cited Patents

The top ten most cited patents in the list of Kuwaiti patents identified in this report are shown in Table 4-2, which excludes patents developed by employees of multi-national companies based in Kuwait. The most highly cited patent is for electrosurgical midline clamping scissors, developed by Hasan Alshemari. This has been cited 153 times, primarily by Johnson & Johnson. Dr Hasan Alshemari is the founder of Alshemari Instruments[14] and is a surgeon and specialist at the Zain Hospital in Kuwait City. Dr Alshemari is typical of the type of individual that may be used as a case study for Kuwaiti invention, to inspire others to innovate and develop their innovations into practical solutions.

Dr Tareq Albahri is a Professor of Chemical Engineering at Kuwait University and is the inventor of two of the most highly cited patents in the Kuwaiti patents identified. One of these is for an electronic window shading system and the other for a method of measuring the properties of petroleum fuels by distillation. These have been cited 77 and 51 times respectively and have received attention from multi-national car, technology and oil & gas companies. Dr Albahri's research appears to be used currently to build international collaborations and this may be supported further. Sultan Tarek's patent on customs inspection and data processing has been cited 35 times by leading corporations such as Alibaba, DHL, HP, IBM and more. The initial assignee on this patent, Public Warehousing Company is now rebranded into Agility and Tarek Sultan is the CEO of Agility.

Mahmoud al Mutawa's patent on a traffic safety system has been cited 24 times and has drawn interest from multi-national automotive and engineering companies, however there is limited further information on this and further research may be required to identify how this innovation is being developed. Fahad M.F.S. Alhuwaishel's fish trap system and Qasem Al-Qaffas' dental hygiene device are both product patents, which have been cited by small companies offering similar types of products either in the same sector or different sectors. Al-Buaijan Tareq Nasser and Mothaffar Hussain's patents have been cited multiple times by large and small companies and international universities.

The Chemtron Research patent appears to have been invented by a Kuwaiti resident and then assigned to an overseas company, demonstrating that there is international interest in Kuwaiti inventions and that there is active management of these inventions in some cases.

4.7 Fields of Patent Registration

The patents in each of the 393 patent families have been classified according to their general technological area using the Cooperative Patent Classification (CPC) system. The CPC system was developed from the former European Classification (ECLA) system and jointly adopted by the EPO and US Patent and Trademark Office (USPTO). The CPC classification of Kuwaiti patents between 1998 and 2018 is shown in Figure 4-10.

The largest group of Kuwaiti patents is in CPC section A, which represents patents in 'Human Necessities'. This typically represents patents in the fields of agriculture, food, clothing and

Patent family	Filing year	Title	Inventors	Current owners	Notable Citing companies	Number of citing patents
EP2633830.A1	2012	Electrosurgical midline clamping scissors	Alshemari Hasan M Sh Sh	Alshemari Hasan M Sh Sh	Johnson & Johnson	153
US2009027759.A1	2007	Electronic Window Shading System for Houses, Transport Vehicles and the Like	Albahri Tareq Abduljalil	Kuwait University	Apple; Boeing; Bosch; Ford; Foxconn; Honda Motor; Hyundai Motor; Peugeot; Schneider Electric; Toyota Motor	77
US2010204925.A1	2010	Method for measuring the properties of petroleum fuels by distillation	Albahri Tareq Abduljalil	Kuwait University	Saudi Aramco; BAE Systems; Eni; Exxon Mobil; Government of the United States; Halliburton; Honeywell; Huawei; IBM; Phillips; Repsol; Saudi Arabia Government; Sinopec Group	51
US2006240852.A1	2005	Method and system to enable mobile transactions	Al Sarawi Saleh	Chemtron Research	AT&T; Bank of America; Facebook	41
US2009089125.A1	2003	Customs inspection and data processing system and method thereof for web-based processing of customs information	Sultan Tarek	Agility	Alibaba Group; Caterpillar; DHL Group; Government of South Korea; Hewlett Packard Enterprise; Honda Motor; IBM; Roche; SAP; UPS	35
US8344864.B1	2012	Traffic safety system	Al-Mutawa Mahmoud E T H	Al Mutawa Mahmoud E T H	Bosch; Honda Motor; Polaris Sensor Technologies Inc; Toyota Motor	24
US2013167428.A1	2012	Fish trap system	Fahad M.F.S. Alhuwaishel	Fahad M.F.S. Alhuwaishel	Aviantronics; Blue Ocean Gear; JAGER PRO; Noble Research Inst.; Shanghai Ocean University	20
US2011067194.A1	2009	Dental Hygiene Device	Qasem Al-Qaffas	Qasem Al-Qaffas	BouMatic; Chirp Wheel; King Fahd Univ. of Petrol & Minerals; SP Berner Plastic Group; Techtronic	19
US2009222233.A1	2008	Partial stroke testing system coupled with fuel control valve	Al-Buaijan Tareq Nasser	Al-Buaijan Tareq Nasser	Saudi Aramco; Emerson; Siemens	17
US2010229287.A1	2009	Head and Neck Restraint System	Mothaffar Hussain	Mothaffar Hussain	Hokkaido University; Nolan Group; Polytechnic University of Milan	16

Table 4-2 *The top ten most cited Kuwaiti patents identified in this study.*

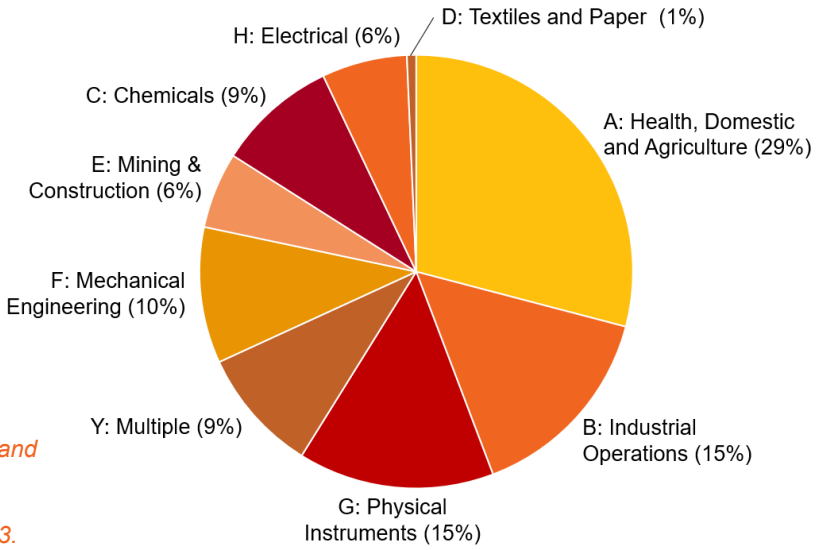


Figure 4-10 *Classification of Kuwaiti patents between 1998 and 2018 based on the cooperative patent classification. The total number of patent families is 393.*

health. The Kuwaiti patents registered in section A are further subdivided into the Section 'A' classes shown in Figure 4-11. The main class is hygiene, followed by agriculture. This represents life science technologies and typically may come from life science research. Both KISR and Kuwait University have multiple life science faculties and may be a key driver for these patents (as the remining institutional producers are engineering and technology companies).

Patents in industrial operations and physical instrumentation make up 15% each of the Kuwaiti patent portfolio, with the remainder spread evenly across mechanical engineering, mining & construction, chemicals and electrical (each between 6-10%). Most Kuwait's patents are therefore in high-technology and industrial areas.

The CPC classification of Saudi Arabian patents in the same period is shown in Figure 4-12. Saudi Arabia has a much lower percentage of patents in 'Human Necessities' than Kuwait at only 7% (compared to Kuwait's 29%). Many of the other categories are comparable but Saudi Arabia instead has a much higher proportion of patents in 'Chemicals' at 25% (compared to 9%) in Kuwait. This is surprising, since both countries' economies are heavily dependent on oil and chemical processing industries, so one might expect relative amounts should be similar (despite Saudi Arabia's much larger patent portfolio). The difference may be due to the way organisations patent in the two countries. Saudi Arabia's state oil company, Saudi Aramco, is actively developing its patent portfolio, submitting 230 patents in 2017, placing it third, only behind ExxonMobil and Chevron for patenting in oil-and-gas exploration

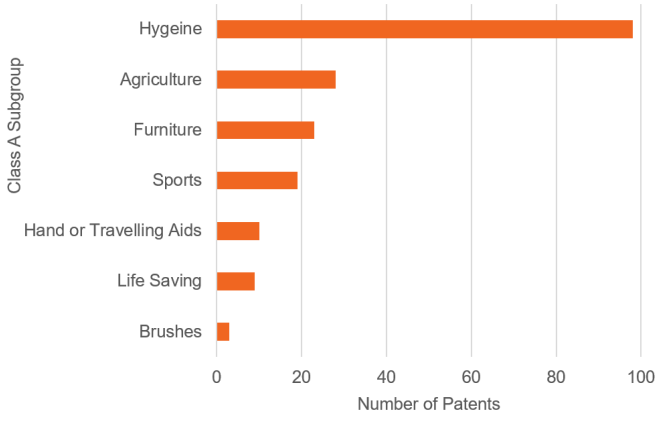


Figure 4-11 *Kuwaiti patents registered between 1998 and 2018, in different classes in Section A.*

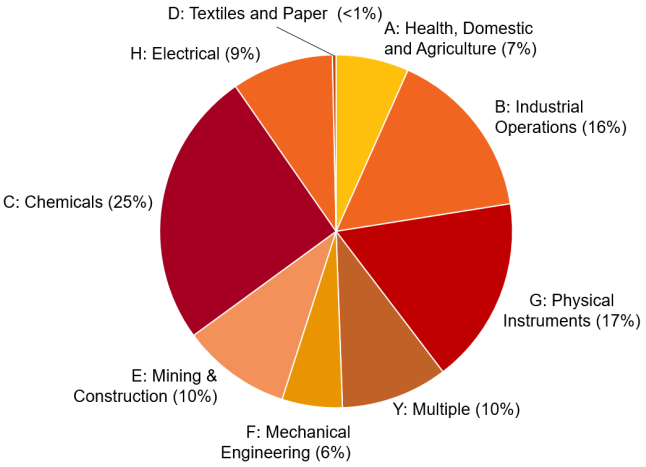


Figure 4-12 *Classification of Saudi Arabian patents between 1998 and 2018 based on the cooperative patent classification. The total number of patent families is 5082.*

and production companies that year[15]. Similarly, SABIC the country's diversified (publicly traded) petrochemical manufacturing company was the largest owner of intellectual property in the Middle East in 2014[16] and has a total patent portfolio of 11,738 patents[17]. Both companies use patent output as an indicator on return on research investment. The data presented in this report shows that patenting in Kuwait is primarily carried out by universities and research institutions, not companies, and therefore the categories of patents are less likely to be representative of the country's economy. Despite this, the level of patenting (i.e. the amount of patents filed) may be effected by the health of the economy and in particular the revenue generated by the oil and gas sector.

5. Recommendations and Next Steps

This report covers Oxentia's findings based on an analysis of the IP outputs from Kuwait between 1998 and 2018. The findings presented here provide an insight into the trends and key producers of IP in Kuwait but the explanations for the trends may be due to multiple factors. Oxentia's conclusions are based on prior knowledge of innovation economies and the results of this analysis. Stakeholder opinions have not been considered as part of this report.

5.1 Continue to Improve Research Commercialisation in Kuwait

Kuwait University and KISR produced 58% of the patents from the top ten patent producers in Kuwait between 1998 and 2018. Both institutes have been exponentially increasing their patent portfolios since 2011. Eight of the remaining top ten patent producers in Kuwait are individuals (who have all received some support from SACGC). The high performers in the patent portfolio are therefore not commercial organisations and the IP is not likely to have a pre-defined route to market.

There are signs that IP is being generated but not being commercialised in Kuwait (such as the number of patents compared to design rights) and the support may not be in place to help these institutions. Oxentia have recently been working with Kuwait University to commercialise their patent portfolio and KISR has its own commercialisation division. Oxentia recommend Kuwait University, KISR and SACGC continue to develop their commercialisation capabilities to improve the level of research commercialisation in Kuwait. This work may be guided by the following recommendations:

- A full review of the Kuwaiti innovation ecosystem, to better understand the strengths and weaknesses and actions required to improve the Kuwaiti innovation ecosystem, including whether patent filing aligns with market trends and what the motivations are for patenting.
- An investigation into why there appears to be such low conversion from patent to product in Kuwait. This should aim to validate this assumption, value the IP in Kuwait's portfolio and try to understand how many patents are supporting products. The investigation should then identify how patents can be translated into products more effectively in Kuwait and benchmark the nation's industrial and product design capabilities.
- Working to understand how the eight prolific inventors mentioned in this report are commercialising their IP (if they are) and what support they may need with this. This information could be made into case studies to create inspiring stories of Kuwaiti innovations.

5.2 Start Examining Patents in Kuwait

Kuwait has been part of the PCT since 2016 and has been accepting patent applications since the same year. However, the Kuwaiti patent office has not started examining or granting patents. The Kuwaiti patent office should be given support to start examining patents as soon as possible. This support may be in the form of:

- Training in how to examine patents
- Secondments to other national patent offices
- In-country support from other patent offices in setting up tools and procedures.

Examining patents in Kuwait should help to develop the innovation ecosystem by making professional advice more readily available and make it easier for Kuwaitis to file patents and protect their innovations.

5.3 Aim to Improve Innovation in Commercial and State-owned Industries

Innovation protected through patents seems to be almost completely absent in commercial and state-owned industries in Kuwait. More work is needed to identify and consult with Kuwaiti companies in industrial and technology sectors to understand how they are currently developing innovation. This stakeholder survey should aim to understand if Kuwaiti companies are investing in R&D internally and/or externally and assess their capability with respect to intellectual property (IP) management. Collaboration within Kuwait and internationally with other commercial and non-commercial (i.e. universities, research institutes) organisations should be investigated as part of this.

The purpose of this will be to identify current issues, gaps and good practice in Kuwaiti businesses. This information can then be used to develop a plan to improve innovation in Kuwaiti commercial and state-owned industries.

End Notes

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