Advancing academic research in the GCC

How to enhance research operations to drive better performance outcomes in Higher Education Institutions

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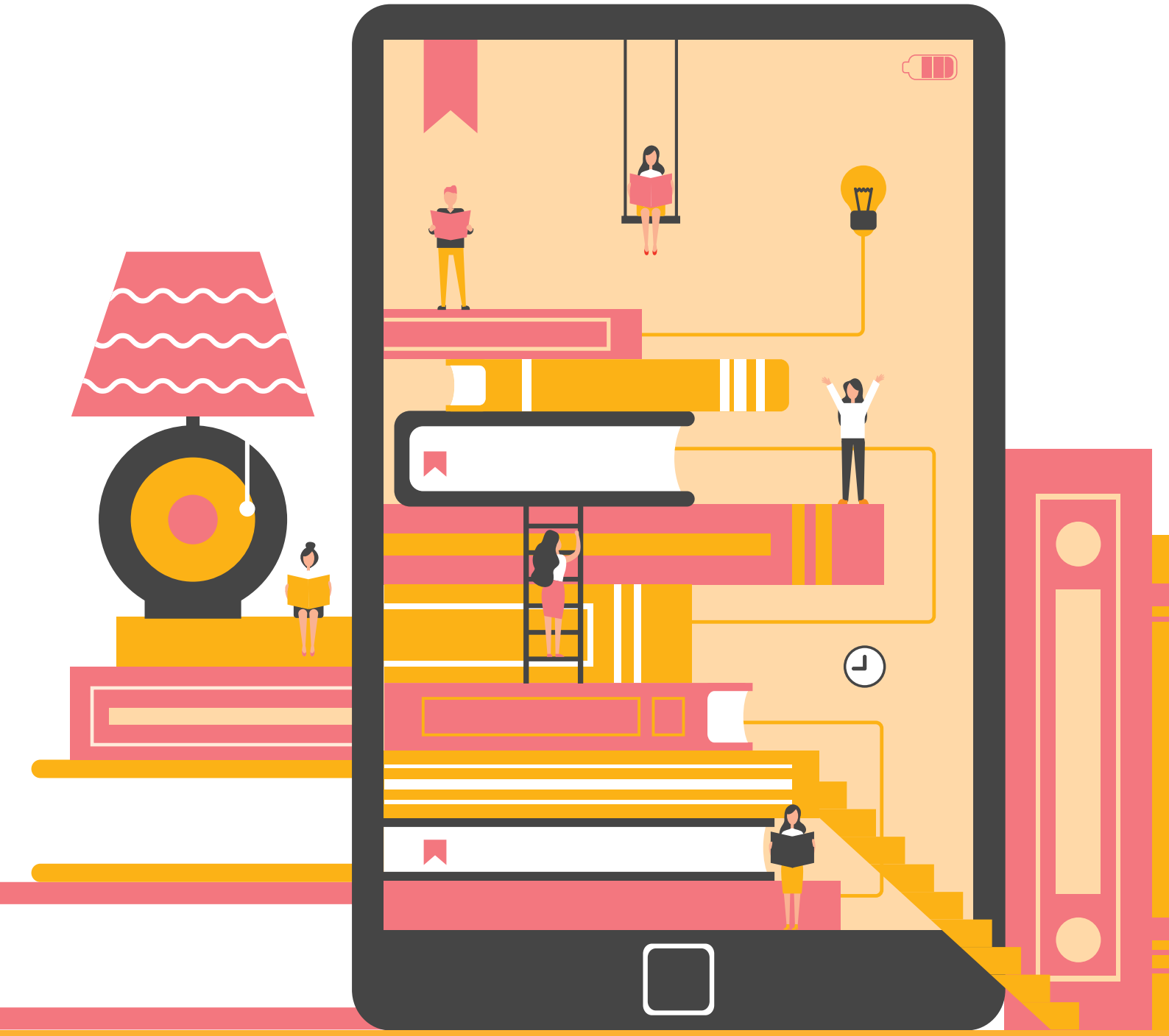

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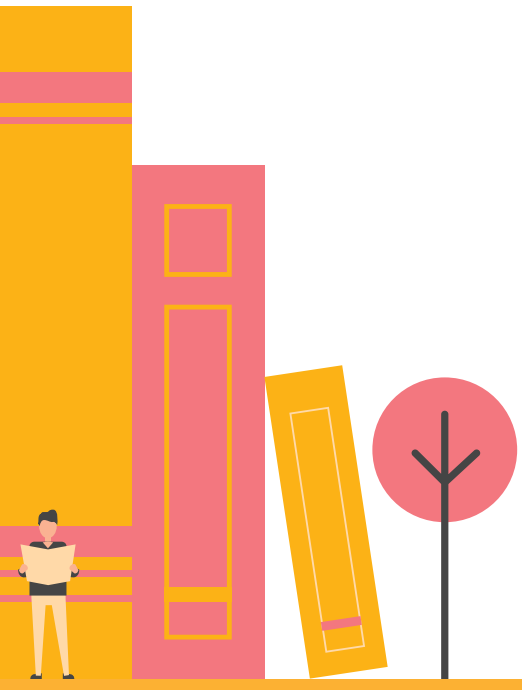


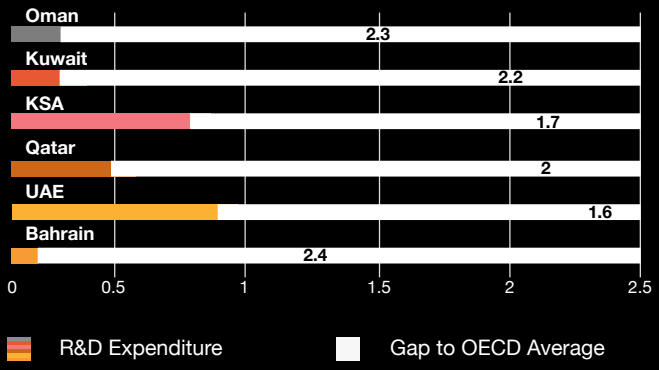
Introduction

Over the past few years members of the Gulf Cooperation Council (GCC) have all stated their desire to move towards becoming knowledge-based economies. The shift is part of their wider efforts to diversify away from relying on oil revenues and create more opportunities for workers.

Knowledge-based economies start from a foundation of research, but it's important to note that a well-functioning research ecosystem is challenging to build. It is clear that while funding is vital, if it is given to researchers without the right support their work will not translate into quality research.

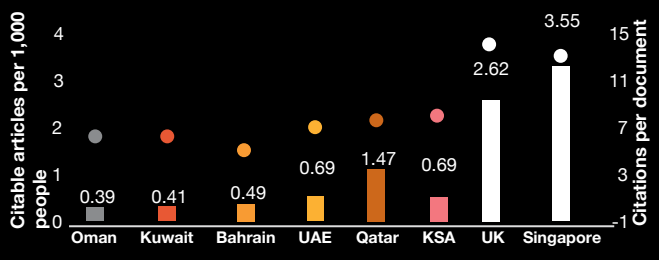
This paper discusses the status of research in the GCC, presents a view of the challenges from the perspective of researchers, and offers recommendations on the key components and dynamics that need to work better to maximise the chances of success.

1.1 Ratio of R&D expenditure to GDP



Work Bank Data

1.2 Citable articles per 1,000 people (2018) and number of citations per document



Scimago Journal & Country Rank

Despite increasing their investment in research infrastructure, GCC governments remain a long way behind established knowledge economies (see figure 1.1), according to the World Bank.[1] Figures also show that the relative quantity and quality of research coming from GCC institutions remains low, as evidenced by the citable articles per 1,000 people (figure 1.2).[2] It is clear that while funding is vital, if it is given to researchers without the right support their work will quickly be overtaken by other research teams in similar fields who are better supported and more focused.

In addition to the ability, or lack of, to publish in English being a common barrier to generating international citations, recent survey results and discussions with aspiring research universities have helped us identify four key challenges within the GCC research ecosystem.[3] These challenges will need to be tackled holistically by Higher Education Institutions (HEI's), government and private industry alike to achieve meaningful change.

1. Limitations within academia, with the top five being:

- Lack of time for research
- Scarcity of PhD programs
- Limited funding
- Inappropriate/weak administrative support
- Lack of collaborative platforms and communication tools

2. Scarce partnerships with international researchers and the private sector

- **Limited global and local networks:**
  Studies show that collaboration with international researchers positively affects research productivity.[4] The lack of communication channels such as voice over IP (VoIP), for example, can exacerbate the problem.
- **Limited R&D partnerships with industry:**
  Industries look for research partnerships to foster the innovation process. The number of researchers collaborating with the industry is very limited.

3. Limited influence on the public sector agenda:

The GCC research community has only a limited role in shaping the national policies.

4. Insufficient IP regulations:

In most GCC countries, the current IP regulatory framework does not sufficiently support research commercialisation.

Governments, for example, need to develop a clear national research agenda, establish the right legal framework, distribute research funding effectively, incentivise academic-industry collaboration, and empower institutions and individuals. Universities need to improve their research facilities and support. Too many have out-of-date and bureaucratic recruiting and procurement policies, for example, that are designed for organisations with a totally different purpose. And local industry needs to learn to be more open for academic collaboration and trust in the capabilities of researchers in their own region.

Without action, the region risks continuing to lose promising researchers to countries with ecosystems that are more agile and conducive to high-quality research.

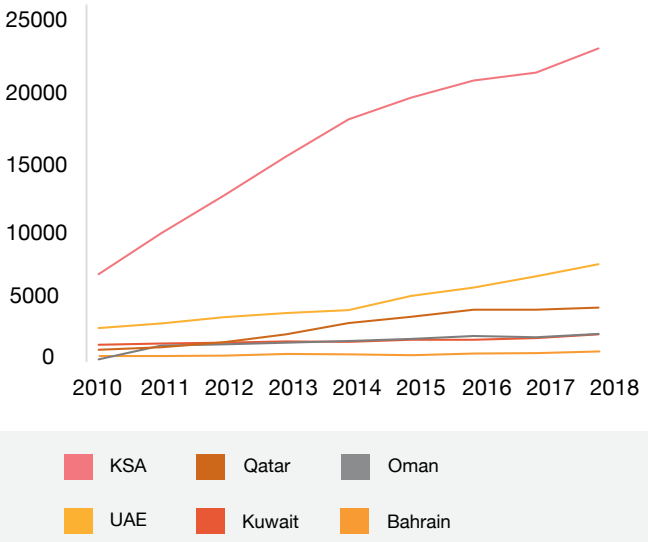
The research environment in the GCC

An overview of research performance in the region

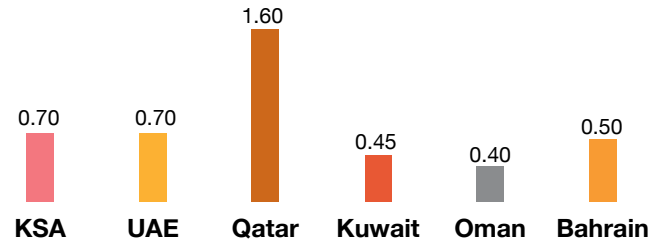
Several indicators can reflect the performance of research, such as publication counts, citations, patent counts, and the impact of their research on the society and economy. Citation levels notwithstanding, there has been a rapid growth in the volume of academic research in the region since 2010, noticeably in Saudi Arabia (KSA), United Arab Emirates (UAE), and Qatar. Last year, the KSA produced the most research by far, with more than 23,000 academic papers published, followed by the UAE, with just over 7,000, and Qatar producing just under 4,000.[5]

When looked at in terms of size of population, Qatar is performing well regionally, with a ratio of 1.6 publications to every thousand inhabitants. However, this is still relatively low compared with a research focused country such as Singapore, for example, where the ratio is 3.6 (figure 1.2).[6]

2.1a Publication volume per country



2.1b Ranking of countries based on publication ratio per 1000 inhabitants



Scopus Database, World Bank and PwC Analysis

Despite increases, the volume of publications is still relatively low compared to other countries outside of the GCC

Global and local connectedness

While collaboration between GCC countries with other countries leading to coauthored papers is 68% (see figure 2.2)[7], collaboration between the region's universities and with industry in R&D is still very limited. Qatar has the highest GCC ranking for "university-industry collaboration in R&D" at 17, followed by the UAE at 28 and Oman at 37 in the Global Knowledge Index.[8]

Within the GCC, researchers are collaborating mostly with KSA peers

2.2 International research collaboration in the GCC

KSA **23,448** Publications	**Co-authored with** 1. Egypt 2. USA 3. India
UAE **7,238** Publications	**Co-authored with** 1. USA 2. UK 3. Canada 6. KSA
Qatar **3,961** Publications	**Co-authored with** 1. USA 2. UK 3. China 7. KSA
Kuwait **1,915** Publications	**Co-authored with** 1. USA 2. Egypt 3. UK 4. KSA
Oman **1,989** Publications	**Co-authored with** 1. India 2. USA 3. UK 4. KSA
Bahrain **679** Publications	**Co-authored with** 1. KSA 2. USA 3. UK 6. UAE

Scopus Database

Disciplinary mix of research

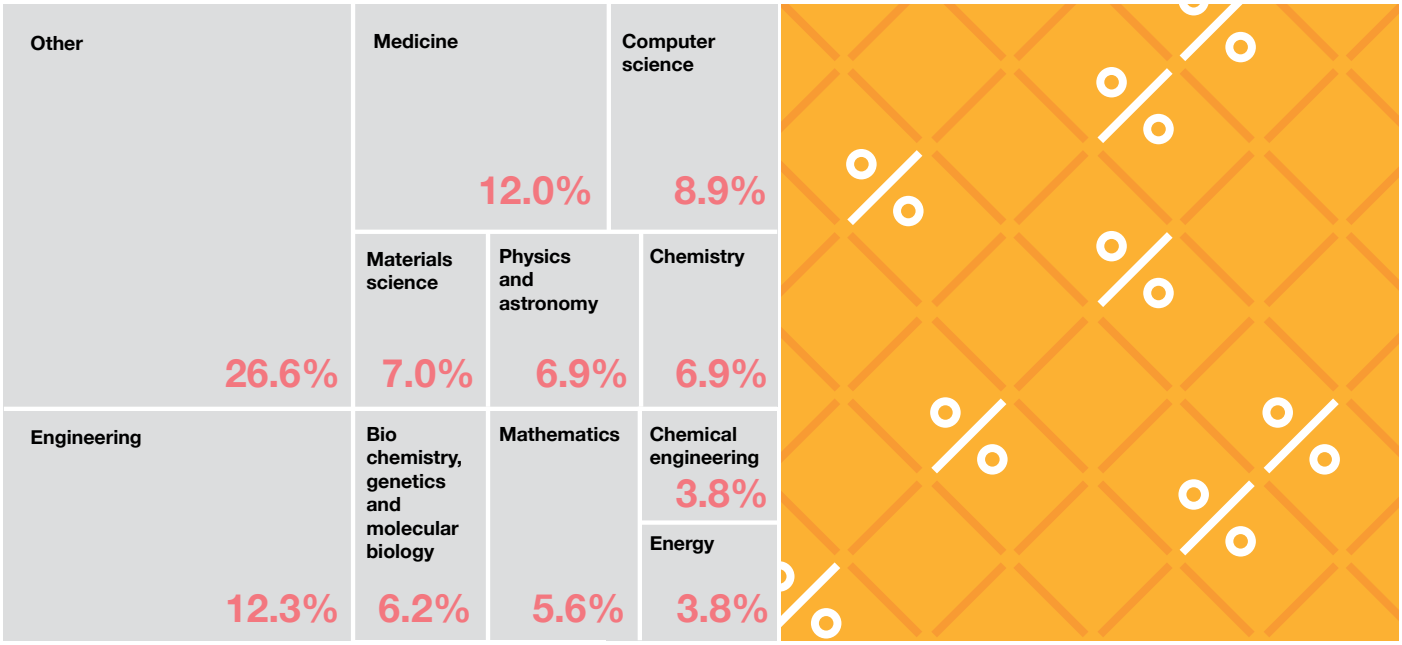
Engineering, medicine and computer science dominate the GCC countries' research base (see figure 2.3)[9], but the mix varies by country and remains limited in range. In the KSA, for example, the largest volume of publications since 2010 were in medicine, with engineering second, followed by chemistry. Whereas worldwide, engineering is the most published subject, with 16% of the total, followed by computer science and medicine on 12% and 11% respectively (see figure 2.4).[10]

The MoE's Vision 2030, a regional program of economic reform, sets out ambitious goals for innovation and includes R&D investment of $1.6bn USD over the next few years. Within this sum $75 million USD has been allocated to support international partnerships and this funding may trigger a broadening out of disciplines. Indeed, Times Higher Education reports that: "The Saudi Research and Development Office has identified six priority fields for international research collaboration: water; energy; information technology; petrochemicals; life sciences and health; and the environment."[11]

2018 data shows that the research focus in **KSA** is shifting to **engineering**

Energy is an increasingly popular research subject in the **UAE**

2.3 Percentage of publications by subject area in the GCC



2.4 Research priorities in KSA and UAE

Saudi Arabia

Since 2010	In 2018
1. Medicine	1. Engineering
2. Engineering	2. Medicine
3. Chemistry	3. Computer science
4. Materials science	4. Materials science
5. Physics & astronomy	5. Physics & astronomy

UAE

Since 2010	In 2018
1. Engineering	1. Engineering
2. Computer science	2. Computer science
3. Medicine	3. Medicine
4. Social sciences	4. Energy
5. Energy	5. Physics & astronomy

How universities are contributing to the research agenda

Among the GCC countries, KSA, UAE and Qatar are producing the majority of GCC publication volume, with a large proportion from KSA universities (the highest four universities among the top 10 in the GCC). The chart below shows the rankings of the top 10 universities in terms of the number of publications produced by each university.

University	
Since 2010	2018
Ranking (total publications)	**Ranking (2018 publications)**

KAUST

Since 2010	2018
3 (13,970)	3 (2,025)

King Abdulaziz University

Since 2010	2018
2 (31,846)	1 (4,657)

King Saud University

Since 2010	2018
1 (37,337)	2 (4,629)

KFUPM

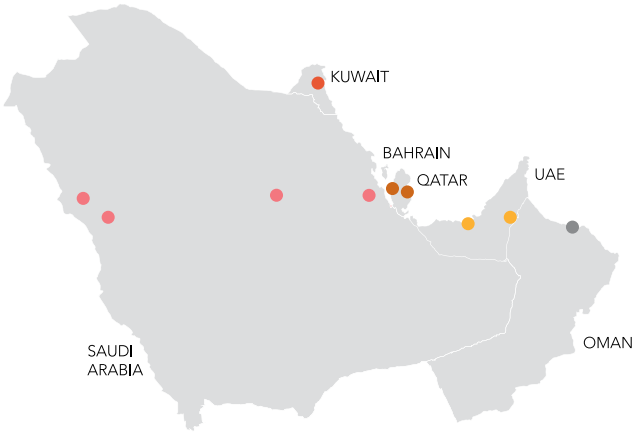
Since 2010	2018
4 (11,290)	4 (1717)

University of Kuwait

Since 2010	2018
9 (6,360)	9 (796)

Sultan Qaboos University

Since 2010	2018
8 (6,576)	8 (912)



Texas A and M University

Since 2010	2018
10 (4,060)	10 (701)

Qatar University

Since 2010	2018
6 (8,328)	5 (1,541)

Khalifa University

Since 2010	2018
5 (9,000)	6 (1,234)

UAE University

Since 2010	2018
7 (6,603)	7 (947)

KSA Qatar Oman
UAE Kuwait Bahrain

Scopus Database

The UAE has a large number of universities relative to the size of population, with 78 universities for some 8 million inhabitants between 16 and 64 years old – a ratio of just over 9.5 universities per million inhabitants. Comparatively the UK has 130 universities for nearly 64 million inhabitants between 16 and 64 years old – a ratio of around two universities per million inhabitants.[12]

However, only a small number of the UAE's accredited universities are genuinely active in competitive research (see figure 2.5).[13] The combined research output of the UAE is modest and comparable to one research-intensive university in the UK.

Seven universities dominate the research output of the UAE

It's worth noting that papers developed through international collaboration showed a higher impact than those with single country authorship. And international collaboration appears to be increasing. Between 2015-18, on average 61% of published research papers had international co-authors, rising to 70% last year.[14]

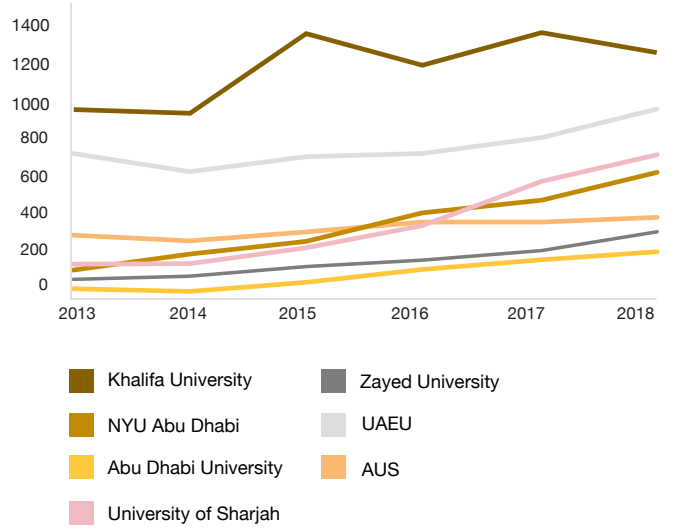
Where there are international links – Khalifa University mainly with MIT, for example, UAE University and NYU Abu Dhabi – they are driven by individual researchers or institutional relations.

There is also minimal local collaboration between universities in the UAE – an issue the funding entity could address through conditional research funding.

UAE universities focus on a range of disciplines (see figure 2.6).[15] Khalifa University has a strong presence in engineering, computer science and materials science. Meanwhile UAE University focuses on medical research, and in recent years has been increasing its focus on engineering and computer science too.

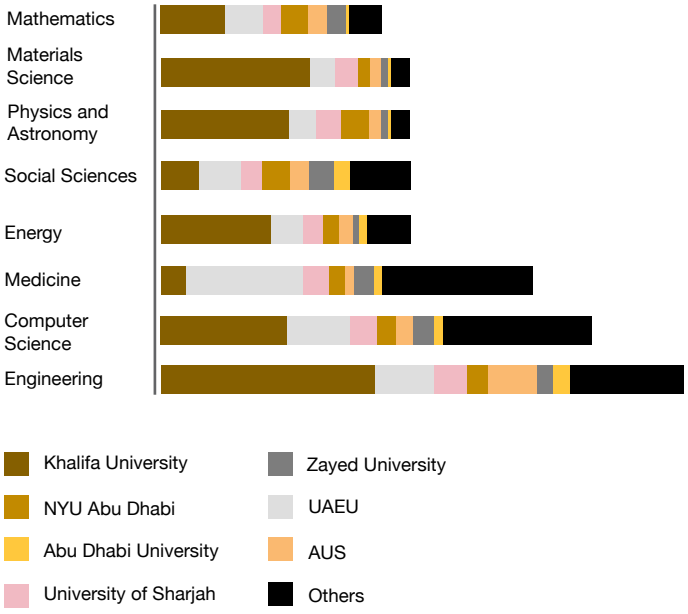
Several universities in the UAE have also started PhD programs to support research activities and contribute to the international research community. It seems that the number of PhD students across the country has grown as a result, with the majority of them being hosted by Khalifa University, UAEU and the University of Sharjah. This growth is expected to continue in the coming years.

2.5 Number of research papers per year for UAE universities



Scopus Database

2.6 Relative research strengths of major UAE universities



Scimago Journal & Country Rank

Improving research performance and impact

Understanding the researcher role

Universities are central to any country's research output. In the GCC, universities are the main source of publications and they rely mainly on faculty, post-doctoral researchers and PhD students.

As the OECD makes clear, research is a people business. It defines research as: "Creative and systematic work undertaken to increase the stock of knowledge, including knowledge of humans, culture and society, and the use of this stock of knowledge to devise new applications".[16] Without talented people involved in research activities, it is difficult to create, share, and apply quality knowledge. A lack of such individuals is the first challenge.

Research is a creative activity that requires talented people who are engaged and focussed

The total number of individuals contributing to intramural R&D (at the level of a statistical unit or at an aggregate level) is modest in GCC countries, averaging around 1,000 researchers per million inhabitants. In the UK, the number is more than seven times higher.[17]

Within the region, the KSA has the largest number of professionals engaged in research as a proportion of the labor force, but it lies 52nd among the 134 countries ranked by the Global Knowledge Index.[18]

PhD students and post-doctoral researchers play a major role in the research performance of a university. There are around 1,400 PhD students enrolled in the UAE's nationally accredited universities (i.e. excluding universities in the free trade zones), and around five times that number in the KSA at approximately 7,000.

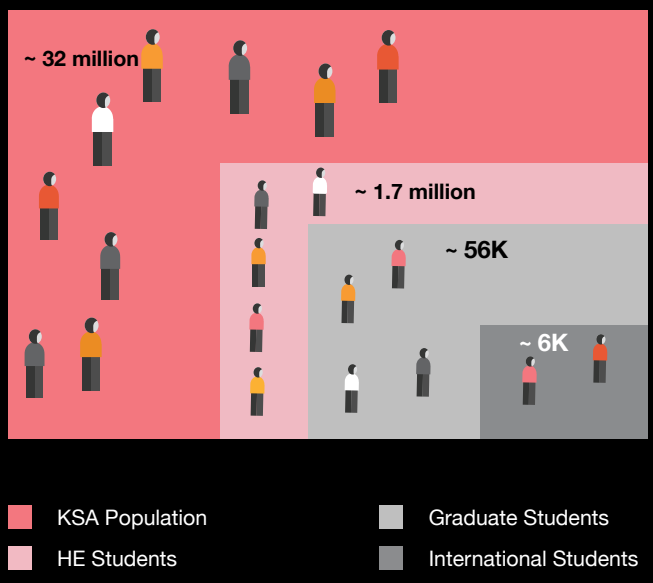
In addition, it should be noted that some 13,000 KSA PhD students study abroad. In fact, the number of PhD students staying in their home country in the GCC is still small compared with international averages. In the KSA, for example, the number of PhD students per 1,000 inhabitants aged 15 - 64 is 0.34; in the UK that number is 2.69. The OECD average is 1.25.[19]

GCC countries recognise the importance and urgency of increasing the number of PhD students, and of launching post-doctoral research programs. Some have already instituted policies to help. For example, the UAE Higher Education Strategy 2030 sets clear objectives for increasing the number of PhD students by increasing support for postgraduate funding,[20] however they have a lot of ground to make up.

GCC governments are taking actions at a strategic level to increase the number of PhD students, but this vision needs to be actualised

The number of postgraduate students in the KSA represents around 3.3% of the total number of students in higher education (see figure 3.1).[21] This proportion is very low compared with other countries such as the UK, where postgraduate students represent about 24% of the total. But the situation is improving.

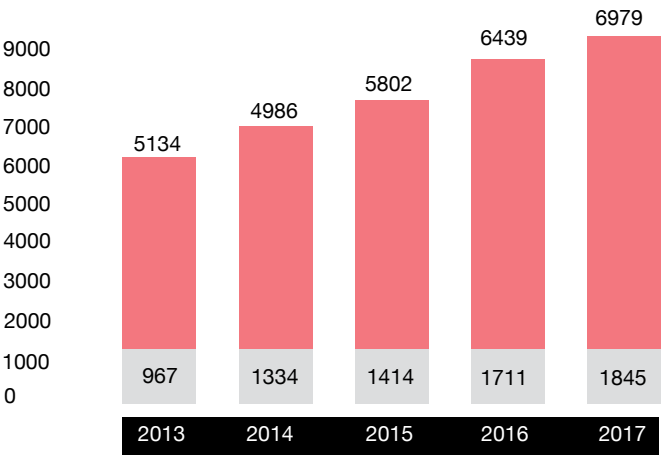
3.1 Graduate studies in Saudi Arabia



UNESCO Institute of Statistics, MoE Data KSA, PwC Analysis

The number of PhD students in the KSA has been growing over the past five years, with the number of enrolled PhD students up 36% between 2013 and 2017 (figure 3.2).[22] This growth is expected to continue.

3.2 Growth in PhD students in KSA



MoE Data, KSA

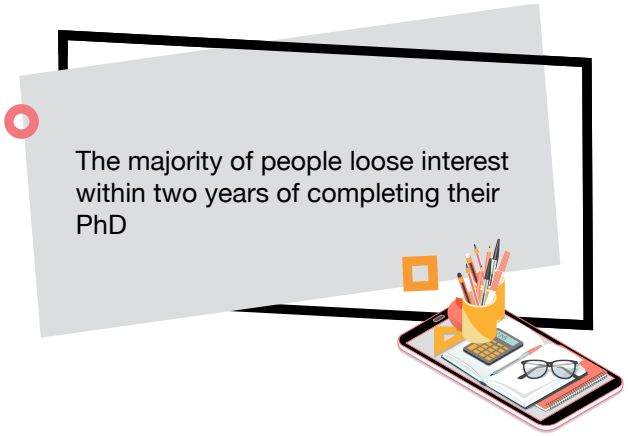
There is also a challenge around ensuring PhD students finish their theses and continue with research after they have graduated.

Several universities in the KSA offer PhD programs and its universities awarded 379 doctorate degrees last year (see figure 3.3).[23] However, the dropout rate is high, suggesting that the programs fail to support PhD graduates, and few offer a competitive opportunity to progress to post-doctoral programs.

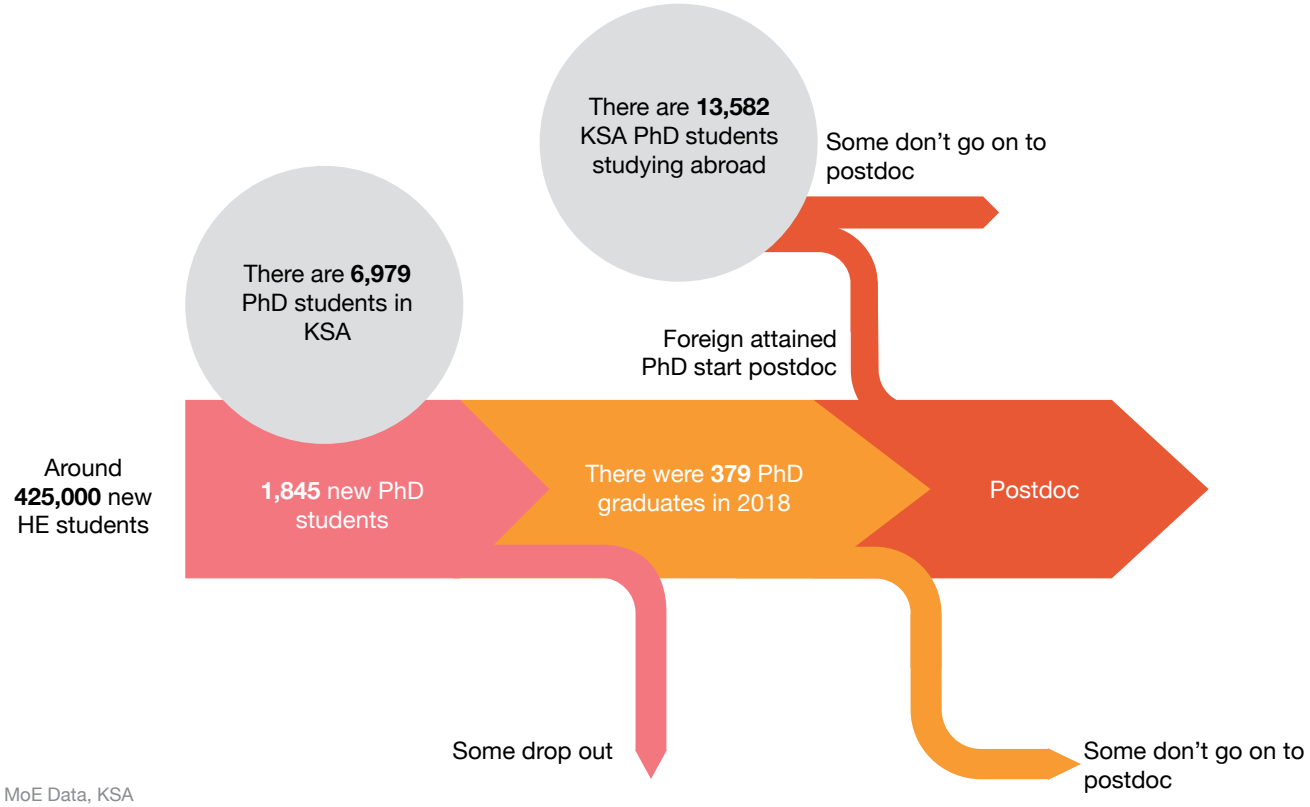
Universities rely mainly on government and industry to fund post-doctoral study. The Saudi Ministry of Education recently launched just such a program, funded by its Research & Development Office, to support postdoctoral research in the country.

But even with more funding the challenge remains to attract qualified researchers to pursue successful postdoctoral careers. In a survey conducted by Sinche (2016) on the value of their postdoctoral position, only around 40% said that it was either what they wanted or what they would prefer.[24]

A career in research is generally influenced by intrinsic motivation. Based on our experience and discussions with multiple research centers, it is clear that the majority of people lose interest in research within two years of completing their PhD. GCC universities will need to develop strategies to attract and retain researchers, as pursuing such a career is becoming increasingly challenging.



3.3 The path to postdoc research in KSA



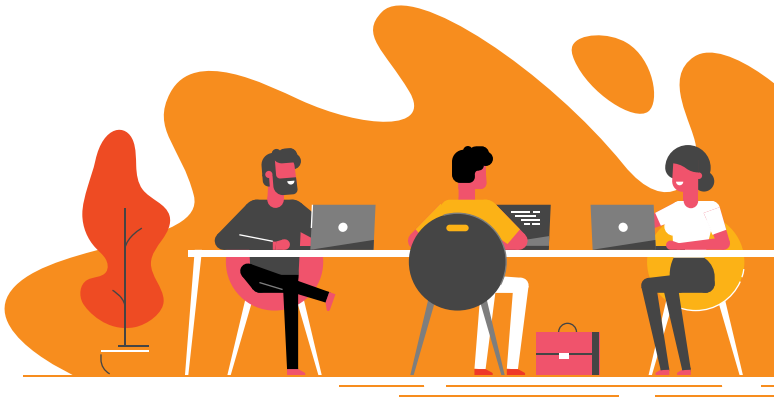
MoE Data, KSA

What universities and research institutions can do to improve research performance

A country's ability to value, absorb, and apply new knowledge depends greatly on the investment it makes in research and development, and how it builds local capabilities to innovate and gain a competitive advantage from that knowledge. For GCC members to increase their ability to do this they need first to recognise the role that researchers play in shaping the future knowledge-based economy and inspiring innovation in a nation.

Funding agencies, universities and research institutions must shape their policies to make research opportunities attractive, facilitate the research process, and ensure positive "return on funds". Such well-established research ecosystems will enable institutions to address the challenges and, accordingly, enable the country to achieve its research targets.

> Inspiring innovation, having the right policies and investing in research operations and capabilities are essential to building a successful research ecosystem



Identify, acknowledge and address researchers' challenges

Working with several research institutions, we have identified a number of challenges for researchers that if addressed could stimulate more and better research.

1 Attracting and retaining students

- The inability to demonstrate the value of research and its impact deters many serious researchers
- Failure to support PhD holders immediately following their graduation means many leave research within the first two years

2 Application for funding

- Lack of competitive research funding opportunities inhibits quality
- Lack of transparency on how research funding is awarded

3 On-boarding

- Lack of clarity over objectives, roles, and responsibilities (contracting)
- Lack of access to resources and services (guidelines, libraries etc)
- Failure to assign mentors or supervisors aligned with researchers' interests

4 Mentoring and training

- Lack of appropriate development opportunities
- Lack of support in building a network and academic reputation
- Lack of opportunities to collaborate with peers and international experts

5 Administrative support

- Complex regulations and lack of support systems
- Anxiety about reporting and compliance distracts researchers from their work, and causes concern about losing research funding

6 Post-research support

- Misunderstanding IP regulations
- Challenges in getting results published
- Lack of opportunity to implement research outcomes to solve industry problems

Imagineer* an end-to-end researcher journey

Research is a human-based activity by nature, with researchers at its center. A good research experience will help address the key challenges and significantly improve the research performance of the individual and the institution.

A good researcher journey provides an overarching view on the research activities in an institution, breaks down the functional silos to integrate all research "personas" across the institution, and helps define clear roles and responsibilities throughout. This enables a seamless research experience and improves operational efficiency. This, in turn, improves researcher productivity and outcomes.

We have identified five steps universities and research institutions can take to improve their researcher journey.

Imagineering the researcher journey provides more agility and enables improved outcomes

1 Understand the researcher and develop 'personas'

2 Map a journey involving all stakeholders

3 Identify areas for improvement and map the 'to be' journey

4 Reconfigure the organisation around the researcher journey

5 Build digital solutions to enhance the journey

These five steps will make it easier to:

- Attract and recruit qualified researchers and design a seamless on-boarding experience
- Define research goals and better help researchers to integrate with relevant research teams, and with the wider research environment
- Offer mentoring and support when it comes to managing funds, handling legal issues, building a network, and self-development
- Publish research, manage the intellectual property process and help researchers build a strong research record and reputation
- Comply with funding agency regulations, report outcomes, and better define implementation opportunities

* "Imagineer": to devise and practically implement a new or highly imaginative concept

Define the research strategy and create a well-structured comprehensive research office

GCC governments are responsible for setting the national research agenda. They create the national structural and legal frameworks that foster the research ecosystem. This in turn enables quality research that can be applied to industry. It is in their interests to get this right because a strong research system can enable innovation across the country and contribute to economic growth.

> University research services can be structured around the researcher journey for improved experience

Universities and research institutions should develop a focused research strategy aligned to the national agenda. This strategy should set the targets and lay the groundwork for quality research activities both within each institution and in collaboration with local and international entities, as well as industry partners. But a word of warning: many universities and research institutions tend to set aggressive growth targets. While high targets are not always a problem, in reality they may incentivise the kind of behavior that leads to a higher volume of lower-quality research.

Universities in the GCC need to build comprehensive research offices to oversee administration for researchers, in line with global best practice, and support them in their work. These research offices should be staffed by managers and professionals with the appropriate experience and qualifications. [25]

Lastly, for the research office to be effective, it should work with the researchers throughout their journey, at all stages of development.

Digitally enable advanced research management and execution

New technologies are increasingly being used to solve complex problems in many industries. Research is no different.

An effective and seamless research management process relies on a secure, user-friendly, web-based information system that supports the administrative tasks related to fund applications, reviews, feedback, funding, contracting, and payment. It also provides management with timely reports that enable informed strategic decision-making.

Technology also brings benefits to the researcher as it can help improve their performance and efficiency, and make collaboration easier. Artificial intelligence (AI), for example, is already being employed to manage interdisciplinary research to make collaboration easier among co-researchers.

In the US, researchers at Carnegie Mellon University have developed a system that can be used to coordinate short pieces of writing by different people and link them together into one quality article. The system is also able to distribute tasks intelligently based on the history of the researchers/ writers involved and their experience. Meanwhile, natural language processing (NLP) techniques are being used to support the literature review process that researchers undertake. In one example, these techniques are helping to build an interdisciplinary research map based on a defined problem statement.

Such tools can play a significant role in improving quality and reducing the time required to accomplish the task, in addition to increasing interdisciplinary inspiration.

Research related systems can be classified into three main categories

Research information systems: to manage and facilitate the administration of the research process

Research support tools: to help researchers to conduct their research (e.g. survey tools)

Research collaboration and communication tools: to facilitate the collaboration between different researchers (e.g. brainstorming and note- sharing tools, or online notepads)

The drive towards cultivating a knowledge-based economy is strong across the GCC. Although steps are being taken to build research-driven ecosystems, there is still much to be done to up the pace and compete with more mature knowledge economies. This presents both challenges and opportunities which will need to be addressed not just by the research institutions themselves, but other parties such as the government and private industry to be truly effective. Improving the research environment, strategy, journey, funding and opportunities will help to attract overseas researchers and keep local academic talent in the region, and ultimately lead to higher quality research and performance outcomes. If the key components and dynamics can work together more effectively, then the GCC will enjoy a much greater chance of success in building a thriving and sustainable academic research ecosystem.

Contact us

We can support you with:

Research diagnostics. Our Agile University Diagnostic Framework can help institutions assess their research strategy, quality and performance, This process can also identify key challenges and provide recommendations for improvements.

Research strategy alignment. This enables institutions to develop and align their research and innovation strategy with the national agenda and evaluate the desired objectives.

Imagineering the researcher journey. This is a key step in building an efficient, research-centric institution that is digitally enabled and agile enough to achieve research targets.

Research and fund management. Building a comprehensive research office will enable you to oversee administration for researchers and support them in their work.

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23 MoE Data (KSA)
24 Sinche, M., 2016. Next Gen PhD, Harvard University Press.
25 Inspired by work done in collaboration with Stanford Research Institute (SRI)

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