

مجلس التعليم العالي
Higher Education Council

National Research Strategy

2014 - 2024

*CREATING A SMART BAHRAIN
Based on
KNOWLEDGE & INNOVATION*

2030
البحرين
BAHRAIN



**HIS ROYAL HIGHNESS
PRINCE KHALIFA
BIN SALMAN AL KHALIFA**
**THE PRIME MINISTER
OF THE KINGDOM OF BAHRAIN**



**HIS MAJESTY
KING HAMAD
BIN ISA AL KHALIFA**
**THE KING
OF THE KINGDOM OF BAHRAIN**



**HIS ROYAL HIGHNESS
PRINCE SALMAN
BIN HAMAD AL KHALIFA**
**THE CROWN PRINCE,
DEPUTY SUPREME COMMANDER
AND FIRST DEPUTY PRIME MINISTER**

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Ministerial Introduction

Launching the first national strategy for research initiated by the Higher Education Council opens the door for an advanced stage of improving the higher education and research sector, to enable this vital sector to go beyond teaching to producing knowledge and conducting quality researches, which will contribute in the overall development of our country under its leadership.



Consultation over several months has been extensive and involved the input of all the key stakeholders from different sectors and areas in Bahrain who have an interest in this agenda. Hence, the strategy summarized in this document is the result of national teamwork and the outcome of consultation and workshops with research institutes, universities, researchers, academics, employers, NGOs, Ministries and Government agencies. In preparation of this strategy, a broad analysis of the Bahraini research system was performed focusing on strengths and opportunities and taking into account the national priorities and economic context, whilst considering the effects of globalization and cooperation within the GCC. Domestic and international studies and reports were consulted, success models and practices benchmarked, and statistical data and strategic plans were reviewed, aiming to ultimately transform to knowledge-based economy and develop knowledge society through effective use of research results in the priority areas in which investment should be concentrated in the coming years.

Finally, I would like to express my thanks to all those who have contributed to this strategy and I hope to see Bahrain establish itself as a significant contributor of research, particularly within the GCC in the future.

Dr. Majid bin Ali Al-Nuaimi
Minister for Education
Chairman of the Higher Education Council

Foreword by the Secretary General of the Higher Education Council



Research and innovation are not like any other solutions for the future. They are the main and sometimes the only tools with which to build tomorrow's world for Bahrain. Therefore, we must create the necessary conditions that will allow research to grow and thrive in our nation in order to create a SMART economy.

For the nation's future prosperity, Bahrain must adopt and implement this national research strategy, which is based upon three key pillars: It is a realistic strategy based upon the analysis of the current status of research in Bahrain and upon tomorrow's challenges and opportunities. It is a true National strategy, its priorities defined by the country's needs, limitations and opportunities, and all stakeholders have had their input in shaping it to be reflective of the research needs of the various sectors in the country. And finally, its priorities will be integrated into the planning of research institutes and universities whose role is to take this strategy forward. It must be understood that research is a core pillar of any university that has ambitions to be recognized internationally.

At the heart of the National Research Strategy is the burning ambition to put research at the center of Bahrain society and the economy. The next steps of the Higher Education Council are to coordinate our actions and resources to respond to the challenge of implementation.

I would like to thank all those who contributed to the development of the strategy, especially our partners at the Stanford Research Institute. My thanks go to the Higher Education Council, chaired by His Excellency the Minister of Education, for its continuous support.

Prof. Riyad Y. Hamzah
Secretary General
of the Higher Education Council

Introduction

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*. This summary of the strategy highlights why research is important to Bahrain, the current state of research in the Kingdom, the vision and goals for the strategy, and its key objectives and initiatives.

Research and its Importance for Bahrain

Research creates new knowledge that contributes to the development of technology and the solution of problems. Technology development, in turn, underlies much innovation, productivity growth, and economic growth.

More broadly, research is an essential component of successful knowledge-based economies. No country can succeed in a knowledge-based economy without strong higher education institutions, and research is essential to having strong universities. Research is needed to attract top international faculty and to have strong graduate programs.

Research is also vital to be able to acquire and use knowledge and technology generated elsewhere in the world. Companies, universities and medical centers, that are active in research tend to stay at the forefront of their fields and are more aware of advances occurring around the world. Researchers who produce knowledge are invited to participate in the forums and networks where new knowledge and technology emerge. Research and development are also needed to test and adapt technologies from around the world for use in Bahrain.

Research in Bahrain is also critical to provide solutions to Bahrain's specific needs -- local and regional problems for which ready solutions often are not available. These include unique local industrial or business problems, as well as health, environment, economic, or social needs. Sustainability – a principle underlying Vision 2030 – is an example of an area that requires local as well as global research into environment, energy, and economics.

Research and Development

- **Research** is the systematic investigation into existing or new knowledge. Research may be undertaken primarily to acquire new fundamental knowledge (basic research) or to acquire new knowledge for a specific practical objective (applied research).
- **Development** is systematic work directed to producing new or improved materials, products or devices, processes, systems and services.
- **Research and development** or “**R&D**” covers both work to create new knowledge and use it to improve technologies. R&D is closely linked to **innovation**, which can be defined as the introduction of new ideas, devices, or methods *into use*.

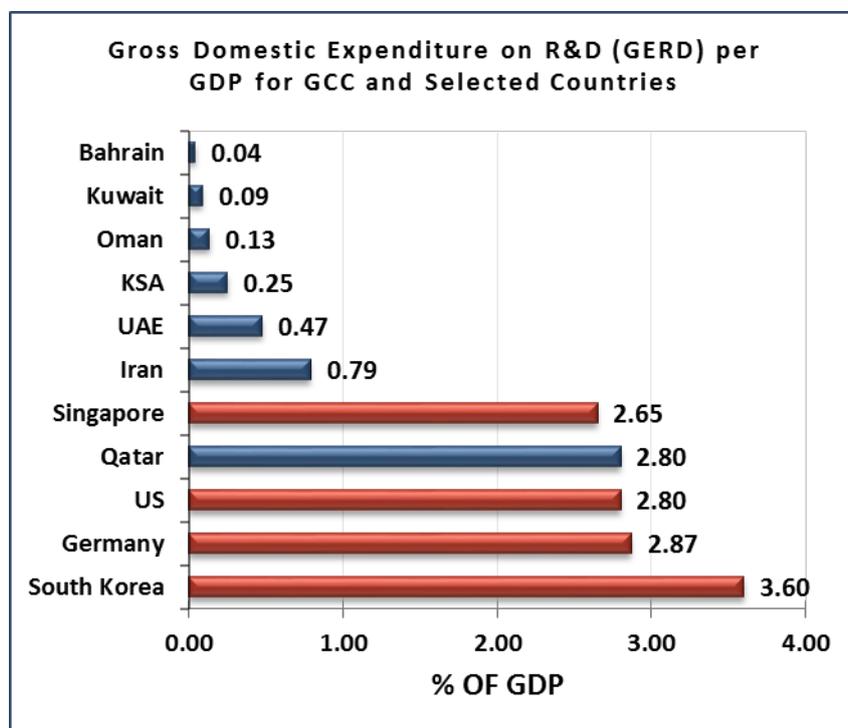
Benchmarking Bahrain's Research Capacity

How does Bahrain compare to its peers in research? A key measure is Gross domestic expenditure on R&D (GERD) as a percent of gross domestic product (GDP). Many industrialized countries have been investing in R&D for decades and for OECD countries, GERD/GDP averages about 2.2%. Some newly industrialized countries, such as South Korea and Singapore have rapidly increased their R&D levels to those of the most advanced countries, with current GERD/GDP of 3.6% and 2.65 respectively.

Compared to GCC countries, Bahrain's GERD/GDP 0.04%.

GERD

Gross domestic expenditure on R&D (GERD) is the total intramural expenditure on R&D performed on the national territory during a given period; typically normalized by expressing it as a percentage of GDP, and this measure is highly positively correlated with the level of economic development of a country.



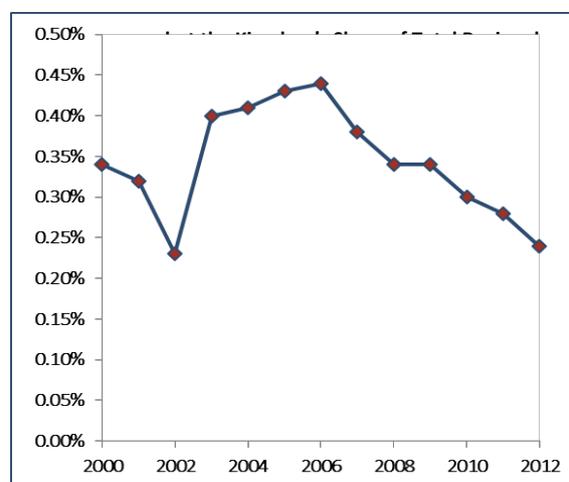
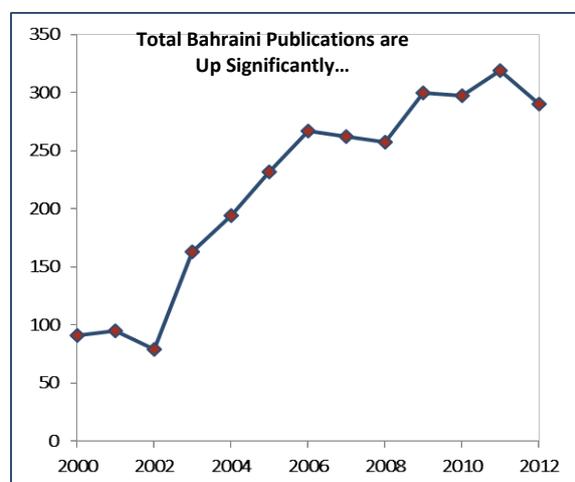
Source: UNESCO Institute for Statistics, Battelle R&D Magazine

Beyond R&D spending, other international indicators of the status of Bahrain’s research in innovation system are competitiveness and university rankings. Bahrain ranked 43rd out of 148 countries on the Global Competitiveness Index (GCI) (2013/14), lower than other GCC countries. Bahrain ranked low among its regional peers on ratings of the quality of scientific institutions and university-industry collaboration.

Table 1. Global Competitiveness Index (GCI) 2013/14 Rankings for GCC and selective countries

Country	Population (million)	GDP (US\$ billion)	GCI Ranking	Capacity for Innovation	Quality of Scientific Institutions	Company R&D Spending	University - Industry Collaboration
Finland	5.4	250.1	3	2	10	3	2
Singapore	5.2	276.5	2	18	11	8	4
Ireland	4.6	210.4	28	20	14	21	13
KSA	28.1	727.3	20	43	39	27	31
UAE	7.9	358.9	19	39	34	24	24
Kuwait	2.8	173.4	36	136	110	126	120
Oman	2.8	76.5	33	61	71	47	45
Qatar	1.9	183.4	13	17	12	9	7
Bahrain	1.3	27	43	82	114	99	121

Based on scholarly publication as a measure of research output, Bahraini universities do not appear on the SIR Global Ranking of research institutions in 2013. In 2009, the most recent year when a Bahraini university appeared in the University of Bahrain ranked 2252. Although the total number of Bahraini publications has increased since 2000 (about 300 publications a year), the Kingdom’s share of total regional publications has been declining. The University of Bahrain and the Arabian Gulf University authors are on the majority of Bahrain publications.



Source: SCImago Journal & Country Rank (from Scopus/Elsevier)

Current State of Research in Bahrain

The strength, weaknesses, opportunities, and threats (SWOT) analysis below summarizes the findings from 35 stakeholder meetings and interviews with more than 90 individuals, as well as two workshops with the Bahrain research stakeholder community conducted between November 2013 and February 2014.

Table 2. SWOT Analysis of Bahrain's Research System: Current State Assessment

Strengths	Weaknesses
<ul style="list-style-type: none"> ▪ Leadership recognizes the need to invest in research ▪ Resources can be leveraged from both public and private actors ▪ Well-developed human capital ▪ Eagerness across individuals and institutions to improve Kingdom's research capacity and impact 	<ul style="list-style-type: none"> ▪ Science agencies, funding, infrastructure, and research culture largely absent ▪ Collaboration, linkages to global networks, data, strategic direction are weak ▪ Research funding has been modest
Opportunities	Threats
<ul style="list-style-type: none"> ▪ Strong & vibrant financial and banking sector ▪ Opportunities for regional research leadership in targeted areas ▪ Open environment conducive to successful research ▪ Chance to leap-frog given there are no legacy constraints 	<ul style="list-style-type: none"> ▪ Increasing competition from neighboring countries with immense resources ▪ Due pressing national priorities, research may not fall on the top of priorities list

Bahrain is at the very early stages of establishing a research system and it is clear from this assessment that there are many institutions and processes that need to be established or improved to create an effective research system. These are summarized in the table below.

Needs for Bahrain's Research System	
➤	Strategic direction and leadership
➤	A government agency with responsibility and resources to support for research, and data on the research system to track progress
➤	Scientific infrastructure (laboratories, equipment, test beds, etc.)
➤	Expanded societal understanding of the value of research
➤	Stronger linkages and collaboration among components of the Bahraini research system, including increased industrial R&D and collaboration with universities
➤	Linkages to global knowledge networks
➤	Strengthened university research <ul style="list-style-type: none">▪ Expanded funding (government, industry, philanthropic, international)▪ Stronger connection to industry or social needs▪ Research administrative structures available for managing complex externally funded research▪ Expanded graduate student research funds and equipment

Bahrain Research Strategy

The Bahrain Research Strategy reflects extensive input from the Kingdom's leadership, universities, industry practitioners, civil society associations and other stakeholders. Considering the needs and current state of research in Bahrain, as well as the likely available resources, the consensus vision, goals, and strategic objectives are presented below.

'Vision: Bahrain will excel in key fields of research of importance to the Kingdom's economy and social welfare, and possess the broad research capacity needed to access and use global knowledge'.

The main goal of the 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

To achieve these goals, Bahrain needs an effective national research system. While such systems vary widely across nations in their structure, accommodating the unique circumstance, needs, resources, capabilities, histories, and cultures of the nations they serve. Across this diversity, however, are essential elements that all national research systems possess with respect to research governance, funding, conduct, and agenda.

Research Governance	Research Funding
<ul style="list-style-type: none"> ▪ Provided by professional research administrators ▪ Makes use of data and evaluation to manage overall research enterprise ▪ Facilitates technology transfer and associated IP issues ▪ Able to convene local, and as necessary international scientific expertise for the purposes of advising government 	<ul style="list-style-type: none"> ▪ Provided at sufficient level that critical mass is reached in the areas that are funded ▪ Basic science funding provided without interference from the source of funds; applied research projects allow for appropriate influence of funders ▪ Overall level is relatively stable over time ▪ Individual grants/contracts are time limited ▪ Is awarded on a peer- or merit-reviewed basis
Research Conduct	Research Agenda
<ul style="list-style-type: none"> ▪ Led by trained and credentialed science investigators ▪ Provides a platform for the training of the next generation of science investigators ▪ Contributes to national human capital development, beyond the training of new scientists ▪ Proposed research is evaluated for impacts of research on human and animal subjects, the environment, and other societal concerns including ethical conduct of researchers 	<ul style="list-style-type: none"> ▪ Focused broadly on the economic, social, and health needs of the country ▪ In general, connected to the needs of industry ▪ Includes a component focused on long-term, high-risk basic research ▪ Acknowledges local assets/areas of strength in research ▪ Evolves over time to meet the evolving needs of the country

To develop a research system with these characteristics, the Bahrain Research Strategy has five overarching objectives related to institutional reforms and research focus that are essential for achieving the stated vision. The objectives are to be pursued simultaneously as they reinforce and complement each other.

Research Strategy Objectives (SO)		
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	Address national research priorities

Each of the stated objectives has associated key tasks and key performance indicators (KPIs) to track progress towards meeting the objectives. Each of the five objectives, their associated tasks and KPIs are illustrated in the tables below.

Strategy Objective - 1 Establish a national research governance infrastructure	
Key Tasks	
<ul style="list-style-type: none">▪ Establish the public research funding infrastructure▪ Fund the establishment of new scientific teams/labs▪ Provide access to scientific and testing equipment and installations to avoid duplication given the small size of the country▪ Introduce scientific research best practice: peer review, evaluation, program evaluation	
Key Performance Indicators	
<ul style="list-style-type: none">▪ Introduction of financing model stimulating competition, development and application of problem-based research▪ Increase in available funds for R&D both for academia and private sector▪ Increase in national R&D expenditure from current 0.04% to 1% by 2020 (2/3 of expenditure by Business enterprises)▪ Increase in number of properly equipped research labs conducting research	

Strategy Objective - 2
Strengthen University Research Capacity

Key Tasks

- Strengthen administrative structures to support and manage research
- Increase admissions to and funding for master's and PhD programs at universities
- Establish stable and sufficient source of merit-based research funding for universities
- Create conducive environment for faculty members to perform research (reducing teaching load, rewarding researchers)
- Enhance knowledge transfer through schemes for creation of scientific incubators or science parks
- Introduce compulsory and regular international evaluation of institutions funding and conducting research

Key Performance Indicators

- Increase in number of researchers at universities & private enterprises
- Increase in number of persons with doctorate degrees
- Increase in the share of students with natural sciences and engineering majors
- Increase in journal publication output from universities, including review articles
- Increase in number of patents & industrial designs filed in Bahrain & internationally
- Improvement in ranking of Bahraini universities in Global University rankings
- Increase in number of enterprises with R&D departments and personnel

Strategy Objective - 3
Strengthen the integration of Bahrain academic institutions
with international research institutions and with entities focused on
Bahrain's economic & social priorities

Key Tasks

- Stimulate private sector involvement in academic research activities
- Introduce schemes for providing matching funds for university-industry collaborative research
- Integrate Bahraini science activities into regional & global research by expanding travel funds, participation in international conferences
- Facilitate access to regional & international organization's research infrastructure
- Maintain, optimize, and expand access to databases of reference scientific publications and information/communication infrastructure
- Create a national forum for linking academia, industry, and government
- Introduce targeted programs supporting scientific activities at private firms and SMEs, such as seed funding in universities for small business creation/proof of concept

Key Performance Indicators

- Increase in number of collaborative research projects between universities and private enterprises
- Increase in number of joint research projects with regional or international universities
- Increase in number of research projects funded by regional or international resources
- Increase in number of national research networks

Strategy Objective - 4 Improve public awareness and understanding of research and innovation	
Key Tasks	<ul style="list-style-type: none">▪ Carry out public dialogue, through conventional & social media, on the role of science and research▪ Introduction of programs for promotion of scientific activities, competitions, and fairs at schools and universities▪ Introduction of scientific research awards to raise the prestige of scientists and researchers▪ Emphasize science, technology, engineering, and mathematics (STEM) education at the primary and secondary levels▪ Universities to develop bridging programmes to improve student preparation during the summer before starting on a STEM programme▪ Exploit social media to improve public awareness
Key Performance Indicators	<ul style="list-style-type: none">▪ Improved public understanding of science as measured in international surveys▪ Outstanding researchers, scientists, & students are recognized and awarded at the highest levels▪ Conventional and social media content and traffic metrics

Strategy Objective - 5 Address national research priorities	
Key Tasks	<ul style="list-style-type: none">▪ Introduce targeted national thematic & sectoral programs relevant to Bahrain's economic & social needs▪ Support the development of thematic research centers or centers of excellence for concentration of critical mass of scientific potential aimed at implementation of the national priorities▪ Be a leader in establishing regional networks in priority areas
Key Performance Indicators	<ul style="list-style-type: none">▪ Increase in resources available for scientific research in priority areas (increase in demand)▪ Improvement in the quality of performed scientific research in priority areas▪ Improvement in the human capital potential: increase in number of highly qualified & motivated researchers working in priority areas▪ Increase in the number of highly qualified Bahraini scientists who studied or conducted research abroad in priority areas▪ Increase in number of participants in regional/international research networks in the priority areas

Priority Research Areas

The Bahraini government in its Vision 2030 has identified priority industries and areas. The Economic Development Board (EDB) National Strategy for Bahrain and the Higher Education Strategy have also identified sectoral priorities, which will feed into the National Research Strategy priority 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)

Primary Area of Focus	
❖ Financial Services, Islamic Banking & Finance, Insurance	
<p>Skills Needed:</p> <ul style="list-style-type: none"> ▪ Banking & Finance ▪ Insurance ▪ Business Administration ▪ Business/Management Information Systems 	<p>Supportive Condition in Bahrain:</p> <p>The finance and banking sector is significant in terms of the number of companies, contribution to the economy, and number of employees</p> <ul style="list-style-type: none"> ▪ More than 400 financial institutions: banking, insurance, investment business firms, capital market, specialized licensees and funds ▪ Contributes more than 17% of GDP ▪ Employs roughly 2.5% of Bahrain workforce, with spillover effects <p>Emergence of the Middle East as a banking center & the rise of Islamic Banking globally</p> <ul style="list-style-type: none"> ▪ Finance that complies with Islamic law has been one of the fastest growing segment of the global financial system and sales of Islamic bonds have risen considerably ▪ More than 300 Islamic Banking institutions exist in more than 50 countries ▪ London and Malaysia are currently hubs for Islamic banking ▪ Dubai significantly ramping up effort and resources in this area
Research & Training Opportunities	
<ul style="list-style-type: none"> ▪ Opportunity to develop regionally as a key research hub and repository of knowledge and skills ▪ Conduct research on the financial sector locally and regionally ▪ Opportunity to establish research and standard setting institutions for Islamic banking & finance 	

Primary Area of Focus	
❖ Health Services & Public Health, Gulf Region Health & Translational Medicine	
Skills Needed: <ul style="list-style-type: none"> Health professionals Scientists & technicians Managers & business executives Business & administrative services Nurses, pharmacists, dieticians, dentists 	Supportive Condition in Bahrain: <ul style="list-style-type: none"> Largely dominated by public sector: Salmaniya Medical Complex, King Hamad Hospital, Arabian Gulf University, & Ministry of Health Private: Royal College of Surgeons of Ireland, American Mission Hospital Non-communicable diseases such as cardiovascular disease, diabetes, and cancer are leading cause of death – Translational Medicine is very relevant in this area Strength in internal medicine, reproductive biology, peripheral vascular disease, hematology, immunology especially at AGU Shortage in technical skills, management, administration & evaluation
Research & Training Opportunities	
<ul style="list-style-type: none"> Opportunity to invest in research in niche areas within the sector, internally or through collaborative research programs with academic institutions, domestically and abroad 	

Primary Area of Focus	
❖ Information & Communications Technology (ICT)	
Skills Needed: <ul style="list-style-type: none"> Computer & electric engineering Computer science, management information systems Management/Business Administration Arts, design, and media 	Supportive Condition in Bahrain: <ul style="list-style-type: none"> Tech-savvy & connected Bahraini youth Quality technical programs at local universities and qualified graduates Availability of startup/venture & training funding especially through the variety of support programs by Tamkeen Strong growth potential across many industries given the enabling platform nature of ICT Strong banking and finance sector which is dependent on agile and robust ICT solutions Growth potential in neighboring economies in need of technical and IT consultancy services
Research & Training Opportunities	
<ul style="list-style-type: none"> To develop a strong ICT sector that could drive growth across the economy and via entrepreneurship To build capacity in high value added IT consulting services that serves both local and regional markets Likely immediate opportunity in ICT in developing applications software (apps) for local/regional use 	

Other areas where research can contribute to important national needs or economic sectors, and where Bahrain can be distinctive within the region, include:

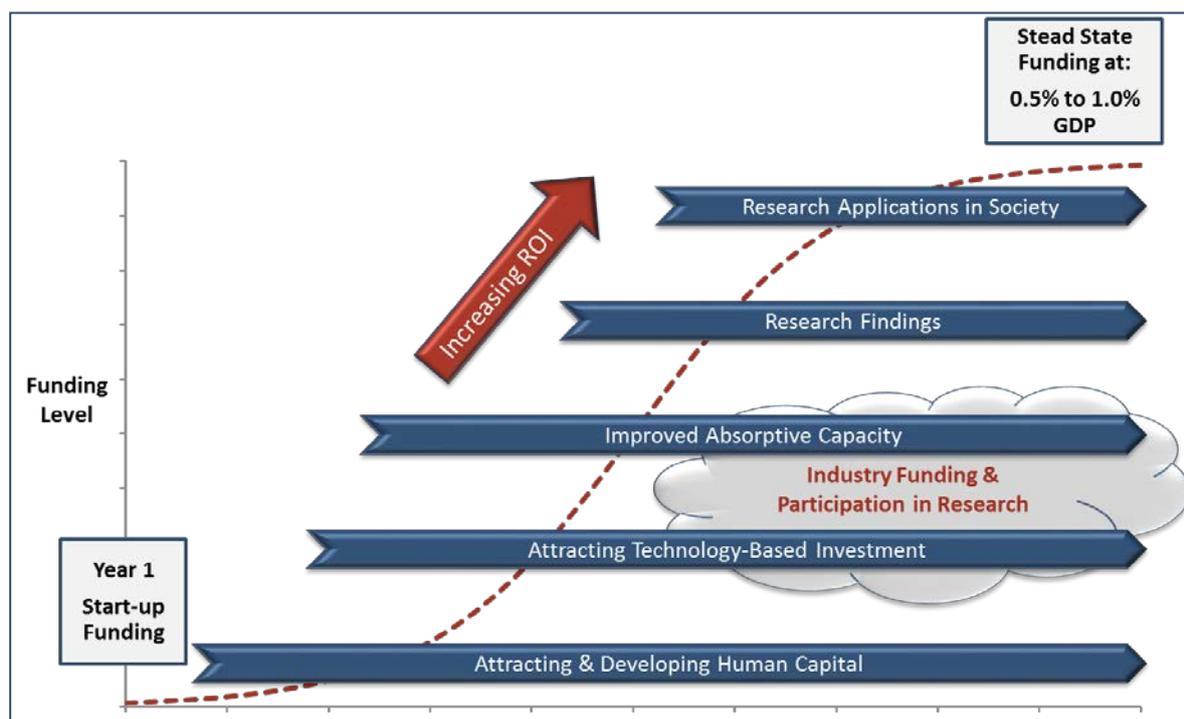
- Education, education services
- Petrochemical, Industrial
- Social Sciences, Economics, Public Policy & Admin
- Environment, Marine Science, Waster Water Management
- Urban Planning
- Tourism & Hospitality
- Arts & Design
- Archeology
- ICT, Media, Telecom

These are all areas where university research, in close collaboration with industry or government can make a major contribution to Bahrain.

Role of Research in the Kingdom's Future

The reforms, institutions, and activities in the Research Strategy are intended to be realistic – recognizing the current level of research and funding – and are also intended to establish the foundation for future advances. Over the long-run research funding levels should expand to be comparable to other knowledge economy countries, which invest about 2-3% of their GDP in R&D including 0.5 to 1% of GDP in universities. The benefits of expanding research will not all occur immediately but will accrue over time. Growing investments in research will help to attract and develop qualified human capital, attract investments in technology, improve the Kingdom's capacity to make use of existing global knowledge, and help solve the Kingdom's social and economic needs.

Figure 1. Bahrain's increasing ROI from its support of research over time



History shows that when nations such as Bahrain dedicate themselves to building a research-based economy, significant and enduring economic and social benefits can result. The Research Strategy will help take Bahrain on path towards its vision of becoming a diversified, sustainable, knowledge-based society.



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