Saudi National Science, Technology and Innovation Plan (Maarifah)

By Dr. Zakarya Alzamil
Background

- The Kingdom of Saudi Arabia has developed a long term vision of science, technology and innovation (STI) to create a “knowledge-based economy and society through a globally competitive national STI ecosystem”, thus achieving the Kingdom’s strategic goal of becoming one of the advanced countries in science, technology and innovation by 1445H (2025).
- It aims at shifting the Saudi economy from oil based to knowledge-based economy and society.
- The National Policy for Science and Technology and Innovation, approved by the Council of Ministers in 1423 Hijri (2002 G), has defined 15 programs for localization and development of strategic technologies that are essential for the future development of the Kingdom of Saudi Arabia.
NSTIP

- To ensure the achievement of the national policy of science and technology strategies, a national science, technology and innovation plan (NSTIP) was developed.
- The NSTIP consists of (8) strategic programs diverging into a number of projects to be co-executed by all national public and private Saudi economic sectors.
NSTIP

- NSTIP is mandated to direct science research and technology development in the Kingdom of Saudi Arabia towards long-term development goals of the country. It is also responsible for strengthening ties between key components of the Science and Technology national plan, such as research and development centers, education and training organizations, companies, investors, innovators, technology suppliers, consulting firms and scientific media.
**NSTIP**

- NSTIP promotes and develops financial support sources in addition to developing regulations that govern the performance of the policy. It also encourages and increases international cooperation in the development of the science and technology fields and it is responsible for the dissemination and distribution of scientific and technology information.

- King Abdulaziz City for Science and Technology (KACST) monitors the implementation of NSTIP, plays a major role in executing the plan, chairs the steering committee, and publishes reports about the key performance indicators and many governing regulation. (Al-Swailem: Saudi national science, technology and innovation plan towards knowledge based economy. BMC Genomics 2014 15(Suppl 2):O2.)
NSTIP Major Programs

- The plan encompasses eight major programs:
  1. Strategic and advanced technologies
  2. Scientific research and technical development capabilities
  3. Transfer, development, and localization of technology
  4. Science, technology, and society
  5. Scientific and technical human resources
  6. Diversifying financial support resources
  7. Science, technology, and innovation system
  8. Institutional structures for science, technology, and innovation
Science & Technology Programs
Establish a robust national infrastructure for science, technology and innovation

Completed!

Did we deliver?

- Become a leading country in science, technology and innovation in the region
- Become a leading country in science, technology and innovation in Asia
- Transform to a knowledge-based economy

Adapted from: Science, Technology and Innovation In Saudi Arabia (SAGIA) January 26th, 2015, M. I. Al-Suwaiyel, President, KACST
NSTIP Medical & Health Research

- KACST collaborated with the King Faisal Specialist Hospital and Research Center (KFSHRC) and other relevant stakeholders to develop a National Medical and Health Research Strategy (NMHRS) for the Kingdom.
- KFSHRC provided project management, subject matter expertise and planning leadership with overall responsibility for coordination with stakeholders.
NMHRS Plan Development

• The development of this plan began with mobilization of resources. This included identification of the stakeholders and users of medical and health research and innovation in the Kingdom, domain experts and key members of the planning team. Extensive literature review and assessment of current status of the medical and health field in the Kingdom was followed by creating vision and mission statements, and conducting background research on the experiences of leading countries around the world.
NMHRS Plan Development

Stages

- **Preparatory Stage**
  - Resource mobilization
  - Team selection
  - Training orientation
  - Communication strategy

- **Writing**
  - First draft

- **Full Draft**
  - Draft for external review

- **Final Document**
KSA Demographics as of July 2008

- Saudi Arabia’s population exceeded 28 million
- Around 50% under the age of 20.
- 55.3% males and 44.6% females.
- Nearly 88% of the total population is urban.
- Population growth rate is 2.06% with a birth rate of 2.91 births per 1,000 population, and a death rate of 2.55 deaths per 1,000 population.
KSA Demographics as of July 2008

- Infant mortality rate is 12.4 deaths per 1,000 live births. For males it is 14.2 deaths per 1,000 live births and for females it is 10.4 deaths per 1,000 live births.
- The life expectancy at birth is estimated to be 75.8 years for males and 73.8 years for females.
- As per a 2007 estimate, total fertility rate is around 3.94 children born per woman.
KSA Demographics as of July 2008

• The Global Human Development report ranked Saudi Arabia 71st out of the 177 nationals (GHD 2002). An improvement was recorded to 61st rank (overall Human Development Index) in the 2007–2008 report.

• This puts Saudi Arabia at a disadvantage against competing nations with regard to health of population, accomplishment in healthcare services delivery and availability of local talent capable of spearheading medical/health research.
Health Services and Research

• The Kingdom spends around 4% of its gross domestic product (GDP) on health services.
• The 2006 MOH report estimated that 11% of the Government budget is devoted to healthcare.
• The expenditure for all research activities stayed around 0.2% of GDP, but is expected to change dramatically in the coming years due to the commitment generated through the National Science, Technology and Innovation Policy.
## Stakeholders Roles

<table>
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<tr>
<th>Stakeholders</th>
<th>Roles</th>
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<tr>
<td><strong>KACST</strong></td>
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<td></td>
<td>- Plan, coordinate and manage the program</td>
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<td>- Conduct applied research, technology transfer and prototype development</td>
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<td>- Manage and participate in national projects</td>
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<td></td>
<td>- Provide support for university and industrial participation in national projects</td>
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<td></td>
<td>- Provide and manage national research facilities</td>
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<td>- Provide advice and services to government on science and technology.</td>
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<td>- Establish Technology Innovation Centers in cooperation with Universities and Industries.</td>
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<td><strong>Universities</strong></td>
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<td></td>
<td>- Create new basic and applied scientific knowledge</td>
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<td>- Train students in science and engineering</td>
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<td>- Host and participate in Technology Innovation Centers</td>
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<td>- Participate in collaborative projects</td>
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## Stakeholders Roles

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<th>Stakeholder Category</th>
<th>Responsibilities</th>
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| KFSHRC and other Independent or Government Specialized Research Centers             | - Create new applied scientific knowledge  
- Participate in collaborative projects  
- Collect, compile, analyze and disseminate key data and information on human health  
- Acquire, improve, and deliver medical solutions and health care technologies to health service providers |
| Ministry and Government Agencies                                                   | - Conduct researches and studies leading to solving operational and implementation challenges of projects  
- Provide input to program on government R&D needs  
- Reduce regulatory and procedural barriers to R&D and innovation  
- Support R&D in universities and industry |
| Private Sector                                                                      | - Develop and commercialize products & processes resulting from the program.  
- Support and participate in collaborative R&D projects.  
- Support and participate in the Technology Innovation Centers |
Global Publication Activity in Medical and Clinical Sciences

• There is general agreement that publications and patents strongly correlate with scientific research capacity, although publication and patent counts alone do not fully represent the quality or scope of research.

• The Institute of Scientific Information (ISI) using essential science index for the years 1995 -2005 ranked Saudi Arabia 33rd amongst 100 nations in terms of number of publications over the indicated ten years. The USA ranked first with around 650,000 publications in clinical and medical sciences, with England, Japan and Germany occupying distant 2nd, 3rd and 4th positions respectively. Among emerging countries, Turkey and India occupy 15th and 22nd positions with publications amounting to 30,000 and 16,000 respectively.

• It is noteworthy that 31 countries are responsible for 98% of the world highly cited papers with the remaining 162 nations contributing less than 2%
Saudi Arabia commands a leading position among its regional peers with regard to total number of publications. However, publications normalized over GDP (articles per USD 1 billion in GDP) provides a different picture. Research performance of the Arab region does not match up to the global performance when performance is measured in terms of publication productivity.
Number of Articles per USD 1 billion in GDP
Comparing Productivity: Arab Region vs. the World
KSA Publication Activity in Medical and Clinical Sciences

- Saudi Arabia’s total publication in the same time period was around 6,000 for the years 1995 - 2005, counted using ISI essential science index. That level of performance puts Saudi Arabia as the leader among its Arab peers with considerable lead over its nearest peer Egypt (below 3,000) publications.
# SWOT Analysis for KSA Medical & Health Research & Innovation Program

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<tr>
<th>Internal</th>
<th>Strengths:</th>
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<td>- Existence of research funds from the government</td>
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<td>- Opening of many universities and research centers in Saudi Arabia with Medical collages</td>
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<td>- Existence of governmental graduate scholarship programs</td>
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<td>- Availability of clinical samples and demographics of the country.</td>
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<th>Weaknesses:</th>
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<td>- Paucity of qualified local talent</td>
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<td>- Lack of effective collaborative research efforts</td>
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<td>- Lack of proper policies and procedures for acquisition and use of new technology</td>
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<td>- Delay in international recruitments in the Kingdom due to government policies and procedures</td>
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<td>- Difficulty in attracting international experts</td>
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<td>- Paucity of private sector grants for research</td>
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<td>- Limited incentives</td>
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<td>- Lack of a fair evaluation system for scholars/researchers</td>
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<th>External</th>
<th>Opportunities:</th>
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<td>- Development of new diagnostic modalities</td>
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<td>- Development of health/medical research industry</td>
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<td>- Possibility of attracting foreign investors to upcoming biomedical research parks at major universities and specialist hospitals</td>
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<td>- Opportunity to lead Arab and Muslim world in medical research</td>
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<tr>
<td>- Lack of biomedical research and development due to security, economic and political restrictions</td>
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<td>- Lack of sufficient educational programs to produce qualified workers in technical fields to work in health and medical research centers</td>
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<td>- Immobilization of initial funding</td>
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<td>- Insufficient commitment by private sector and health care providers</td>
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National Medical and Health Research Strategy (NMHRS)

• The National Medical and Health Research Strategy (NMHRS) consists of the following planning process:
  • Identified the key national health issues and associated priorities for research and innovation in the Kingdom
  • Assessed the strengths, weaknesses, opportunities, and threats for the program, including an analysis of KSA publications and an assessment of international models of national research agencies and institutes
  • Defined a mission and vision for the Kingdom’s medical and health research program
  • Defined key strategic goals and related tactical objectives to achieve the vision
NMHRS

- **Vision** of the National Medical and Health Research (NMHR) Program, as collectively developed all relevant stakeholders, is:
  - The NMHR Program will advance the health and wellbeing of people in Saudi Arabia by developing the requisite national manpower, expertise, and infrastructure for sustainable, high quality, cutting-edge and competitive research; by fostering and facilitating the performance of novel, interdisciplinary and collaborative research; and by effectively communicating to both policy-makers and the public, findings of research and significance of promotion of health, prevention of disease and delivery of healthcare.

- The NMHR Program’s **mission** is:
  - To promote research in the medical and health sciences to further health and wellbeing in Saudi Arabia.
NMHRS Priority Areas

- Initial list of medical and health priority areas have been selected for strategic intervention:
  - Non-Communicable Diseases NCDs (a group of conditions that are not mainly caused by an acute infection, result in long-term health consequences and often create a need for long-term treatment and care, which is considered as number one cause of death and disability in the world with more than 75% of deaths worldwide)
    - Cardiovascular Diseases
    - Cancer
    - Respiratory diseases (chronic lung illnesses)
    - Diabetes
    - Allergy and Asthma
    - Neurodegenerative Diseases
  - Communicable Diseases (Infectious diseases)
NMHRS Priority Areas

- **Cardiovascular Diseases:** It is estimated that by the year 2032, the economic burden arising from Cardiovascular Diseases will be close to SR 80 billion.
- **Diabetes:** It is estimated that the burden of Diabetes may exceed SR 120 billion by 2035.
- **Cancer:** It is estimated that the total burden of cancer on Saudi Arabia will exceed SR 2 billion per year by the year 2030.
**NMHRS Priority Areas**

- **Allergy and Asthma:** it is estimated that the total burden on Saudi Arabia will exceed SR 20 billion by the year 2032. In the year 2015 alone the estimated number of people affected will be 4.25 million while the total cost of treatment will near SR 10 billion.

- **Neurodegenerative Diseases (Alzheimer as a case in point):** it is estimated that the total burden of AD on Saudi Arabia accruing from patient care and lost productivity may exceed SR 22 billion by 2030 as number of patients may exceed 22,000.
NMHRS Priority Areas

• **Communicable Diseases:** Communicable disease such as TB, Malaria, and Hepatitis place an extraordinary burden on those afflicted by the disease, their families, communities, and on government budgets.
• Genetics
• Cell Therapy
• Disability
• Environmental Health
NMHRS Strategic Goals

• The following strategic goals were identified and agreed upon by the stakeholders:

1. Development and retention of national manpower and expertise in medical and health sciences research
2. Development of infrastructure for sustainable, cutting edge and competitive research in the medical and health sciences
3. Facilitate the performance of novel, competitively funded and high quality research in the medical and health sciences
4. Effective communication of research findings and significance of those findings to policy-makers and the public
Strategic Goal #1

• Development and retention of national manpower and expertise in medical and health sciences research
  • A possible mechanism to attain this goal may be the use of grants and contract funding to support career development for researchers engaged in individual driven, institutional or multicenter-based basic, translational or clinical research.

• Tactical Objectives:
  1. Develop postgraduate training programs to create a locally competent talent capable of conducting novel medical and health sciences research.
  2. Develop undergraduate and vocational training programs and on-the-job training opportunities to create a pool of technically skilled support staff and technicians who are committed to good laboratory practices.
  3. Develop training programs and rules/regulation mandating compliance with professional research ethics.
  4. Prepare competitive recruitment packages in order to attract, retain and nurture first-class researchers.
Strategic Goal #2

• Development of infrastructure for sustainable, cutting-edge and competitive research in the medical and health sciences
  • This goal can be achieved by the creation of National Centers of Health Statistics. This national center will collect, analyze and disseminate data pertaining to health statistics and burden of disease.

• Tactical Objectives:
  1. Establish a National Centre for Health Statistics.
  2. Establish and manage financial systems capable of achieving the stated objectives.
  4. Establish infrastructure to facilitate and expedite acquisition of and access to resources.
  5. Create infrastructure that supports and enables research including e-libraries, clinical research centers, integrated research IT capabilities and core facilities.
  6. Develop mechanisms for private fund-raising for research through industry partnerships
Strategic Goal #3

• Facilitate the performance of novel, competitively-funded and high quality research in the medical and health sciences
  • This goal can be realized by the establishment of centers of excellence dealing with the defined burden of disease highlighted previously.

• Tactical Objectives:
  1. Provide leadership in medical research by identifying and developing national priorities, securing the requisite financial support, and developing requests for proposals (RFP) for competitive grants and contracts.
  2. Develop fair proposal review and scoring protocols for merit-based decisions and awards.
  3. Promote performance of basic and translational interdisciplinary research for better understanding and treatment of diseases pertinent to the KSA.
  4. Increase national scientific discovery and productivity through dissemination of findings via publications in peer-reviewed and reputed journals.
  5. Invest in high quality research through competitive awards.
  6. Establish national mechanisms for capturing intellectual properties and accelerating their commercialization.
  7. Develop mechanisms to encourage research partnerships and create new industries.
  8. Establish and manage financial and administrative systems capable of achieving the stated tactical objectives.
Strategic Goal #4

• Effective communication of research findings and significance of those findings to policy-makers and the public
  • This goal can be achieved through a designated corporate affairs unit within the proposed National Council for Medical and Health Sciences Research, which may provide administrative support services that include human resource, financial, and facilities management, security and procurement, transportation and liaison with various governmental and private external entities.

• Tactical Objectives:
  1. Serve as a source of bio-data for informed decision-making in collaboration with the National Center for Health Statistics.
  2. Expand the stakeholder pool on a national level.
  3. Increase public awareness of medical and health sciences research and its value to the society.
  4. Run public awareness campaigns to raise private funds from industry and philanthropists to support endowed chairmanships and named centers of excellence.
National Council for Medical and Health Research (NCMHR)

- NCMHR’s primary role will be to provide administrative oversight and logistical support to the affiliated divisions and research performing institutions.
- It should be headed by a director whose performance is supervised by an advisory council.
- Members of the advisory council will be nationally and internationally recognized biomedical and clinical scientists as well as health professionals such as physicians, dentists, and public health specialists with keen interest and documented track record in research.
References

• “Strategic Priorities for Advanced Medical and Health Research”, KACST, King Abdulaziz City for Science and Technology, Doc. No. 39P0001-PLN-0001-ER01.

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• “National Science, Technology and Innovation Plan Projects Setup Regulations”, Vol. (6), 2012/1433, KACST.