INNOVATION POLICIES IN LEBANON: GAPS AND RECOMMENDATIONS

Dr. Hassan Ghaziri
Director General of the Lebanese Center for Studies and Research

Ms. Tanya Dib
Research Analyst

BRIC
BEIRUT RESEARCH & INNOVATION CENTER
OUTLINE

- Vision
- Major Challenges in the Arab World
- The Reality of Innovation in Lebanon
- Case Study on BRIC
  - Strategic Model
  - Business Model
  - Humanitarian Demining Research Program (HDRP)
  - Partners and Collaborators
- Recommendations
  - Law on Innovation and Technology Transfer
  - Science and Technology Parks
  - Science, Technology and Innovation Observatory
    - Key Performance Indices (KPIs) for NIS
  - Arab Fund for Innovation
• Emergence of the new Knowledge Era

• Knowledge Cycle

• Restoring the Knowledge Cycle in Lebanon and Arab world is a necessity
MAJOR CHALLENGES IN THE ARAB WORLD
HIGHEST PERCENTAGE OF YOUTH UNEMPLOYMENT IN THE WORLD

*Wasted youth*
Youth* population and unemployment in the Arab world

Sources: ILO; World Bank; US Census Bureau

* 15- to 24-year-olds

Economist.com

Innovation Policies in Lebanon - ESCWA November 1-2, 2016
The Reality of Innovation in Lebanon
Unprecedented Number of Brain Drain

Rate of expatriation to OECD countries by highly skilled migrants

Innovation Policies in Lebanon - ESCWA November 1-2, 2016
THE REALITY OF INNOVATION IN LEBANON
NEED FOR AN INTEGRATED NATIONAL INNOVATION SYSTEM

Innovation Policies in Lebanon - ESCWA November 1-2, 2016
## Innovation Policies in Lebanon - ESCWA November 1-2, 2016

### THE REALITY OF INNOVATION IN LEBANON

### GAP IN TECHNOLOGY TRANSFER

<table>
<thead>
<tr>
<th>Science and Technology</th>
<th>Knowledge Generation and Technological Production</th>
<th>Technology Transfer</th>
<th>Using Technology to Meet the Needs of Society and Economy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Universities, CNRS, Research Centers, IRI, LIRA</td>
<td>BRIC</td>
<td>ACCELERATORS AltCity, Speed@BDD, UK Lebanon Tech Hub</td>
<td></td>
</tr>
<tr>
<td>Industries</td>
<td>World Bank – iSME</td>
<td>INCUBATORS/TECHPARKS Berytech, BIAT, SouthBIC, BDD</td>
<td></td>
</tr>
<tr>
<td>Research Development</td>
<td>Early Stage Innovation</td>
<td>STARTUP Berytech Fund II, IM Capital, Leap Ventures, B&amp;Y Venture Partners, Cedrus Mundi, MEVP, Phoenician Fund I, Wamda Capital Fund</td>
<td></td>
</tr>
</tbody>
</table>

- **Support Intensity**
- **Business**

---

### Innovation Policies

- **Research Development**
- **Early Stage Innovation**
- **Startup**
- **Growth**
CASE STUDY ON THE BEIRUT RESEARCH AND INNOVATION CENTER

**BRIC is**

- **A research platform**, launching and conducting integrated research programs with high economic and social impact in line with national and regional priorities, to restore the Knowledge Cycle in Lebanon and Arab World

- **An interface** between the academia, the business community and the public authorities, filling the gaps of the entrepreneurship chain

- **A pole of excellence** attracting talented scientists, and providing opportunities for postdoctoral and young researchers to use their talents, competencies and knowledge in projects serving the needs of Lebanon and the region

- **An intellectual hub** where scholars, analysts, and researchers debate to better understand the nature of the challenges faced by our society, building cross-disciplinary collaborative teams to tackle vital economic and social issues
• **Initiate challenging interdisciplinary research programs**
  - These research programs should provide services with high added value to the business and social community, or develop a new product having a high potential to be commercialized.
  - Each program is conducted in collaboration with local partners in the private/public sectors and the civil society, and is mentored by one or more international institutions to secure cutting edge research, visibility, good governance and efficient transfer of knowledge and know-how.

• **Provide an integrated management** of the RP and coordinate the research teams through an efficient organizational structure

• **BRIC is driven by an ethical and entrepreneurial spirit** with high social and environmental responsibility.
Innovation Policies in Lebanon

GOALS
- Reverse brain drain
- Provide integrated solutions to critical problems
- Intellectual property protection
- Matching innovators and entrepreneurs
- Integrated management of research programs
- Bridging Lebanese and international institutions and stakeholders

STRATEGIC MODEL
- Challenging research/action programs
- Interdisciplinary & institutional collaborative research teams
- Social responsibility & environmental/entrepreneurial spirit

ADDED VALUE
- Science & technology programs
  - Humanitarian demining
  - Support for persons with special needs
- Policy studies/dialogue
  - Oil & gas policy studies
  - Diversity maintenance

OUR WORK
- Restore knowledge cycle

BRIC November 1-2, 2016
### Business Model

#### WHO

<table>
<thead>
<tr>
<th>Partners</th>
<th>Key Activities</th>
</tr>
</thead>
<tbody>
<tr>
<td>International &amp; regional</td>
<td>Managing research projects</td>
</tr>
<tr>
<td>research labs</td>
<td>Research teams coordination</td>
</tr>
<tr>
<td>Chambers of industry</td>
<td>Interdisciplinary cooperation</td>
</tr>
<tr>
<td>NGOs</td>
<td>Inter-sectorial collaboration</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Resources</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Public institutions (AUF, CNRS,</td>
<td>Scientific assistance</td>
</tr>
<tr>
<td>COOS...)</td>
<td>Equipped lab</td>
</tr>
<tr>
<td></td>
<td>Developers, analysts, computing power</td>
</tr>
<tr>
<td></td>
<td>Academia business interface</td>
</tr>
</tbody>
</table>

#### WHAT

<table>
<thead>
<tr>
<th>Value Proposition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Innovative research hub at the service of national and regional science and technology system around projects with direct implication on the economy and society</td>
</tr>
</tbody>
</table>

| Integrated programs with high commercial potential and high added value services |

#### HOW

#### FOR WHOM

<table>
<thead>
<tr>
<th>Beneficiaries</th>
</tr>
</thead>
<tbody>
<tr>
<td>BENEFICIARIES RELATIONSHIP</td>
</tr>
<tr>
<td>Guidance in IP protection</td>
</tr>
<tr>
<td>Assistance for matching innovators and entrepreneurs</td>
</tr>
<tr>
<td>Integrated support for managing research /action programs</td>
</tr>
<tr>
<td>Executive support for capacity building</td>
</tr>
<tr>
<td>Consensus building and community mobilization</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TARGET CONSTITUENCIES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Academic and learning community</td>
</tr>
<tr>
<td>Business community</td>
</tr>
<tr>
<td>Civil society/local NGOs/international organizations</td>
</tr>
<tr>
<td>Public authorities</td>
</tr>
<tr>
<td>Special needs community</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Costs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Researchers’ salaries</td>
</tr>
<tr>
<td>Administration &amp; logistics</td>
</tr>
<tr>
<td>Labs equipment</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Revenues</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sponsorship</td>
</tr>
<tr>
<td>Grants</td>
</tr>
<tr>
<td>Royalties</td>
</tr>
</tbody>
</table>
LMAC estimates that over 550,000 landmines are laid through the country.

About 96,000 munitions were fired into Southern Lebanon, in the final 72 hours of the 2006 summer war, delivering over four million cluster sub-munitions, which contaminated about 54.7 million m$^2$ of land.

Over 3,000 Lebanese have been killed as a result of landmines and cluster bombs since the 1970s.

Landmine and UXO contamination hinders the social and economical wellbeing of those living in affected areas, and leaves negative effects on the country's economy.
Conventional clearance methods are unsafe, slow, and costly:

- Landmines and cluster bombs will not be totally cleared before 2021 and 2016, respectively.

- About 100 millions US dollars, and between 70 and 80 millions US dollars are needed to clear landmines and cluster bombs, respectively.
Work has been done at the École Polytechnique Fédérale de Lausanne (EPFL), Switzerland on the remote detonation of Improvised Explosive Devices (IEDs).

This work involved two doctoral students from Colombia.

IEDs are a serious problem in Colombia.

Our goal at BRIC is to transfer this knowledge and port this technology to solve our landmines/UXOs problem.

This led to the establishing of the Humanitarian Demining Research Program (HDRP).
A system integrating remote detection localization and detonation of landmines does not exist.

Our objective is to design and build a fully integrated prototype by 2017.
HDRP’S INVESTIGATED SOLUTIONS
DETECTION OF LOCALIZATION CLASSIFICATION

• The use of metal detectors enhanced with signal processing techniques that are not only able to detect the targets but also to classify them and determine their type.

• A database of the ‘fingerprints’ of the available landmines and cluster munitions will be created for use with these advanced metal detectors, which can later be mounted on robotic vehicles for a complete automated solution.
HDRP’S INVESTIGATED SOLUTIONS
REMOTE NEUTRALIZATION

- We are developing a high-power directed microwave pulse system that can generate and radiate such pulses in towards the target landmines to remotely detonate/neutralize it.

- The system includes a high-power microwave generator and an antenna.

- So far, we've developed a 1kW system as a test prototype.

- This system is based on a magnetron taken from a home microwave oven.

- This is an early step towards developing system with hundreds of megawatts of output power.

- On the antenna side, we've been working on designing 2-D slotted waveguide antenna arrays with optimized performance and reduced size (e.g. using metamaterials).

- So far, we have used a commercial rectangular horn antenna in our tests.
PARTNERS AND COLLABORATORS

• MoU with LMAC, 2013

• MoU with EPFL-EMC, 2013

• ARU with CNRS-L, 2014
• Lebanese University (LU), Lebanon
• American University Beirut (AUB), Lebanon
• Notre Dame University (NDU), Lebanon

• International Collaboration
• University of New Mexico (UNM), USA
• Université de Technologie de Compiègne (UTC), France
• National University of Colombia, Bogota, Colombia
High Level Skills Acquired in Advanced Technology:

- Parallel Computing, Pattern Recognition, Neural Networks, Signal Processing, Image Processing

Major Problems Faced in:

- Continuous funding, quick import of equipment, telecommunications, industrial prototyping centers (Fast Prototyping), strong human capital

Major Achievements

- The development of a highly efficient device to monitor the demining process, hiring 4 PhD team members, research outsourcing (projects) from Switzerland
SOME RECOMMENDATIONS

• Tackling the Disconnected Innovation Network and Lack of Coordination
  • Collective law that encourages and organizes generation and transfer of advanced technologies (Read More)

• Bridging the Gap in Early Stage Innovation
  • Investing in Technology Incubators and not only incubators for technology companies (Read More)

• Continuous M&E for the Effectiveness of the Innovation System, Effects and Investment Payoff of this sector through the establishment of a Science, Technology and Innovation Observatory and a number of Key Performance Indices (KPIs) (Read More)

• Establishing an Arab Fund for Innovation to encourage cooperation and the formation of critical masses of specialists and sufficient material resources (Read More)
Objectives of the Law

1. To prioritize the development of high technologies and advanced technologies and the creation of places of employment in industry and the absorption therein of scientific and technological manpower, simultaneously with making investment in technological renewal.

2. To strongly develop the technology market; to encourage and promote technology and technology business incubation; to step up the transfer of research results to production and business activities, for increased economic benefit.

3. To encourage and create favorable conditions for technology transfer activities in all geographical areas, in the development of science-intensive industry whilst utilizing and expanding the technological and scientific infrastructure, and the existing human resources of the country.

4. To improve international cooperation and create favorable conditions for organizations and individuals to enter into international cooperation in technology transfer activities.
Means of Achieving Objectives

- For the purpose of achieving the objectives of the Law, grants, loans, exemptions, reductions and will be provided, which shall be given on the basis of an approved plan, all as set out in the Law.

Implementation

The Ministry of Economy and Trade and the Ministry of Finance are jointly charged with the implementation of the Law.
Contents of State Management of Technology Transfer Activities

1. Promulgating and organizing the implementation of propagating, disseminating and educating about the law on technology transfer
2. Formulating and directing the implementation of strategies, plans, programs, measures, mechanisms and policies to promote technology transfer and technological renewal
3. Managing technology transfer activities in a unified manner
4. Entering into international cooperation in technology transfer
5. Inspecting and examining the observance of the law on technology transfer; to settle complaints and denunciations, and handle violations of the law on technology transfer
Objectives of an S&T Park

- To support and develop projects and companies working in the sphere of innovations and high technologies

Technology Infrastructure

- Administrative Center with Business Incubator
- Furnished Offices
- Scientific Research Laboratories
- Production Spaces, Exhibition and Conference Halls
- Data Centers
- Educational Training Centers
- Equipment Sharing Centers

Business Incubation Program

- Assistance in raising and gaining access to funds
- Expenses subsidizing for innovative activities
- Assistance in projects promotion
- Establishment of business contacts

Educational Training Center

- Staff training and professional development (adaptation) using innovative educational techniques
- Organization and holding of all types of practical training for students on enterprises using S&T Park innovative and technological possibilities
- Evaluation of competence level of personnel on enterprises and organizations

Equipment Sharing Center

- SuperComputing Center
- 3D Prototyping Center
- Software Sharing
## Innovation Infrastructure
### Science and Technology Parks (2)
#### Facts and Figures in the MENA Region

<table>
<thead>
<tr>
<th>Country</th>
<th>Name of S&amp;T Park</th>
<th>Features</th>
</tr>
</thead>
<tbody>
<tr>
<td>Egypt</td>
<td>Mubarak City for Scientific Research and Technology Applications (MuCSAT)</td>
<td>Hosts 12 research centers</td>
</tr>
</tbody>
</table>
| Israel*   | MATAM/Haifa Industrial Park for R&D Centers          | - Hosts 50 leading high-tech companies (ex. Intel, Elbit Systems, Microsoft, Philips, Zoran, Google, and Yahoo, among others)  
- Has 6,000 employees  |
|           | Ashkelon Technology Incubator                         | - Hosts light manufacturing spaces  
- Legally established projects covering patents, salaries, etc.                                                                                                                     |
| Jordan    | Royal Scientific Society                             | - Has 600 staff members  
- Hosts 8 research centers                                                                                                                                                       |
| Morocco   | Casablanca Technopark                                | - Supports 800 companies per year in Casablanca, 80 in Rabat, and 20 in Tangier Technopark  
- Hosts 250 Moroccan companies, startups and SMEs with 2,000 employees                                                                                                         |
| Oman      | Knowledge Oasis Muscat                               | - Hosts 1 One-Stop-Shop facility handling all administrative services and commercial registration requirements with relevant government entities |
| Saudi Arabia | King Abdul-Aziz City for Science and Technology     | - Hosts 6 research institutes  
- Hosts the Saudi Patent Office                                                                                                                                                  |
| Tunisia   | Elgazala Technopark                                  | - Has 2,950 employees  
- Creation of 300 new jobs  
- Includes 1 incubator and 18 regional Cyberparks                                                                                                                                   |
| UAE       | Dubai Techno Park                                    | - Has 133,000 employees  
- Has housing for 60,000 permanent residents                                                                                                                                 |

*around 4% of GDP is spent on R&D (2014), higher than average for OECD countries
**INNOVATION INFRASTRUCTURE**

**SCIENCE, TECHNOLOGY AND INNOVATION OBSERVATORY (1)**

- **Definition and Objective**
  - A tool to provide independent information (quantitative and qualitative) about the structure and development of science, technology and innovation in Lebanon, to both public and private stakeholders on a regular basis, as well as the contribution to key economic metrics including employment, productivity, export activity and macroeconomic linkages.
  - This information is best presented as an online platform (website) and can be complemented by periodic outreach and dissemination events such as workshops and trainings.
  - The range of subjects it could cover include SMEs and innovation, labor market studies, access to finance, access to infrastructure, academia-industry technology transfer, and sector studies.

- **Means of Creating the Observatory**
  - This includes data collection, data housing, data analysis, and dissemination of studies.

- **Stakeholders Involved**
Organization

- A cooperation framework should be signed between all the involved ministries and other governmental institutions.
- The framework should outline high-level principles related to the rationale and purpose of an Observatory.
- A steering committee should be created comprising all key stakeholders with the objective of overseeing the operationalization of the Observatory and playing an advisory role on subjects covered by the Observatory.
### Key Performance Indices (KPIs) for the National Innovation System

- **Absorptive Capacity**
  - Expenditures in education in % of GDP
  - Science and Engineering graduates
  - Population with tertiary level education
  - Employment in medium/high-tech industries
  - Employment in high-tech services industries

- **R&D Capability**
  - Public R&D expenditures (% GDP)
  - Business R&D expenditures (% GDP)
  - R&D personnel per labor force
  - High-tech patents (per million population)
  - Resident patents per capita

- **Diffusion**
  - Training enterprises as % of all enterprises
  - Continuous Vocational Training in % of labor costs of all enterprises
  - ISO 9000 certifications per capita
  - Internet users per 10,000 inhabitants
  - PC per 100 inhabitants
  - ICT expenditures (% GDP)

- **Demand for R&D and Innovation**
  - Stock market capitalization in % GDP
  - Domestic credit provided by banking sector
  - Share of FDI in GDP
  - Share of trade in GDP
  - Index of patent rights
  - Registered unemployment
  - Consumer price index

<table>
<thead>
<tr>
<th>Type of Knowledge Flow</th>
<th>Main Indicator</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Industry Alliances</strong></td>
<td></td>
</tr>
<tr>
<td>Inter-firm research cooperation</td>
<td>Firm Surveys</td>
</tr>
<tr>
<td></td>
<td>Literature-based Counting</td>
</tr>
<tr>
<td><strong>Industry-University-Research Institutes Interactions</strong></td>
<td></td>
</tr>
<tr>
<td>Cooperative R&amp;D</td>
<td>University Reports</td>
</tr>
<tr>
<td>Co-patents</td>
<td>Government Reports</td>
</tr>
<tr>
<td>Co-publications</td>
<td>Patent Record Analysis</td>
</tr>
<tr>
<td>Industry use of university/research institute patents</td>
<td>Publications Analysis</td>
</tr>
<tr>
<td>Cooperative information-sharing</td>
<td>Citation Analysis</td>
</tr>
<tr>
<td></td>
<td>Firm Surveys</td>
</tr>
<tr>
<td><strong>Technology Diffusion</strong></td>
<td></td>
</tr>
<tr>
<td>Technology use by industry Embodied technology diffusion</td>
<td>Firm Surveys</td>
</tr>
<tr>
<td></td>
<td>Input-Output Analysis</td>
</tr>
<tr>
<td><strong>Personnel Mobility</strong></td>
<td></td>
</tr>
<tr>
<td>Movement of technical personnel among industry, universities and research institutes</td>
<td>Labor Market Statistics</td>
</tr>
<tr>
<td></td>
<td>University/Institute Reports</td>
</tr>
</tbody>
</table>

Source: OECD, *National Innovation Systems*
• **Putting in place an Arab Fund for Innovation**

  - **Mechanism:** the Fund should be based on Public-Private Partnerships
  - **Objectives**
    - To invest in social and technological innovations that aim to improve the lives and opportunities of millions of people in the Arab World
    - To pool talent and expertise from the participating countries to form a collective and integrated network
    - To help in the integration of markets and resources (human capital, technology, infrastructure, etc.)
    - To support a collective innovation strategy for the Arab World
Principles of the Arab Fund for Innovation

- Include but are not limited to:
  - Transparency
  - Replicability
  - Fair Allocation
  - Shareholder Participation and Cooperation
  - Compliance
  - Periodic Review and Reporting

Source: Triodos Bank. *Principles of Fund Governance*