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Core elements of infrastructure and support mechanisms for technology-based entrepreneurship

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Outline

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2. Meeting sustainable development goals
3. Infrastructure and support mechanisms
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5. Technology parks and incubation models
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1. Understanding technology-based entrepreneurship

- Technology entrepreneurship is a vehicle that facilitates prosperity in individuals, firms, regions, and nations.

- What distinguishes technology entrepreneurship from other entrepreneurship types (e.g., social entrepreneurship, small business management, and self-employment) is the collaborative experimentation and production of new products, assets, and their attributes, which are intricately related to advances in scientific and technological knowledge and the firm’s asset ownership rights.

- Main elements of technology-based entrepreneurship are intellectual property, finance, and marketing that are applied to exploit novel science and technology ideas.
A definition:

“Technology entrepreneurship is an investment in a project that assembles and deploys specialized individuals and heterogeneous assets that are intricately related to advances in scientific and technological knowledge for the purpose of creating and capturing value for a firm.”

Tony Bailetti (February 2012), http://timreview.ca/article/520
1 Understanding technology based entrepreneurship (cont.)

Imperatives

- Quality infrastructure is positively related to the achievement of social, economic and political goals
- Inadequate infrastructure leads to a lack of access to markets, jobs, information and training, creating a major barrier to doing business
- Manufacturing is an important employer, accounting for around 470 million jobs worldwide in 2009 – or around 16 per cent of the world’s workforce of 2.9 billion. In 2013, it is estimated that there were more than half a billion jobs in manufacturing
- Industrialization’s job multiplication effect has a positive impact on society. Every one job in manufacturing creates 2.2 jobs in other sectors
- SMEs that engage in industrial processing and manufacturing are the most critical for the early stages of industrialization and are typically the largest job creators. They make up over 90 per cent of business worldwide and account for between 50-60 per cent of employment

Source: http://www.un.org/sustainabledevelopment/infrastructure-industrialization
2. Meeting Sustainable Development Goals

- Goal 8: Promote inclusive and sustainable economic growth, employment and decent work for all

- Goal 9: Build resilient infrastructure, promote sustainable industrialization and foster innovation

- Goal 17: Revitalize the global partnership for sustainable development
3. Infrastructure and support mechanisms

(a) Policy support

Technology-based entrepreneurship infrastructure and support mechanisms are established by national policy, laws and regulations.

- To meet:
  - National development goals
  - Sustainable development goals

- To provide:
  - Policy level support
  - Institutional level support
3. Infrastructure and support mechanisms (cont.)

(b) National / macro level

- **Central Business Incubation Authority** to integrate and monitor all business incubators and activities
- **S&T Parks, Industrial Parks and SME Clusters**
- **Technology business incubators** (setting-up a business), **Startup accelerators** (scaling-up a business)
- **Innovation based incubators** set up in Institutions of Higher education, Research Institutes and other Centers of Excellence
- **Incubation infrastructure development fund, innovation funds, VC funds**
- A **consortium of banks** to invest and fund the business incubators
- **Fiscal Incentives** - Reimbursement of Value Added Tax (VAT) / Central Sales Tax (CST)
- **Non Fiscal Incentives** - Single window clearance unit for granting approvals & clearances to entrepreneurs; Awards for Innovation
3. Infrastructure and support mechanisms (cont.)

(c) Institutional / incubation level

- Technology licensing / transfer offices in Universities and R&D institutes
- Establishment of Pilot Incubators in PPP Model
- Incubation facilities such as Office Spaces, Small and Large Conference Rooms etc
- R&D / High Tech Labs and testing facilities
- Electronic Platform to act as a “Virtual Incubator” to startups connecting the research institutes, mentors, entrepreneurs and all other stakeholders
The Government can facilitate creation of common support infrastructure for development of startup ecosystem to attract new technology entrepreneurs:

a) Common Testing labs, Design Studio & Tool Rooms, and Fablabs (for hardware manufacturing and creating prototypes of hardware products)

b) Enterprise Software & shared Hardware

c) Shared services like Legal, Accounting, Technology, Patents, Investment Banking

d) Other Amenities and Facilities like individual accommodation, hostel rooms

e) Community Events and Promotional support for incubators and startups

f) Common Facilities Centers (Warehouses, Storage facilities, QA/QC labs etc)
3. Infrastructure and support mechanisms (cont.)

(e) Common IT infrastructure

- **Technology – Server & Software**

  - **Cloud Server:** Government to host a cloud server in the state data center that would connect all the incubation centers across the state. This server would be beneficial to all the startups at low or nominal costs.

  - **Enterprise Software & Device Testing Labs:** Based on the requirement, Government should procure Enterprise versions of key software required for testing and other purposes at incubators. These software and Labs can be utilized by the companies in the incubation space at nominal charges.
4. Service needs of technology startups

- Government subsidies and technology funds
- Provision of office and manufacturing space
- Cleanliness of environment
- Company certification and technology-based enterprise qualification
- Loan / credit guarantee and other assistance to get banking loan
- Provision of short term, small scale financial aids
- Access to information (like industry policies), legal arrangements
- Recruitment of staff
- Assistance in obtaining certification of products to go into the market
- Security services, fire extinguishers
5. Technology parks and incubation models

A hierarchical arrangement

- Concept
  - Research Park
  - Science Park
  - Technology Park
- Technology Incubator
- Business Incubator
- Hightech industrial zones; Technopolis / Innopolis

Product
5. Technology parks and incubation models (cont.)

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<thead>
<tr>
<th>Characteristics</th>
<th>Technology Incubators</th>
<th>Start-up Accelerators</th>
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<tbody>
<tr>
<td>Clients</td>
<td>All kinds of business including biotech, clean energy, medical devices, nanotechnology.</td>
<td>Web-based, mobile apps, social media, cloud-based software.</td>
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<tr>
<td>Selection process</td>
<td>Competitive selection mostly from the local community.</td>
<td>Competitive selection of firms from a wide geographic area including globally.</td>
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<td>Assistance</td>
<td>1 to 5 or more years (33 months on average)</td>
<td>Generally 1 to 3 month boot camps.</td>
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<td>Services</td>
<td>Management support, IP rights assistance, networking and access to external financing.</td>
<td>Fast-test and validation of ideas, with mentoring support from experienced entrepreneurs and seed-funding.</td>
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<tr>
<td>Investment</td>
<td>Usually does not take equity but assists in bringing in third party venture capital.</td>
<td>Typically invests &lt;$25,000 in teams and takes 4% to 8% equity stake in each venture.</td>
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Source: Dempwolf, Auer & D’Lppolito (2014)
6. Business incubation best practices

Management of the program

• Conduct a feasibility study before starting a program
• Develop a consensus-driven mission statement
• Establish client entry & exit criteria
• Collect outcome data
• Provide networking opportunities between client firms
• Establish effective tools to deliver support services
• Build networks with area business services providers
• Market incubators beyond the entrepreneurial community (i.e. embed the program in the fabric of the host community)

6. Business incubation best practices (cont.)

Key entrepreneurial support services

- Business plan writing and business basics
- Legal assistance, including but not limited to: General legal services, IPR, Incorporation or other legal business structure, Import/export requirements
- Access to capital
- Marketing assistance
- Access to broadband high-speed Internet
- Mentoring boards for clients
- Close ties with higher education institutions
- Accounting and financial management services
- Networking with other entrepreneurs, particularly other clients
- Networking with area business community
- Assistance in developing presentation skills
- Assistance in developing business etiquette

6. Business incubation best practices (cont.)

Additional key services

- Technology commercialization assistance
- Access to specialized equipment and laboratories at reduced rates
- Intellectual property management assistance

6. Business incubation best practices (cont.)

Success factors for technology incubators

In a study of technology incubators in the United States ten success factors were identified.
7. Fostering entrepreneurial university

Universities can make a substantial contribution, particularly on a regional level by linking industry and academic institutions and generating flows of knowledge between the two partners.

University ready to promote innovations, creativity and open the door to the SMEs is the key element in the creation of knowledge regions.

Over 200 universities, representing every continent of the world, were identified by experts as demonstrating established or emerging leadership in entrepreneurship. Three universities, however, were consistently cited as the world leaders – MIT, Stanford University and the University of Cambridge.

(Source: http://www.seerc.org/iceird2009/ppts/3.4.pdf)
7. Fostering entrepreneurial university (cont.)

- **Efforts needed**

  - **Transform research results and ideas** more effectively into businesses and enterprises
  - **Make venture capital available and increase financing** at early stages of business and company development
  - **Improve legislation and design workable ground rules** and promote the use of IPRs
  - **Create sound conditions for competition** that favour the growth of new enterprises

(Source: http://www.seerc.org/iceird2009/ppts/3.4.pdf)
8. Selected country experiences
Stanford-Silicon Valley entrepreneurship success

- A recent Stanford study estimated that the university’s entrepreneurs have generated revenues of $2.7 trillion annually and created 5.4 million jobs.

- Six conditions have been identified which helped create Stanford and Silicon Valley’s entrepreneurship and technological innovation:
  - A risk-taking culture
  - Talented, diverse, and imaginative students
  - A community that gives back (The generosity of accomplished entrepreneurs and venture capitalists who give back their time, money, and advice)
  - Abundant capital (Stanford students looking to fund a startup have ample opportunities to present their idea or prototype to investors.)
  - Collaboration with industry [Robust and dynamic Office of Technology Licensing (OTL) helping commercialize faculty and student research into profitable companies.]
  - Government support for funding cutting-edge research (The primary, almost exclusive source of its research budget is the federal government, particularly the NIH, the NSF, the Defense Departments and various other federal agencies.)

8. Selected country experiences (cont.)

Innopolis of Rep. of Korea (Daedeok, Gwangju, Daegu, Busan)

- **R&D-leading innovation clusters** wherein science, technology, and knowledge are efficiently created, transferred, and utilized

- **INNOPOLIS Daedeok** has been known as ‘The Heart of the Creative Economy’ for Korea’s science and technology growth and a rapidly **evolving innovation hub for high-tech commercialization**

- It hosts a super-high concentration of top-class **scientific and technical human resources, national research laboratories and research universities** within, and continuously attracts major contracts from private sector R&D organizations.

- There are **60 [public (25) and private (35)] research institutes** operating within the ecosystem making INNOPOLIS Daedeok.

- Supported over **906 technology transfer** between the domestic/global stakeholders. (31 of start-ups have gone public at KOSDAQ)

- **Number of internationally registered patents exceeds 10,000.** (Source: https://www.innopolis.or.kr/eng_sub0201)
8. Selected country experiences (cont.)

Infrastructure of Daedeok Innopolis

- **Daedeok Research Complex**
  - A cluster of research entities, including *government research institutes and private sector institutions*
  - An R&D cluster of *research-focused universities, including KAIST, and venture start-up collaboration zones*

- **Daedeok Techno Valley**
The *research and production base of support for advanced businesses* in the Daedeok Research Complex

- **Daedeok Industry Complex**
The *industrial base* of INNOPOLIS Daedeok

- **Northern Green Belt Area**
The northern area near the Daedeok Research Complex which includes the *core science belt areas of Shindong and Dungok*

- **Area of the Agency for Defense Development**
The *Area for military defense* which includes ADD and Hanhwa (defense contractors)

(Source: https://www.innopolis.or.kr/eng_sub0201)
8. Selected country experiences (cont.)

Technopolis of Finland

Technopolis are the planned efforts of a region where synergies between firms, higher education institutions, and research driven organizations are established and developed in order to create and help with the generation and diffusion of new technologies (Víctor Manuel Tamayo Bustamante and Ana María Calle Fernánd, 2008)

- Discovery phase (0...6 months) – Evaluation: Feasibility Studies (Assessment and feed-back on business idea feasibility)

- Pre-Incubation phase (0...6 months) - Business Plan: Start-up planning and preparation

- Incubation phase (12...24 months) - Business Development Road-map: Creation of a solid business platform for business growth

- Acceleration phase (6..12 months) - Toward Growth Track: Preparation for acceleration and internationalization

- Technopolis Ventures results:
  - Post-incubation survival rate 86%
  - Average growth rate 50%
  - Average 5-7 jobs/start-up at exit

Source: https://www.infodev.org
8. Selected country experiences (cont.)

Hightech industrial zones of China

- Major thrust of China’s STI policy in 1985

- **739** incubators, **50** national university-sponsored science parks, **441** technology transfer institutions, **175** productivity promotion centers, **732** products inspection and examining organizations, **504** strategic alliances of industrial and technological innovation, along with industrialization bases for new and high technologies, industry clusters with distinct features, pro-technology and pro-innovation public development platforms, public service platforms and public financing and investing platforms.

- Produced more than **13,000 companies with assets over 100 million yuan**, about **18,000 tech-based enterprises**, over **1,000 companies that are publicly traded in different stock exchanges** in international financial centers, and, in 2012 alone, **65,000 newly registered business ventures**.

8. Selected country experiences (cont.)

Hightech industrial zones of China

- In 2012, the zones collectively realized a total revenue of 16,596 billion yuan, an export earnings of $376.04 billion which accounted for 18.4% of the national total export earnings. Tax revenues totaled over 968 billion yuan.

- Among all national hi-tech zones, 12 contributed over 30% of the total value of industrial output of the city in which they operate; 30 contributed more than 20%; and two hi-tech zones contributed more than 50%.

Source: http://www.china-un.org/eng/chinaandun/economicdevelopment/kj/t1106070.htm
9. Success factors in technology-based entrepreneurship

- **Attitudes** as to why small companies are important in bringing new innovative ideas to market
- **Management talent** needed to make a company succeed
- **Patents** play a major role in building a sustainable advantage for small, high-tech startup companies
- Stimulating **passionate behavior among employees** in startup companies
- Role of **quality investors** and timing of investment
- Getting **high quality products** to the market quickly
- **Flexibility** in small organizations
- Importance of **location** -- where you locate your business
- **Clusters** breed competitive advantage

(Source: John T. Preston Associate Director, MIT Entrepreneurship Center. Originally a Transcript of a Lecture Delivered in Tokyo in 1997 Updated August 2001)
10. Final thoughts !!!

- Entrepreneurship development needs to comply with the national development goals
- There is a need to align with relevant SDGs and targets
- Universities and institutes of higher learning and research should be made entrepreneurial
- Entrepreneurship infrastructure development should consider sectorial strengths and regional/local capacities
- Robust entrepreneurship development and management support systems are key to success
- Public finance and venture capital are critical
- Successful models and champions in technology based entrepreneurship and business incubation could catalyze and accelerate faster development
Thank you

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