



Course 1.3

Innovation Theory and Concepts, National Systems of Innovation (NSI) and the SDGs

UN-Wide Capacity Building Workshop on Technology for Development:
Innovation Policies for SDGs in the Arab Region

15 April 2018, Amman, Jordan



National Systems of Innovation and SDGs

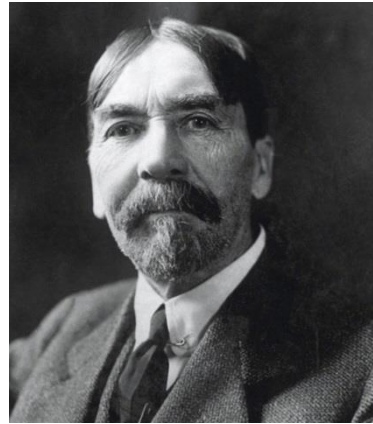
- 1. What is a National System of Innovation?**
- 2. How do we know the NSI is operating?**
- 3. What problem does NSI solve?**
- 4. How does the NSI relate to SDGs?**
- 5. What are key technologies for SDGs?**
- 6. Exercise: Innovation policy in Norland**

1. What is a National System of Innovation?

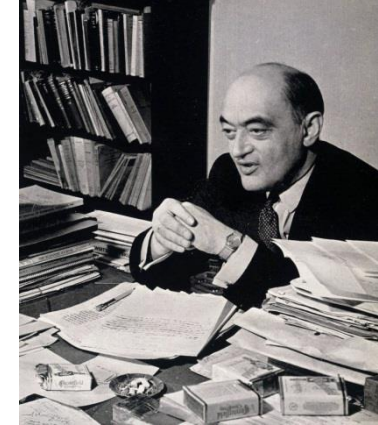
Not a new concept



Friedrich List
1789-1846



Thorstein Veblen
1857-1929

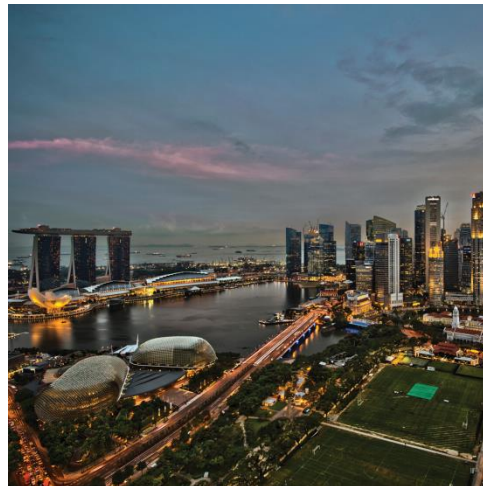


Joseph Schumpeter
1883-1950



OECD

Marshall Plan



Asian catch-up

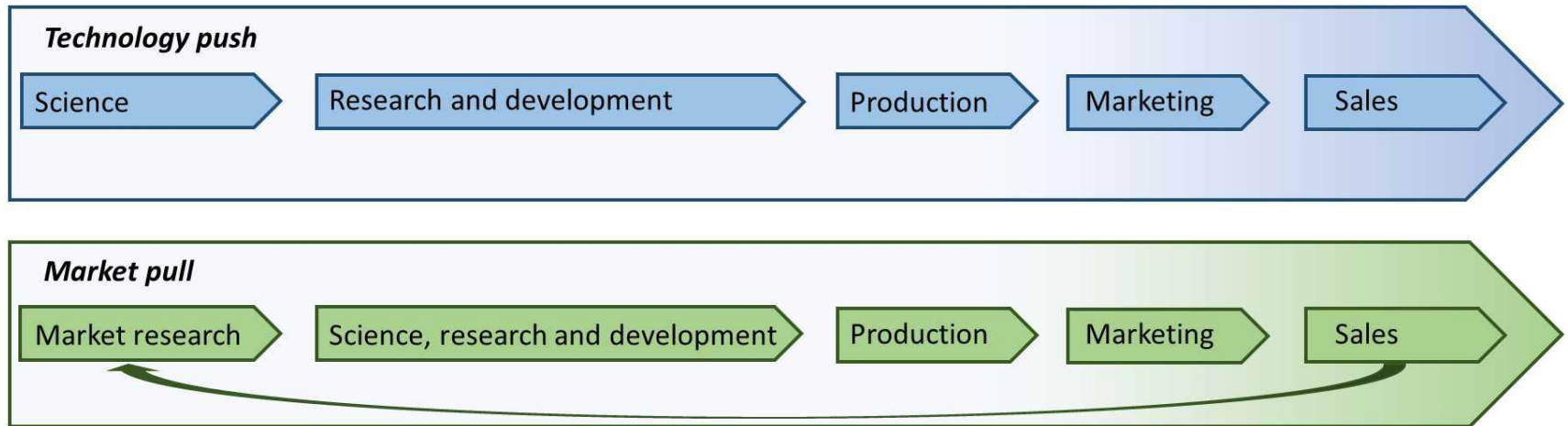
2017 EUROPEAN INNOVATION SCOREBOARD

EU MEMBER STATES' INNOVATION PERFORMANCE

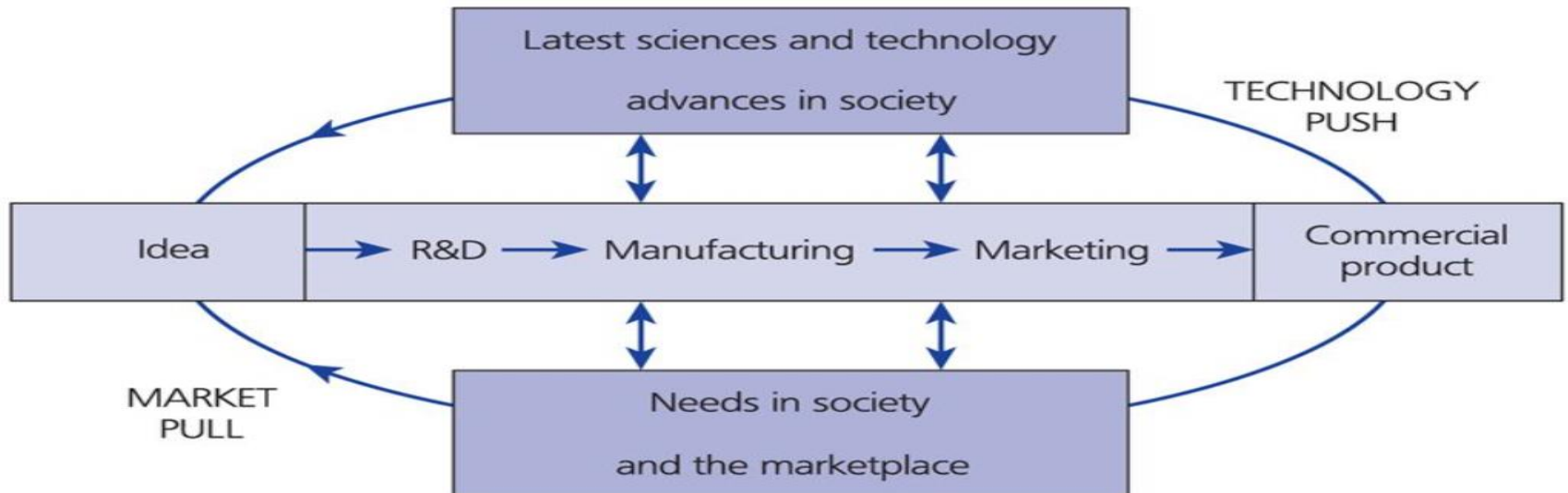
- Innovation Leaders
- Strong Innovators
- Moderate Innovators
- Modest Innovators



Common wisdom: Linear Innovation Model



Interactive model of innovation (Rothwell, 1985; Trott, 2011)



Some definitions:

“... network of institutions in the public- and private-sectors who import, modify and diffuse new technologies.” (Freeman, 1987)

“... relationships which (enable) production, diffusion and use of new, and economically useful knowledge ...” (Lundvall, 1992)

“... institutions and economic structures affecting the rate and direction of technological change ... ” (Edquist and Lundvall, 1993)

“... system of interacting private and public firms, universities, and government agencies aiming at the production of science and technology. (Niosi et al., 1993)

“... institutions, incentive structures and competencies, that determine the rate and direction of technological learning (Patel and Pavitt, 1994)

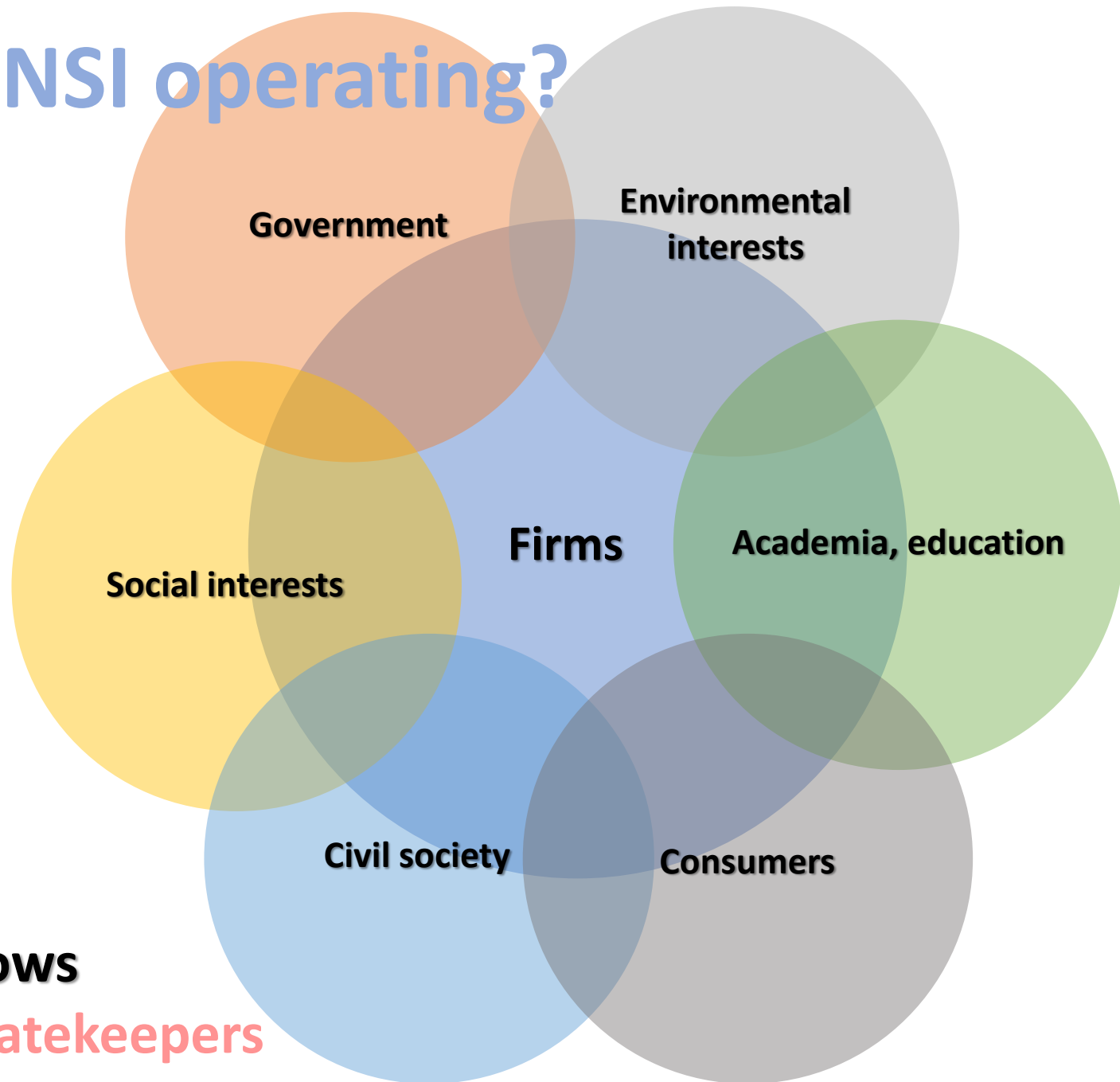
“... system of interconnected institutions to create, store and transfer the knowledge and skills and artefacts ...” (Metcalfe, 1995)

National System of Innovation

- Firm-centric
- Interaction in the socio-economic environment
- Institutions
- Relationships
- **Not an STI policy**

Q: Is the NSI operating?

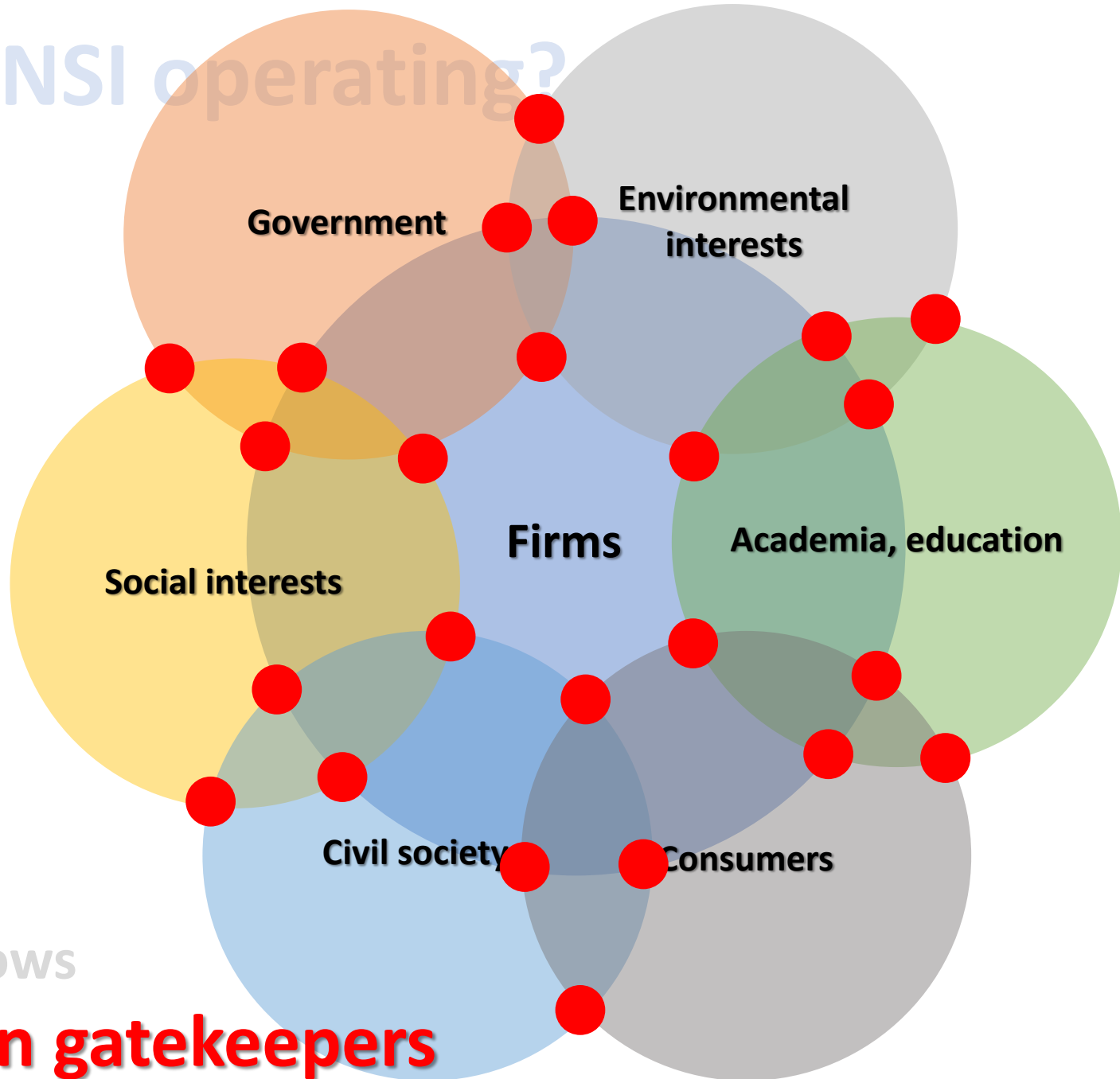
Linkages
Interactions
Relationships
Quantity
Quality
Stakeholders
Capability
Capacity
Learning
Knowledge flows
Information gatekeepers



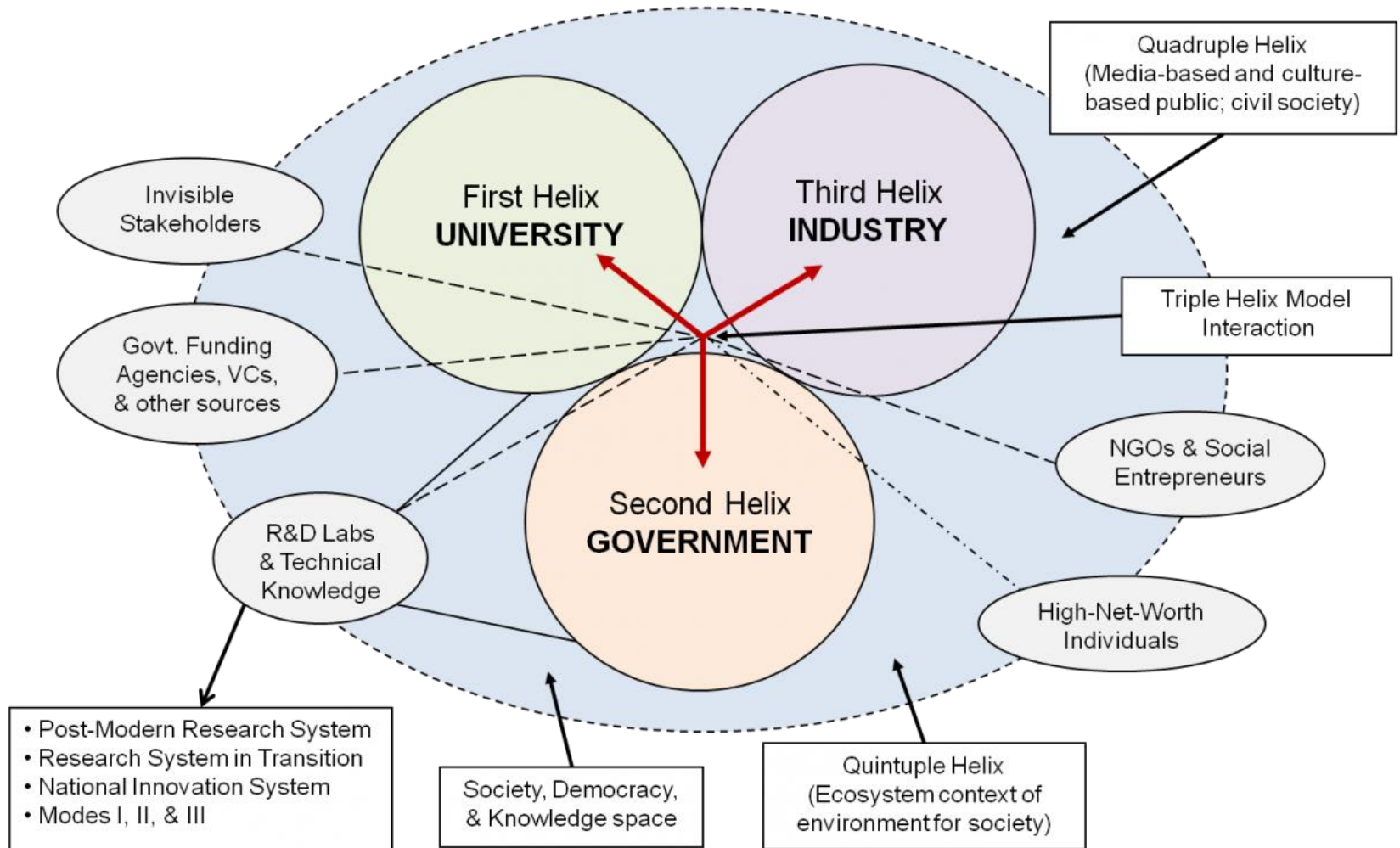
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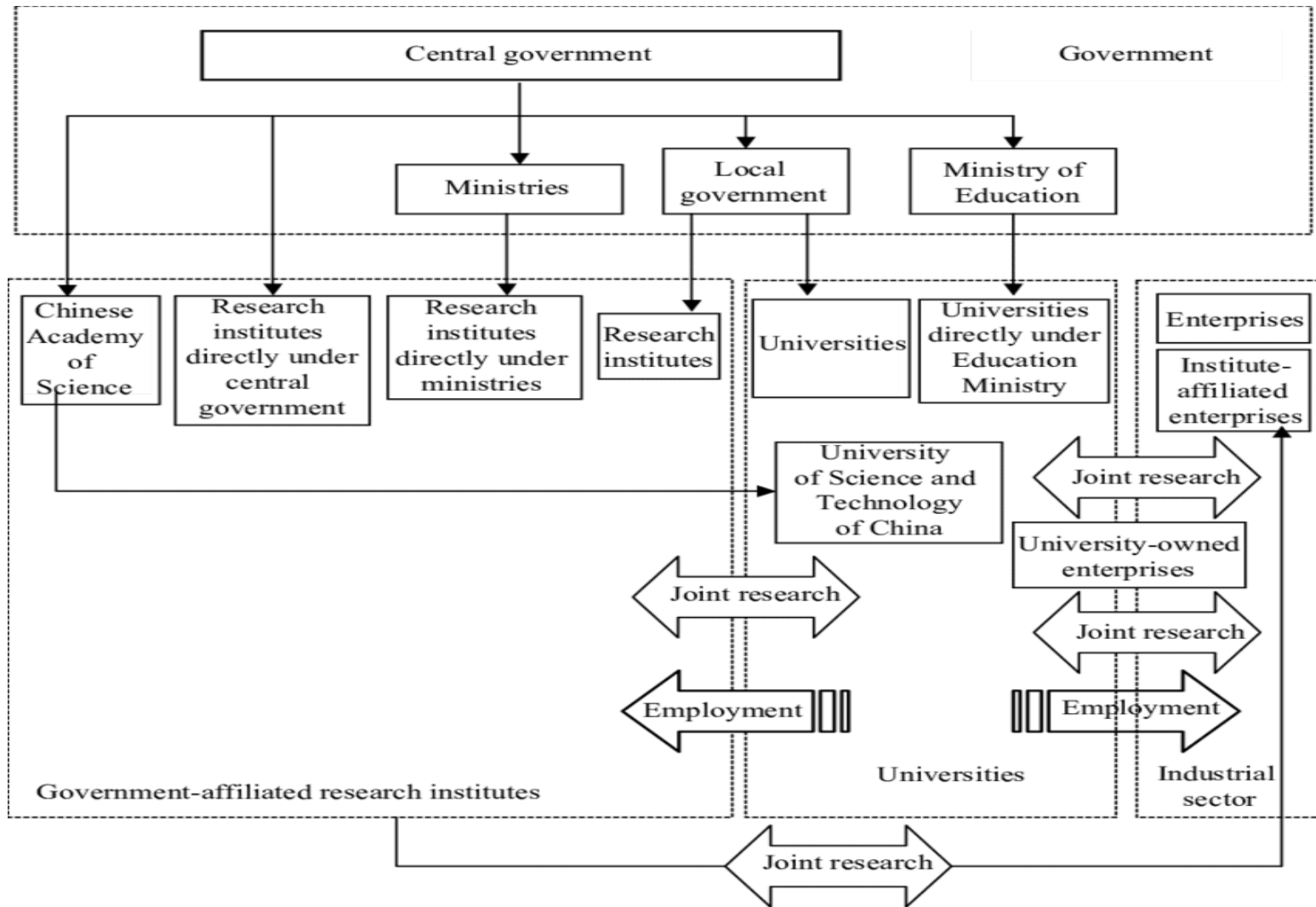
Information gatekeepers



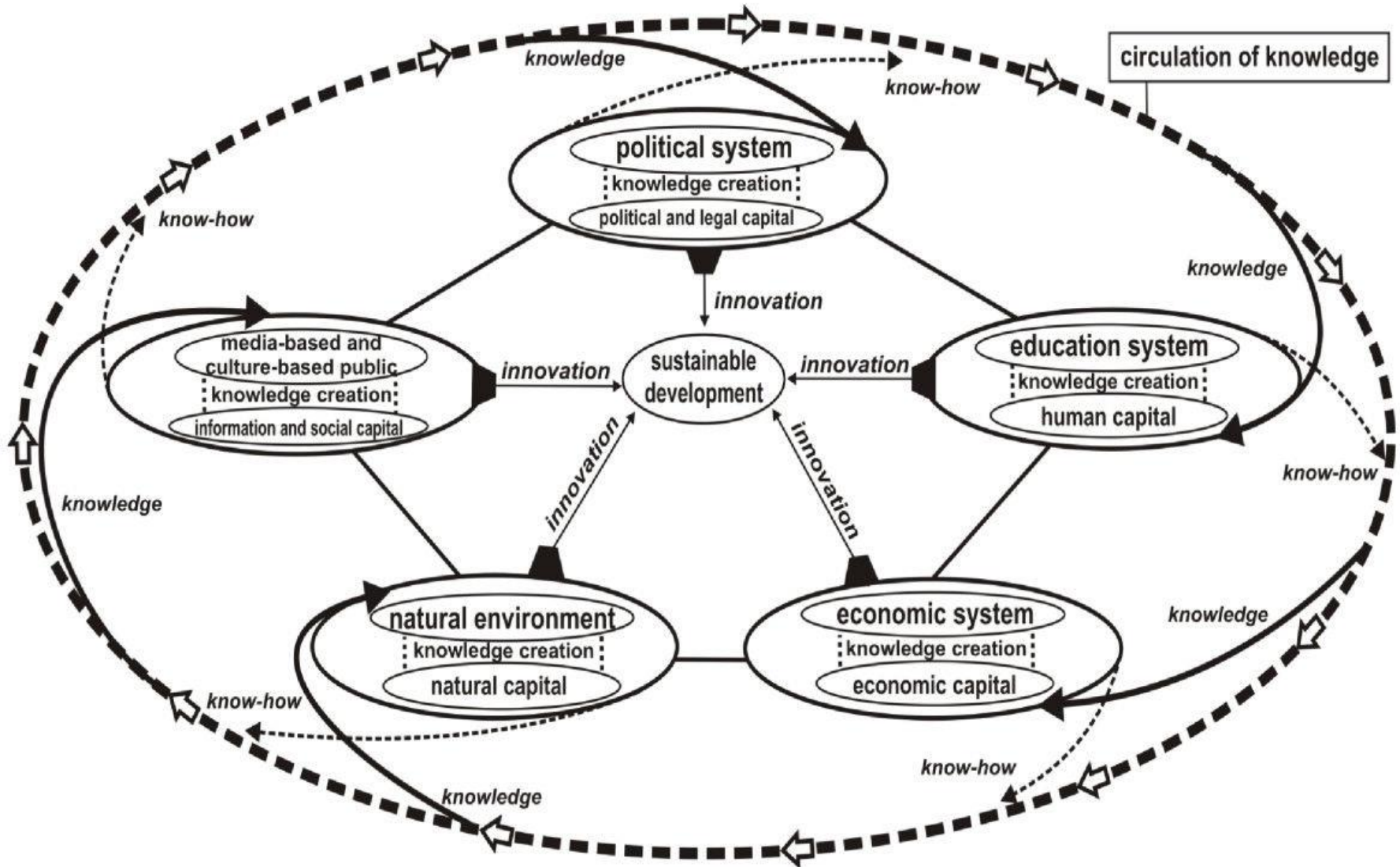
Knowledge Systems of Innovation and Major Stakeholders in India



Innovation entities in China's national innovation system



Quintuple Helix innovation model



3. What problem does a National System of Innovation solve?

A1: Provides a **framework** for developing and implementing **policy**

A2: Includes firms, markets, institutions and interests... **and SDGs**

A3: Moves STI policy thinking beyond funding R&D

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Denmark – a nation of solutions

Enhanced cooperation and improved frameworks for innovation in enterprises

December 2012 The Danish Government

Australian Business Foundation

NATIONAL INNOVATION SYSTEMS: FINLAND, SWEDEN & AUSTRALIA COMPARED

LEARNINGS FOR AUSTRALIA

NOVEMBER 2005

REPORT PREPARED FOR
THE AUSTRALIAN BUSINESS FOUNDATION BY

GÖRAN ROOS, LISA FERNSTRÖM AND OLIVER GUPTA

Intellectual Capital Services Ltd.
48 Gray's Inn Road
London WC1X 8LR
E-mail: intcap@intcap.com

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Social and Behavioral Sciences

2nd International Conference on Leadership, Technology and Innovation Management

National Innovation Systems: the Moroccan Case

Sihani Hamid^a, Nadia Benabdeljalil^a

^aFaculté Mohammed VI d'Ingenierie, Mohammed VI University, Rabat, Morocco

Abstract

Morocco has introduced in the late 90s a National Innovation System (NIS) to make innovation a driving force for economic development in a particularly competitive context. However, the anticipated dynamics of this system do not live up to expectations. In this context, this paper proposes an analysis of the architecture of the Moroccan NIS, its achievement in the field of innovation, and its limits. The overall goal of the article is to understand why technical high-performance remains of limited impact over Moroccan economy.

Keywords: NIS, National Innovation System, R&D, Morocco

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1. Introduction

Innovation is one of the foundations for building competitive advantages specific to each economic context. Nonetheless, innovation is not an isolated series of phases, but rather a set of ongoing interactions between the possibilities that the technology or the market can offer, the assets employed by the company or the State as well as actual strategies (Boyer and Dohér, 1996). It is therefore a process heavily influenced by public policy (Etzkowitz, 2010).

The first integrated approach to National Innovation Systems (NIS) was proposed by Lundvall (1985 and 1988). This approach is based on the concept of "national system of production" suggested by Lutz and Von Hippel's work on the national technical collaborations among companies. Lundvall proposes three interacting spheres for the national system of innovation: first, a productive sphere related to its economic and industrial structure. Second, a training-based sphere related to human resource training. And finally, a research sphere, characterized mainly by bonds built between public research institutions and companies (Dyfflat, 2002).

Several authors have emphasized the interest of developing national innovation systems (NIS) in developing countries, stressing that this is a new area of research (Dyfflat 2003, 2004, 2008, Casadella and Benalherne-Temesna 2006, Baltes and Hamrock 2004, ...). Their work shows in particular that productivity and knowledge utilization is accompanied by a reduction of poverty and an improvement of income distribution. The research of Dyfflat (2009) even describes a system to implement for a "take off" of research and development and innovation in African countries.

Corresponding author. Tel. +212 460 010 479 Fax. +212 037 718 833
E-mail address: sihani.hamid@gmail.com

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Procedia

Social and Behavioral Sciences

International Conference on Research Paradigms Transformation in Social Sciences 2014

Features of the Advancement of Science as an Integral Part of the National Innovation System in Modern Russia

Chmykhalo Alexander^a, Abusheeva Magpervara^a

^aNational Research Tomsk Polytechnic University, 60 Lenin Ave., Tomsk, 634026, Russia

Abstract

The study explores current tendencies in science and innovation in Russia and gives an assessment of perspectives for optimization of the national innovation system. The paper reviews the main trends in the development of science and innovation in the modern world. A comparative analysis of the historical experience in science and innovation in Russia is made that reveals the dominating role of the state and the military character of the national innovation system. The evolution of the current national innovation system shows the inclination of the Russian state to preserve the traditional system. Extrapolation of the results of the current policy, even in the near future, indicates further degradation of the national innovation system is likely. The findings of the study demonstrate the need to work out a strategy for development of the national innovation system in which the government will have to manage other parts of the innovation system, such as private enterprises, universities, and startups, and create an open and competitive environment with free access to resources for every participant to achieve the full potential of the national innovation system.

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<http://dx.doi.org/10.1016/j.procs.2015.10.110>
Peer review under responsibility of Tomsk Polytechnic University.

Keywords: innovation, national innovation system, science

1. Introduction

The paper deals with the Russian government policy in the field of science and innovation development. The study focuses on the analysis of traditional principles of science and technology policy in Russia as well as their transformation in post-Soviet Russia. The analysis also aims to reveal the main contradictions and problems related to the implementation of the government's policy toward innovation development to find the historical and cultural roots of these formations.

Current science of science treats the process of scientific knowledge and innovation as a complex system with a number of interacting factors which give rise to new ideas and knowledge. This knowledge in turn may contribute to the development of new products, processes, organizations, and the opening of new markets (Schumpeter, 1939; Schumpeter, 1987). Today many researchers, when analyzing the process of obtaining new knowledge (primarily,

^a Chmykhalo Alexander Tel. +78133640128
E-mail address: alexander@tpu.ru

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doi:10.1016/j.procs.2015.10.110

MINISTRY OF EDUCATION

Evaluation of the Finnish National Innovation System

Policy Report

www.evaluation.fi

TYÖ- JA ELINKEINMINISTERIÖ
FINNISH ECONOMIC DEVELOPMENT
MINISTRY OF EMPLOYMENT AND THE ECONOMY

UNITED NATIONS CONFERENCE ON TRADE AND DEVELOPMENT
UNCTAD

Science, Technology & Innovation Policy Review

Oman

UNITED NATIONS

4. How does NSI relate to SDGs?



- All require knowledge, technology and innovation
- All require interaction and partnerships as formulated in SDG 17
- Many, most, require sustainable action by firms-entrepreneurs

SDG 17 is analogous to NSI framework at a global level

17 PARTNERSHIPS
FOR THE GOALS



"Strengthen the means of implementation and revitalize the global partnership for sustainable development"

SDG 17 has specific technology targets:

17.6 on international collaboration

17.7 on promoting environmentally sound technologies

17.8 on innovation capacity-building (focus on LDCs)

Underscores the complexity of the task in terms of linkages and relationships

NSI > STI > SDGs: Aiming at quick and profound transformation driven by fast-evolving and converging technologies

1. **No definitive list of technologies**
2. **Common features of new technologies relevant to Agenda 2030**
 - Fast change and short adaptation cycles
 - Lower costs and wider choices
 - More open science, technology and innovation
 - New forms of work and inclusiveness
 - **DISRUPTIVE INNOVATION**

5. What are key technologies for SDGs?

- **Precision agriculture:** SDGs 1, 2, 9, 12, 15
- **Water management, wastewater treatment and nutrient recovery:** SDGs 6, 9, 11, 15
- **Circular economy:** SDGs 6, 7, 13, 14, 15
> residual, waste = resource for products, energy
- **Transformative technologies:** SDGs 3, 4, 8, 9, 10
> exponential growth, impact, strong links with ICTs
(e.g.: AI, IoT, robotics, autonomous V, blockchain, 3D printing-additive mfg.)

Current concerns, way forward

- **Big issue is SDG 5: Gender Equality**
- **Q: Are SDG actions sustainable?**
A: Innovation and entrepreneurship
- **Q: What to do?**
A: Get policy fundamentals right
 - > **strengthen NSI** – framework for STI (do an STI Policy Review?)
 - > support **innovative firms** (accelerators, finance, fiscal, HR...)
 - > strengthening **education and training**
 - > build domestic and international **linkages**
 - > **demand-side** science, technology and innovation policy
 - > **inclusive, grassroots, social, open > SDGs-relevant**