IKED
INTERNATIONAL ORGANISATION FOR
KNOWLEDGE ECONOMY AND ENTERPRISE DEVELOPMENT

Geopolitics, innovation and restructuring in Iran and the Middle East

Sharif University
December 3, 2017

Thomas Andersson
Thomas.andersson@iked.org

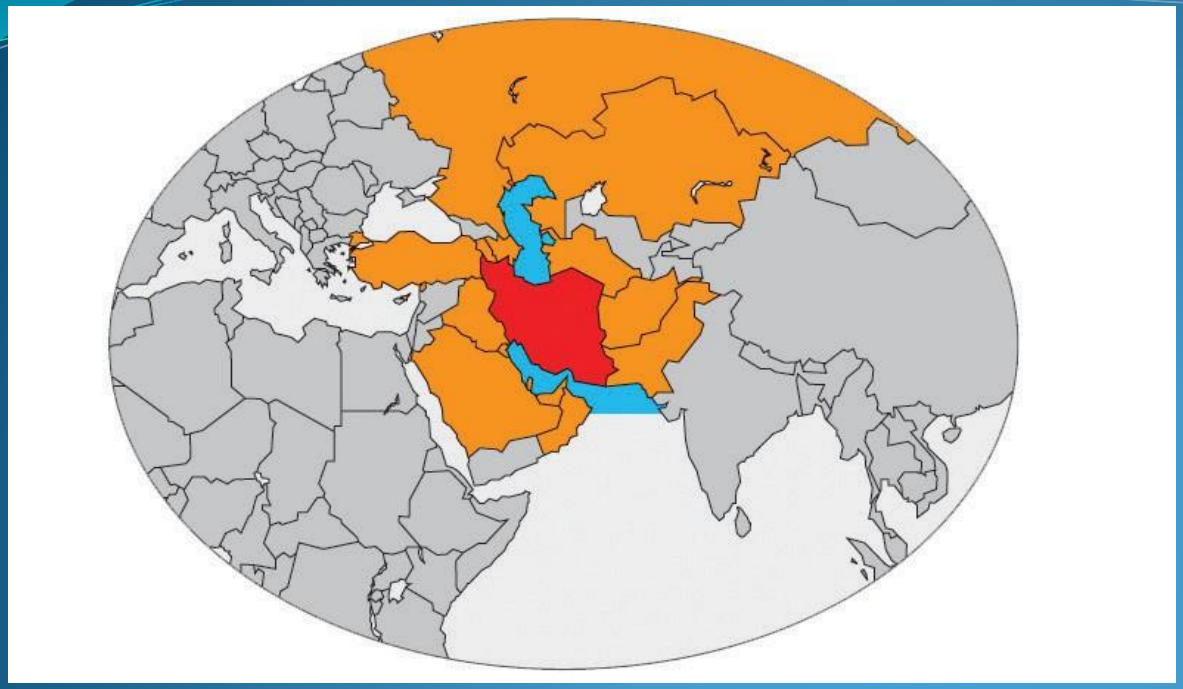
Outline

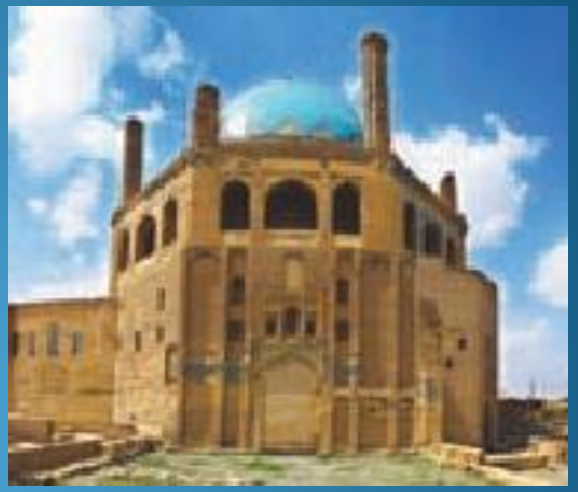
- Context
- Benchmarking
- The Innovation System
- The Digital Era
- Governance

2017-18: Where are we…

- Technology on the move, incremental, disruptive, diffusion
- Economic expansion and cross-border integration blend with stagnation, alienation and new protectionism
- Challenges social cohesion, income differences, jobs
- Population explosion overall, urbanisation, young vs. old societies
- *Grand Challenges* intensify:
  - Climate change, ecosystem deterioration, accelerating loss of biological diversity
  - Energy, food and water supply disruptions
  - Poverty, congestion, waste, new health issues
- Public indebtedness and unmet investment needs
- Regional conflicts, refugee crisis
- Terrorism, peace at stake, threat of major war
- Explosion of populism, opportunism, crisis of the “public good”

The Islamic Republic of Iran





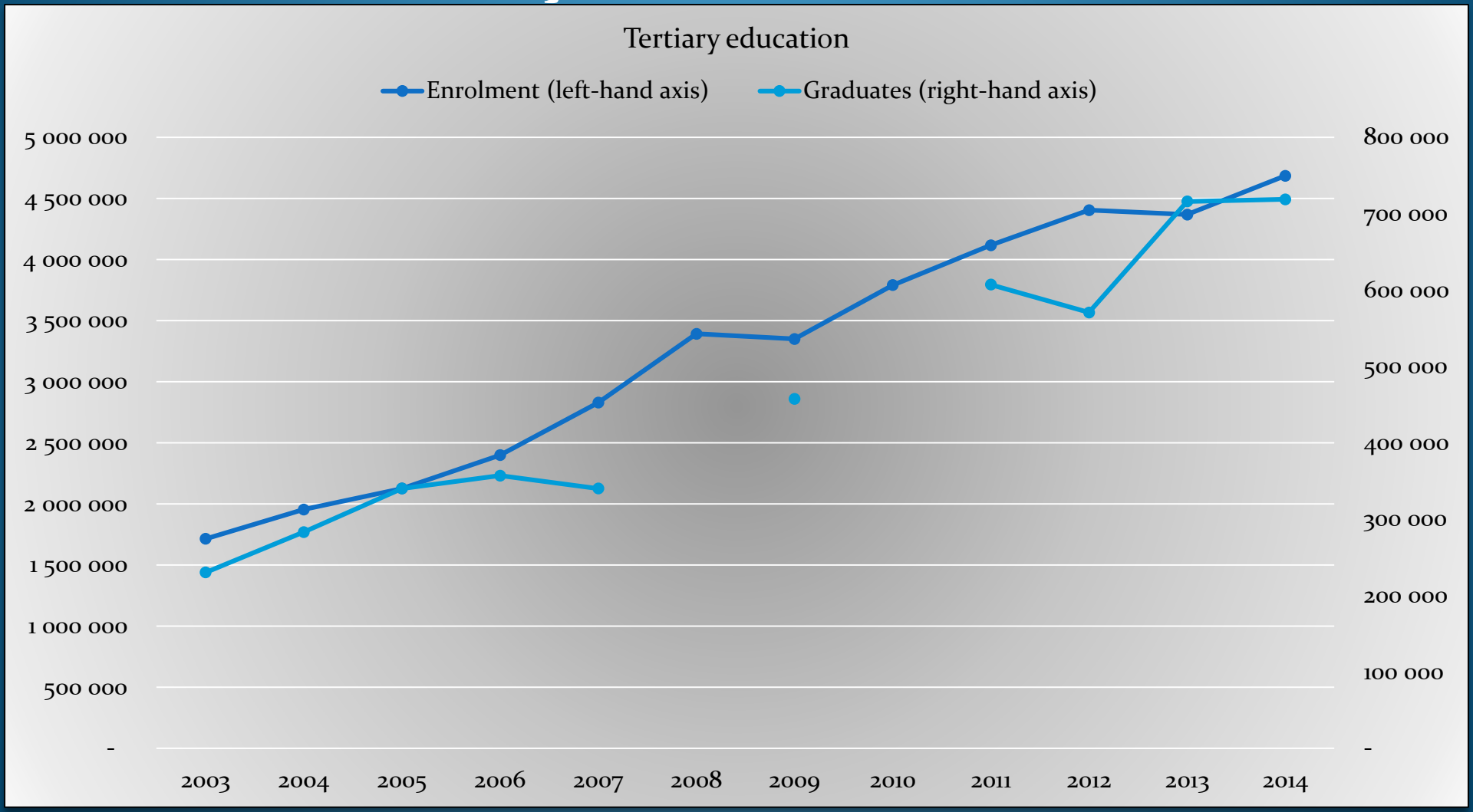
Regional – Economic Context

- **High Growth based on natural resources is over**
- Critical challenge to diversify **away from oil & gas and large public sector** with high cost levels
- **Government** domination, efficiency and trust issues
- Generations change; informed, wired and educated young generations, but quality problems in education, mismatch with labor markets
- "Rentier" economy - emphasis on real estate and tangible investment
- Failure to put in place inspirational and inclusive approach to research, innovation and entrepreneurship!!

Share of adults with at least a bachelor's degree	30%
Number of Iranian universities in top 10% worldwide	5
Full-time university professors per million population	2 000
Share of PhD students among total students	3.5%
GERD/GDP ratio	4.0%
Share of GERD financed by business enterprise sector	50%
Researchers (FTE) per million population	3 000
Government researchers (share of total researchers)	10%
Researchers in business enterprise sector (share of total researchers)	40%
Share of researchers employed by universities	50%
Scientific articles per million population	800
Average citations per publication	15
Number of articles among 10% most cited worldwide	2 250
Number of Iranian journals with an impact factor of more than 3	160
Number of national patents	50 000
Number of international patents	10 000

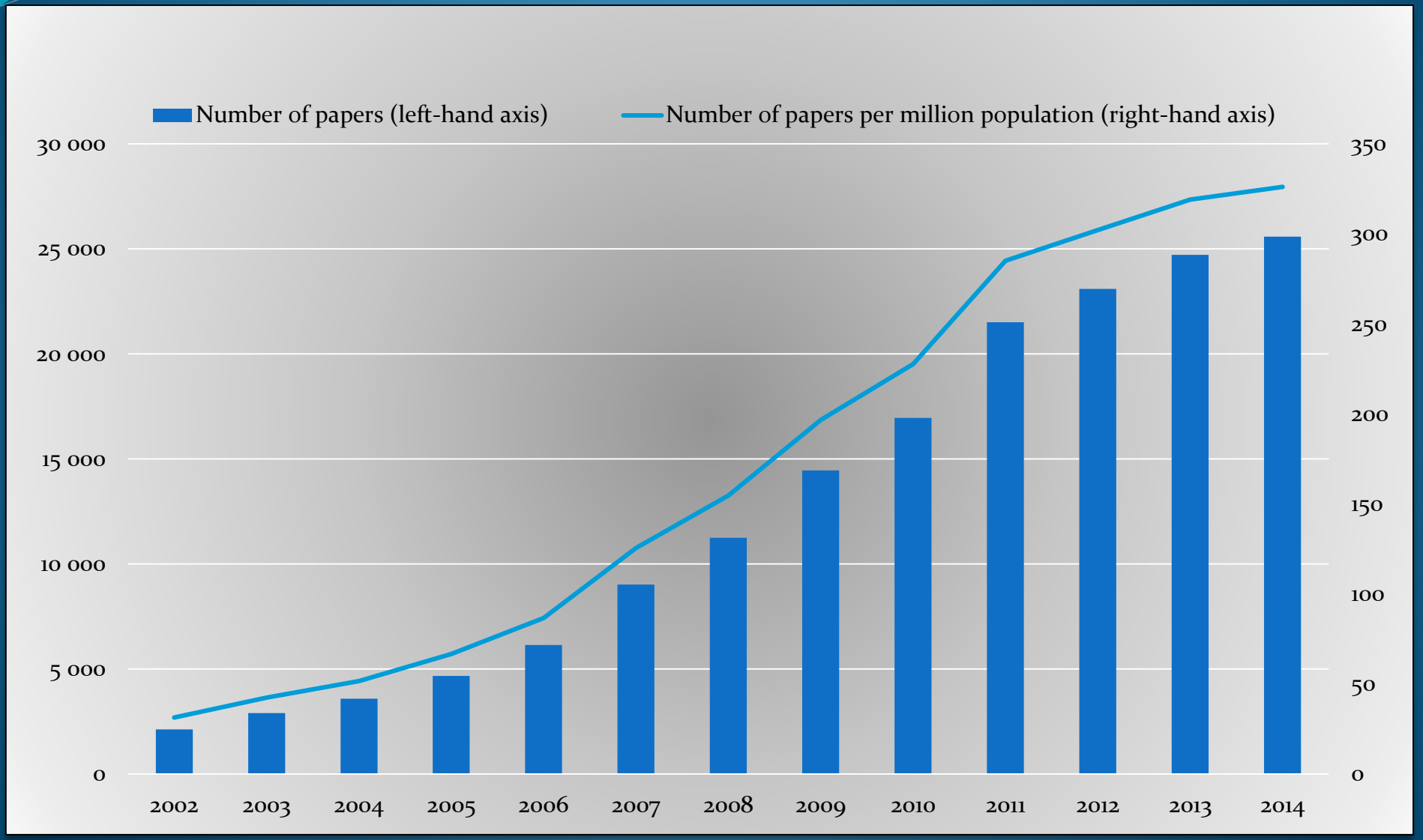
Source: Government of Iran (2005) Vision 2025

Enrolment in and graduation from tertiary education in Iran



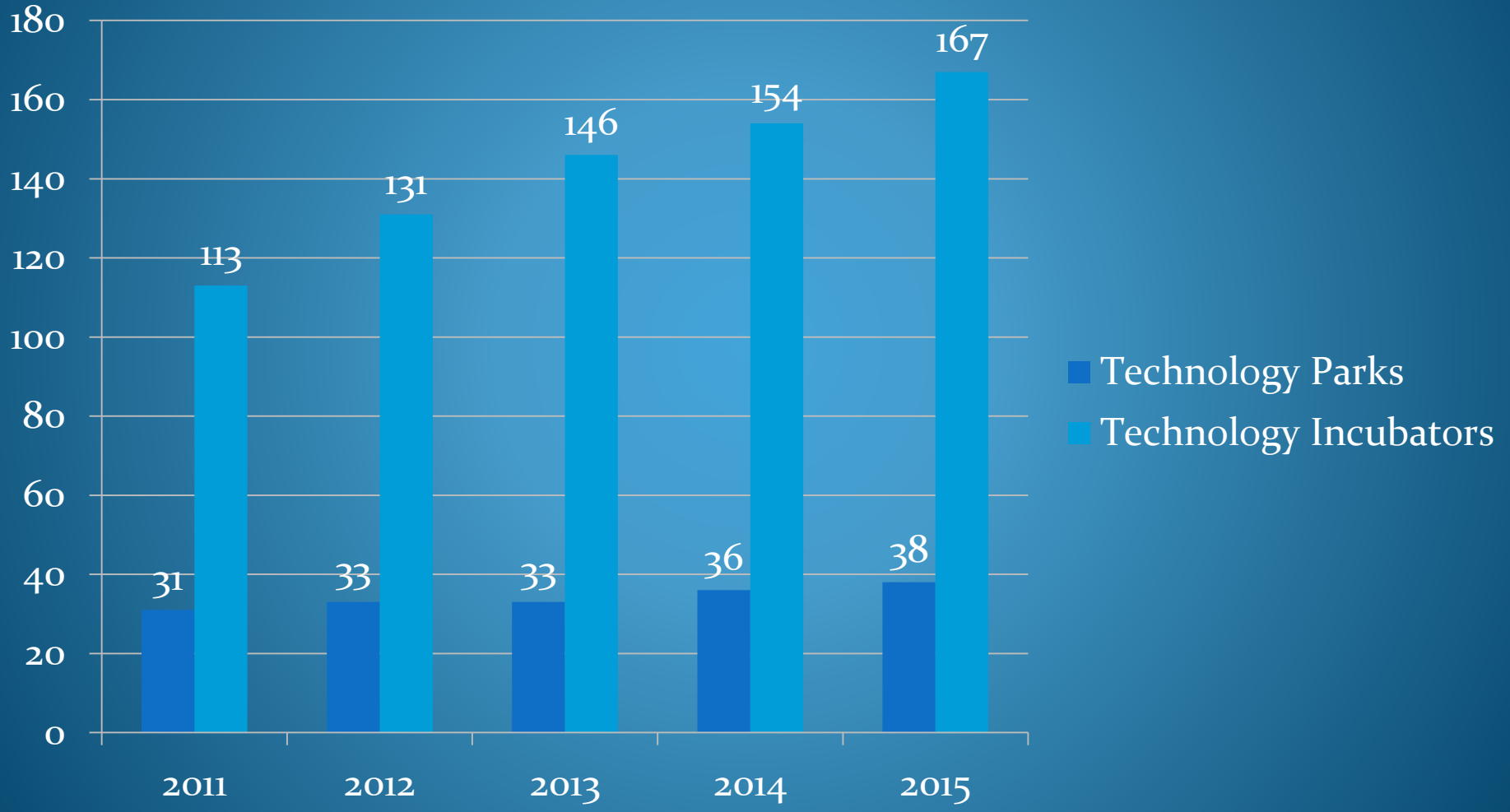
Source: UNESCO Institute for Statistics database (2016)

Scientific publications, Iran



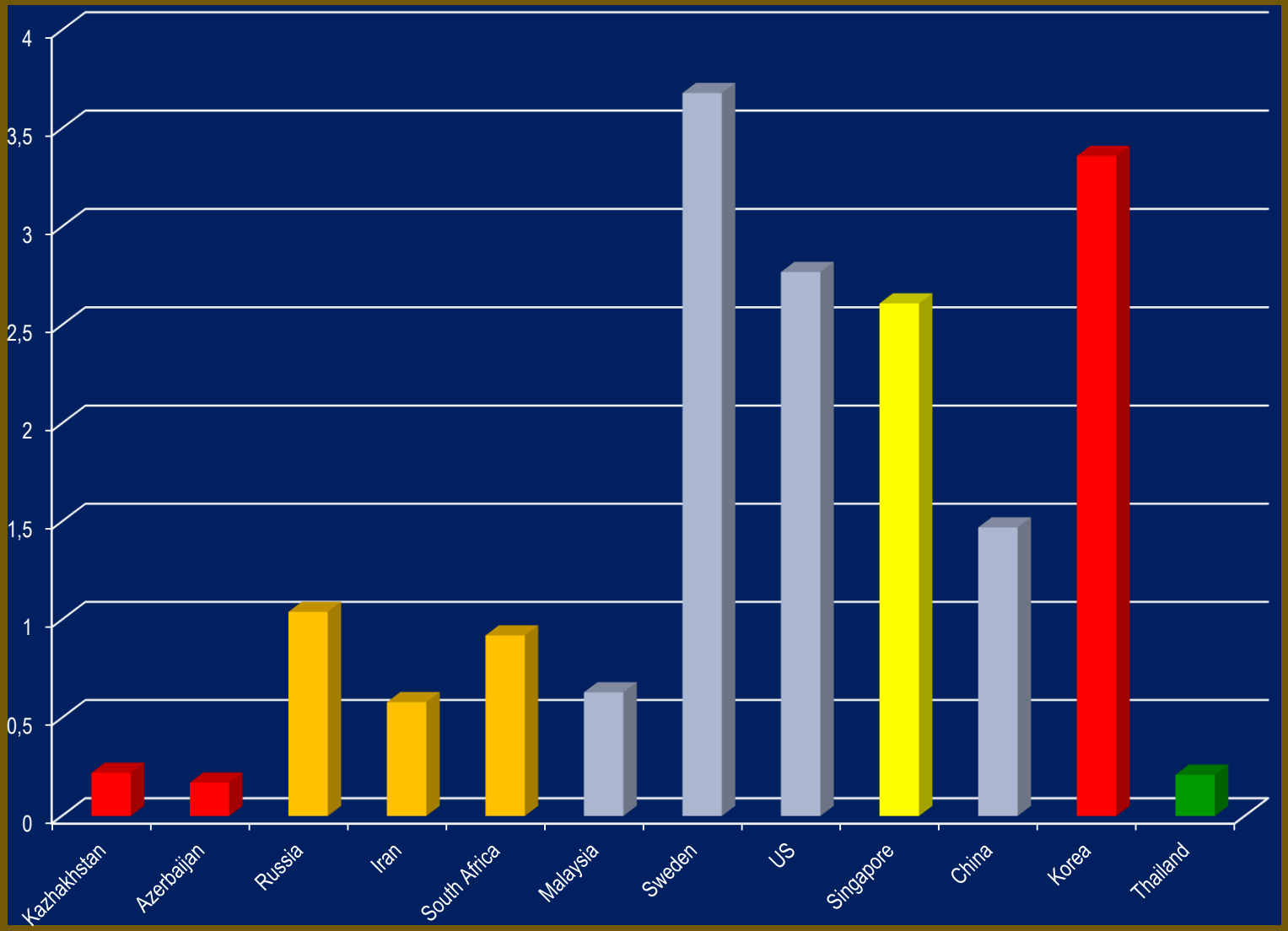
Source: Thomson Reuters' Web of Science, Science Citation Index Expanded (2015)

Development of Technology Parks and incubators in IR Iran



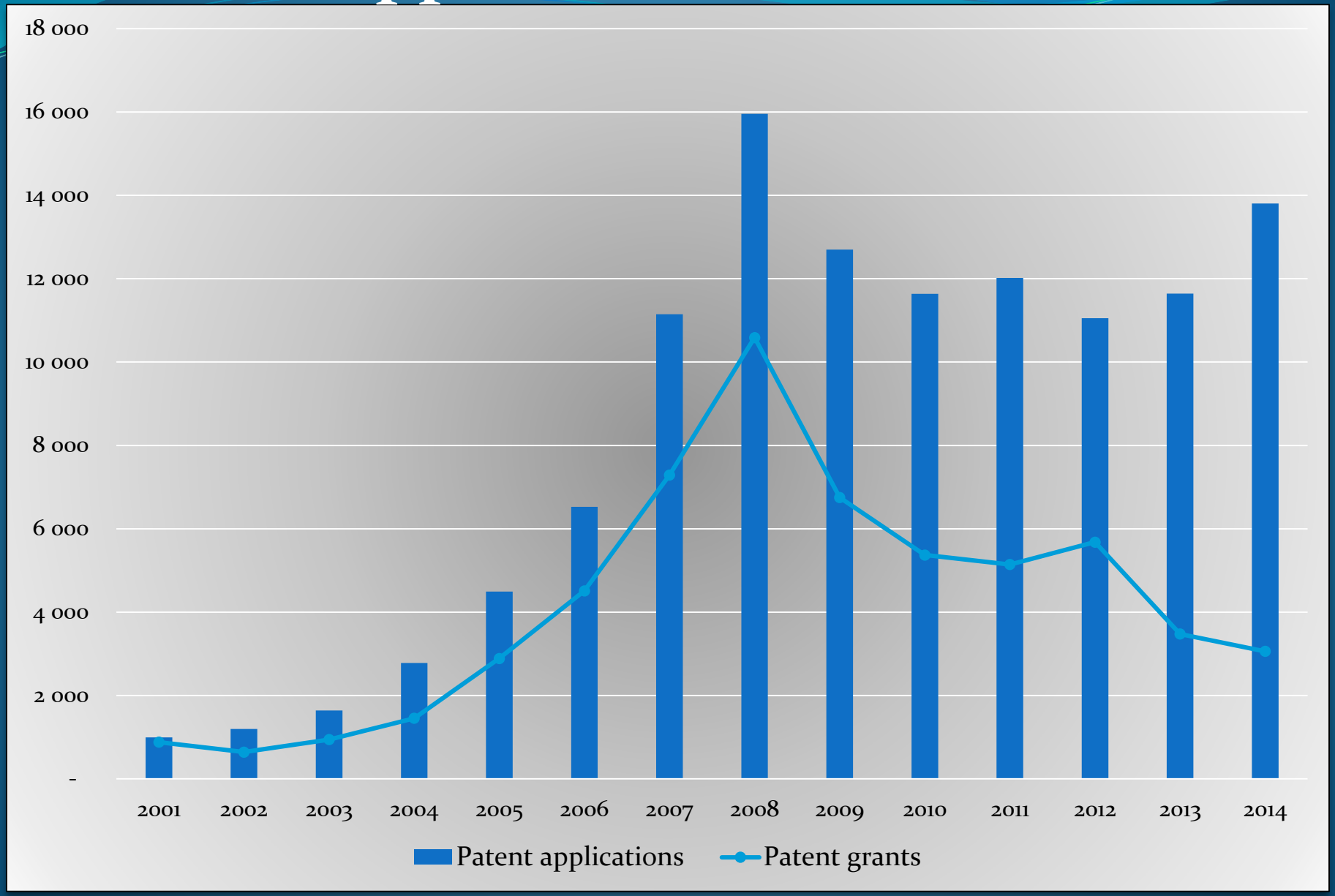
Source: Ministry of science, research and technology (2016)

R&D Expenditure % of GDP, 2012



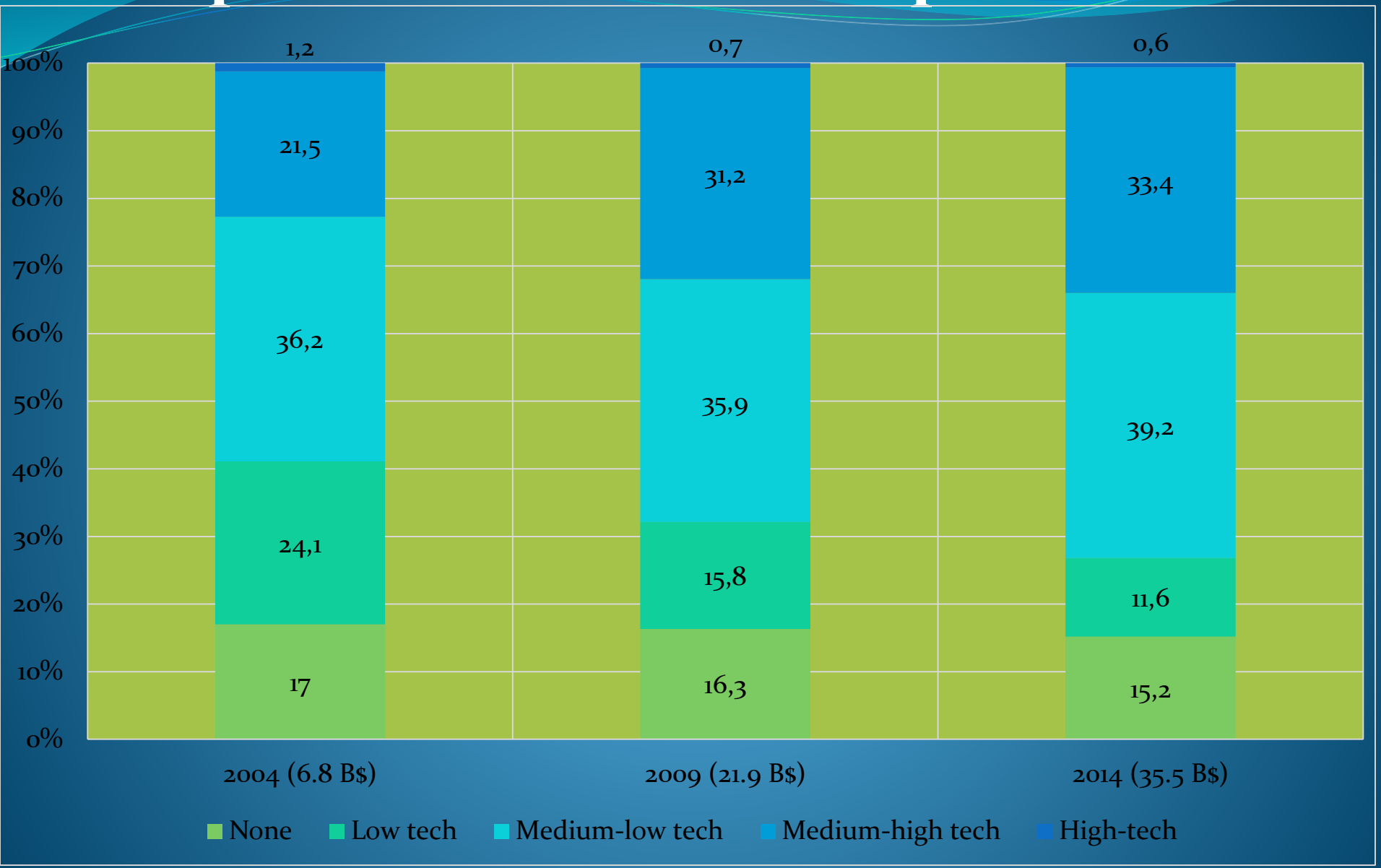
Source: The World Bank (KAM)

Patent Applications, Iran 2001-2012



Source: UNESCO Institute for Statistics database, 28 January 2016

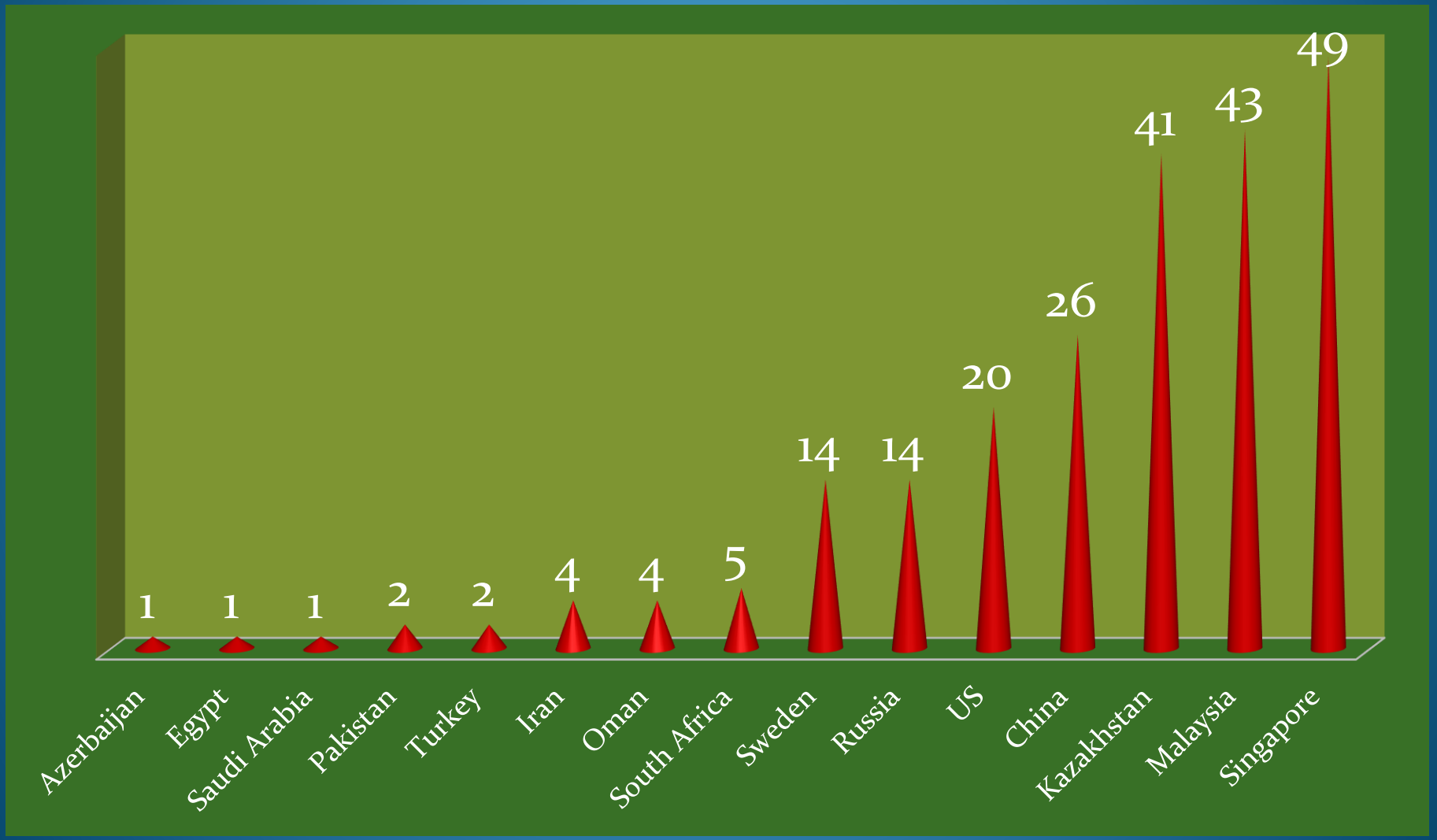
Composition of non-oil exports in Iran



Source: UNESCO Institute for Statistics database, 28 January 2016

Undiversified economy

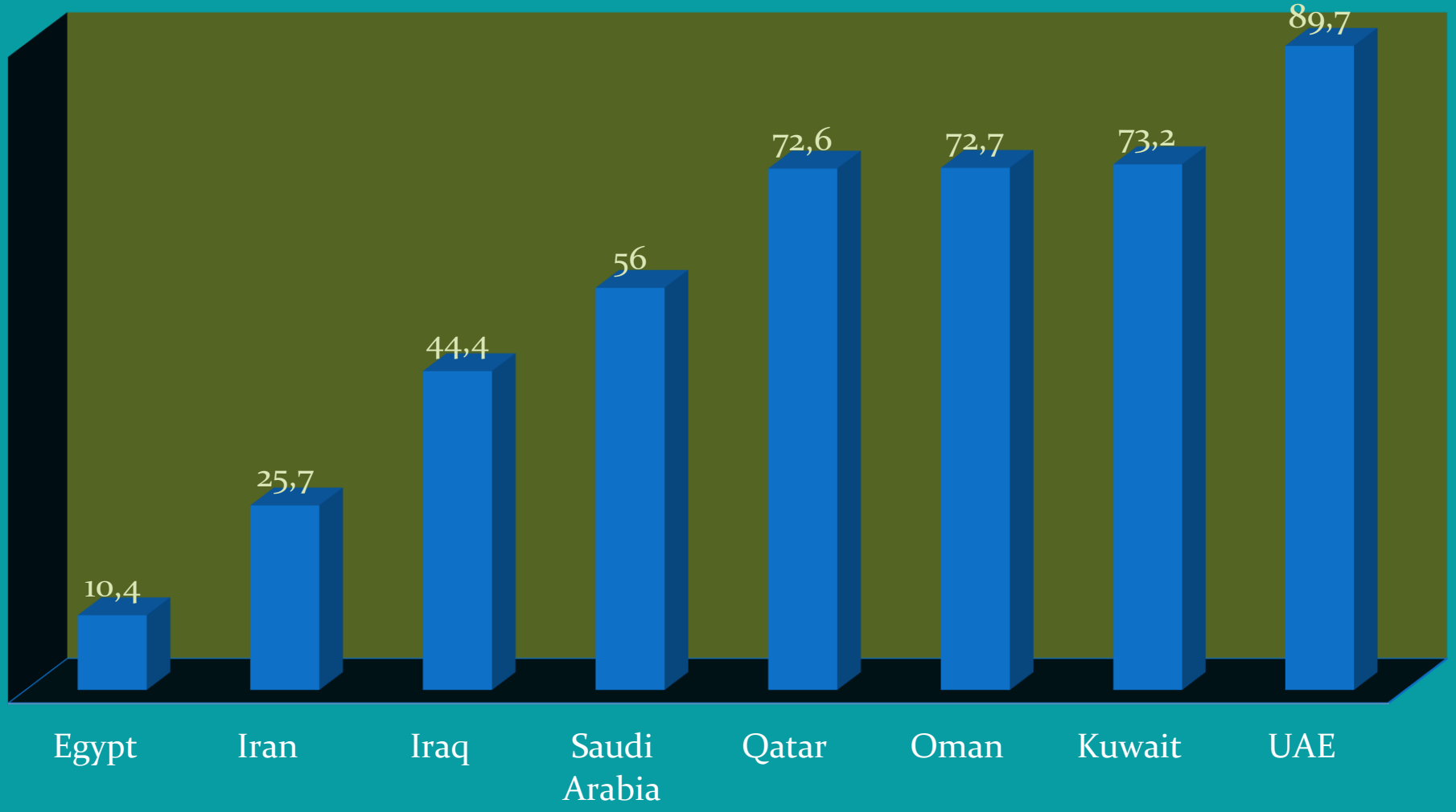
High-technology exports (% of manufactured exports)



Source: The World Bank 2017, data from 2012 or latest available

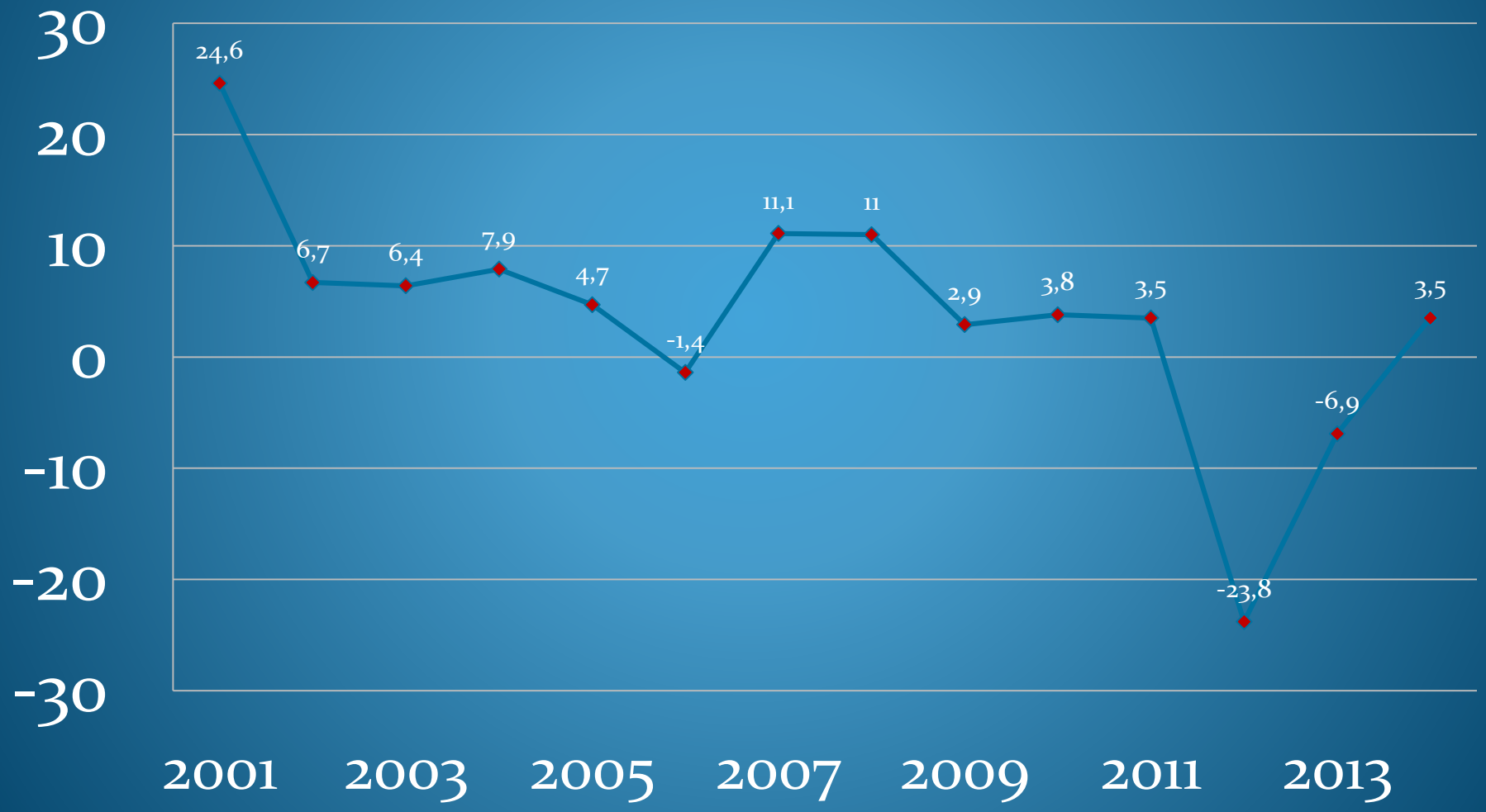
International trade muted

Export of Goods & Services % of GDP (2015)



Source: The World Bank 2017, data from 2012 or latest available

Investment growth rate, per cent (2001-2014)



Source: Management and planning organisation (2016)

Outline

- Context
- Benchmarking
- The Innovation System
- The Digital Era
- Governance

Competitiveness ranking, 2017-18

Index rank	Iran	Brazil	China	Egypt	Kazakhstan	Korea	Malaysia	Mexico	Oman	Pakistan	Saudi Arabia	Turkey	Sweden	US
GCI	69	80	27	100	57	26	23	51	62	115	30	53	7	2
Macroeconomic environment	44	124	17	132	98	2	34	43	66	106	58	50	4	83
Institutions	85	109	41	64	68	58	27	123	28	90	26	71	11	20
Technology readiness	91	55	73	94	52	29	46	71	59	111	44	62	5	6
Financial Market Development	128	92	48	77	114	74	16	36	54	96	56	80	10	2
Higher education and training	51	79	47	100	56	25	45	80	71	120	43	48	18	3
Business Sophistication	97	56	33	84	108	26	20	49	72	81	34	67	6	2
Innovation	66	85	28	109	84	18	22	56	76	60	40	69	7	2
Labour Market Efficiency	130	114	38	134	35	24	26	105	122	128	80	127	20	4

Source: The Global Competitiveness Report (2017)

Education ranking, 2017/18

Index rank	Iran	Brazil	China	Egypt	Kazakhstan	Korea	Malaysia	Mexico	Oman	Pakistan	Saudi Arabia	Turkey	Sweden	US
Overall ranking (GCI)	69	80	27	100	57	26	23	51	62	115	30	53	7	2
Primary education enrolment	14	94	1	33	4	30	32	71	77	131	42	82	12	84
Secondary education enrolment	77	50	66	84	18	53	93	74	32	119	22	37	3	57
Tertiary education enrolment	26	57	68	77	64	3	90	82	58	116	41	2	43	9
Quality of education system	94	125	29	130	77	81	14	108	75	61	41	101	20	4
Quality of Management schools	92	95	50	124	39	69	25	67	116	102	52	108	22	6
Internet access in schools	93	90	50	119	39	15	27	83	79	98	57	72	3	10

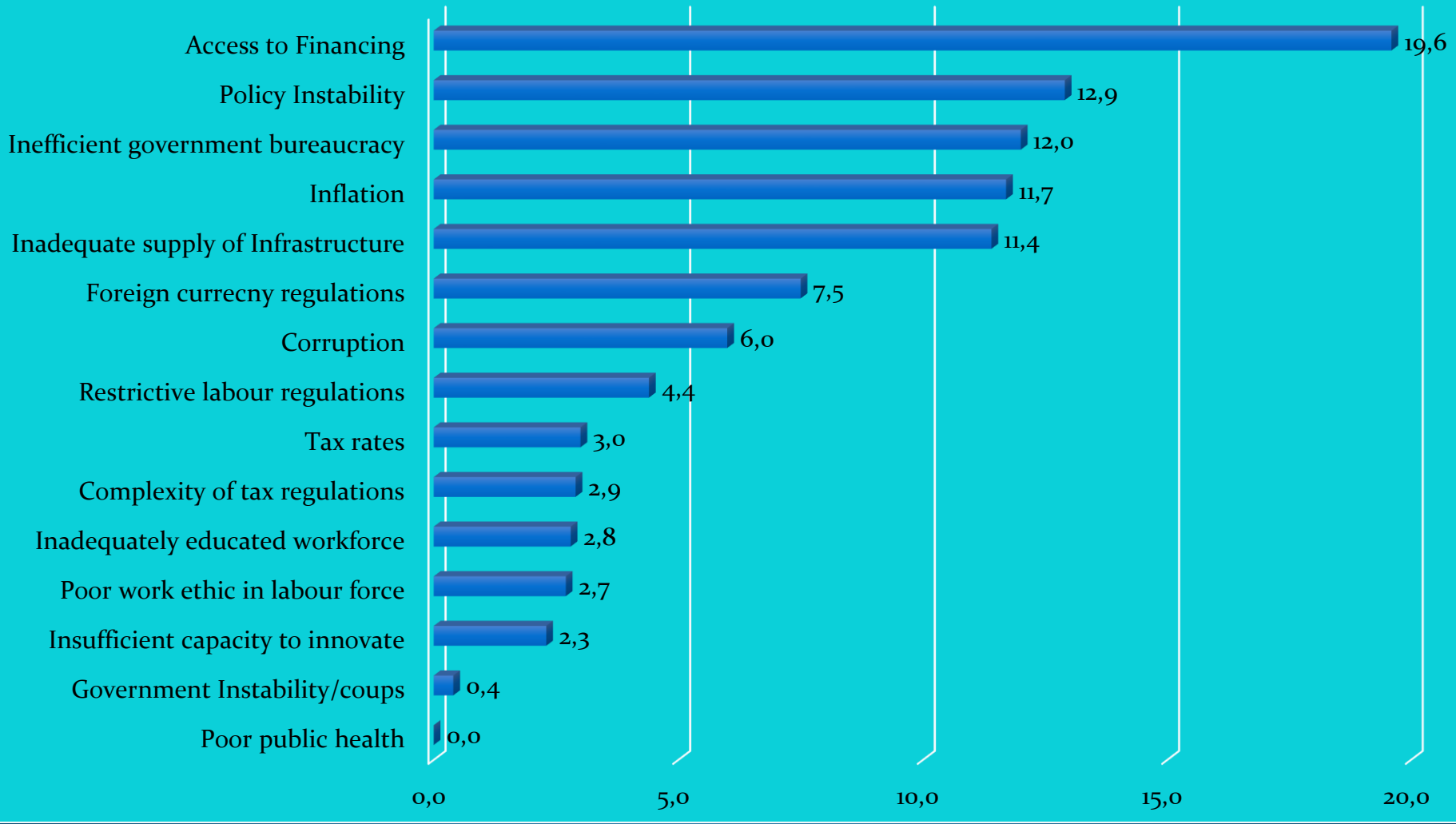
Source: World Economic Forum (2017)

Technological Readiness & Innovation 2017/18

Index rank	Iran	Brazil	China	Egypt	Kazakhstan	Korea	Malaysia	Mexico	Oman	Pakistan	Saudi Arabia	Turkey	Sweden	US
Overall ranking (GCI)	69	80	27	100	57	26	23	51	62	115	30	53	7	2
Availability of latest tech.	105	78	81	91	104	23	35	52	71	70	40	57	5	6
Firm-level tech. absorption	118	59	58	100	81	23	17	56	95	88	32	46	1	2
FDI and tech transfer	74	53	49	75	93	55	13	26	86	69	39	61	14	5
Capacity for innovation	88	73	44	123	84	35	14	70	109	80	64	74	4	2
Quality of research institutions	55	77	36	121	78	32	24	46	57	67	54	100	13	5
University-industry collaboration	94	70	28	117	75	27	11	49	97	63	46	66	10	2
Government procurement	50	118	10	61	73	32	4	90	133	33	15	64	17	2

Source: World Economic Forum (2017)

Most Problematic Factors for Doing Business, Iran, 2017/18



Source: The Global Competitiveness Report (2017)

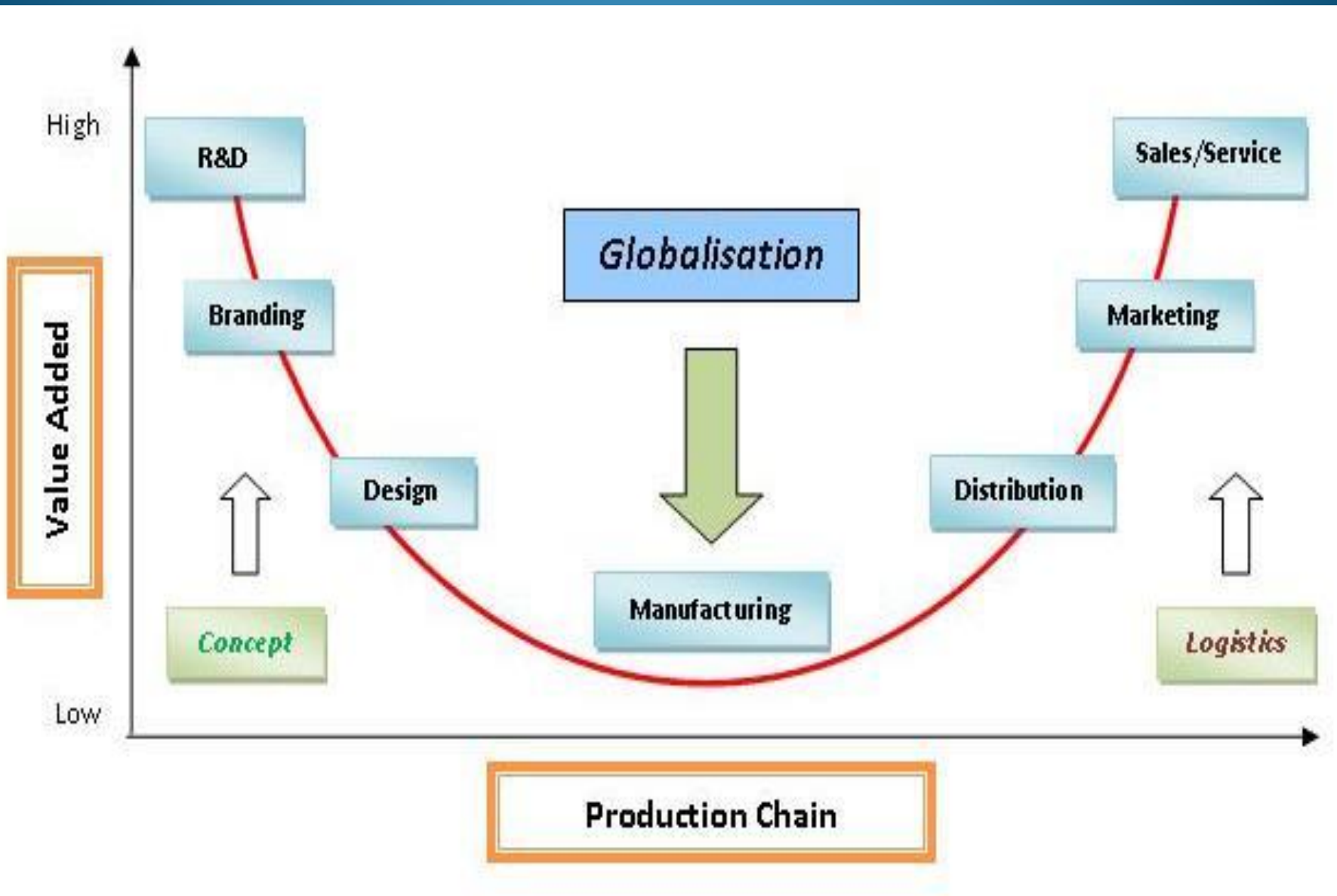
Outline

- Context
- Benchmarking
- The Innovation System
- The Digital Era
- Governance

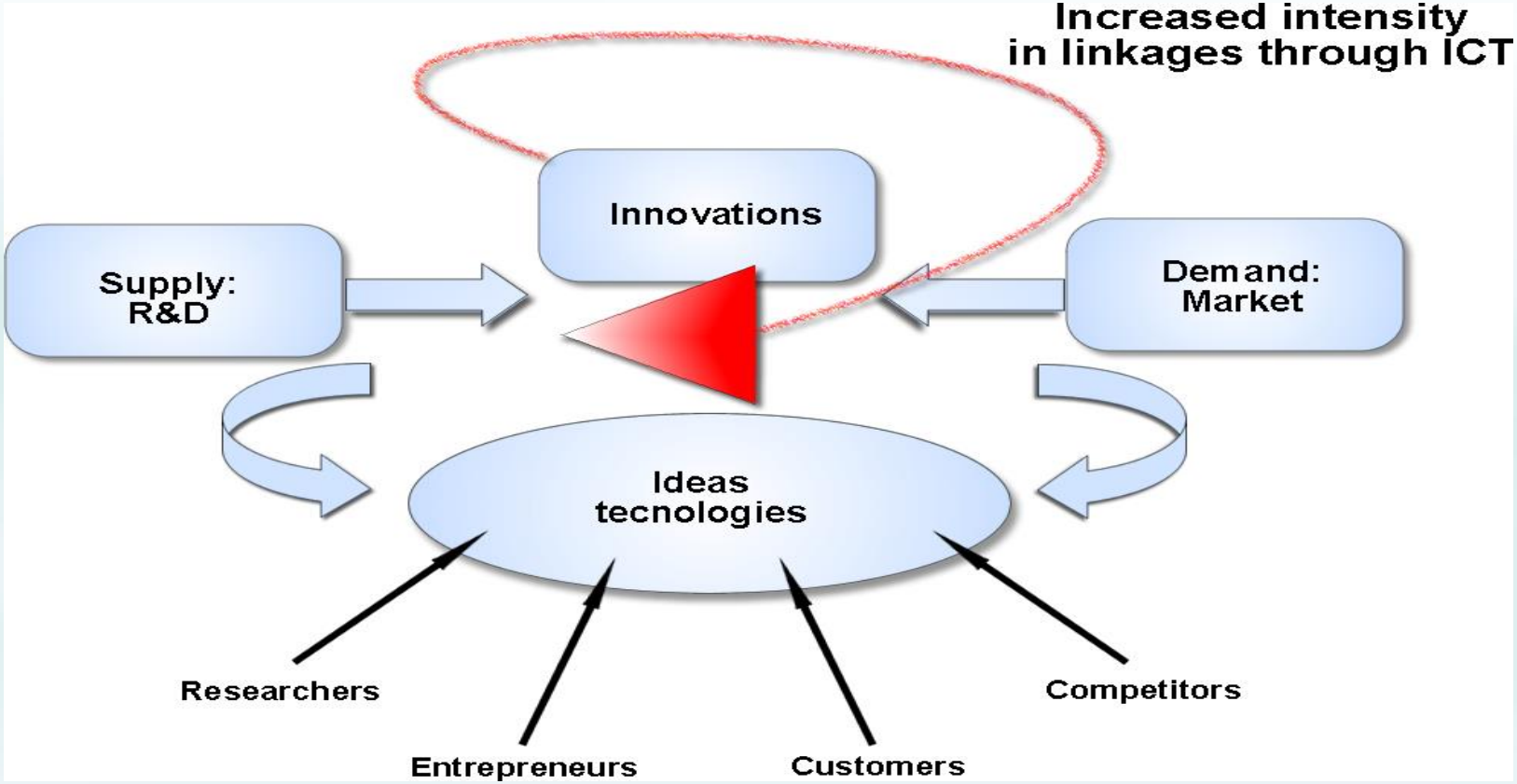
Evolution of innovation metrics

First Generation Input Indicators (1950s–60s)	Second Generation Output Indicators (1970s–80s)	Third Generation Innovation Indicators (1990s)	Fourth Generation Process Indicators (2000s plus emerging focus)
·R&D expenditures ·S&T personnel ·Capital ·Tech intensity	·Patents ·Publications ·Products ·Quality change	·Innovation surveys ·Indexing ·Benchmarking innovation capacity	·Knowledge ·Intangibles ·Networks ·Demand ·Clusters ·Management techniques ·Risk/return ·System dynamics

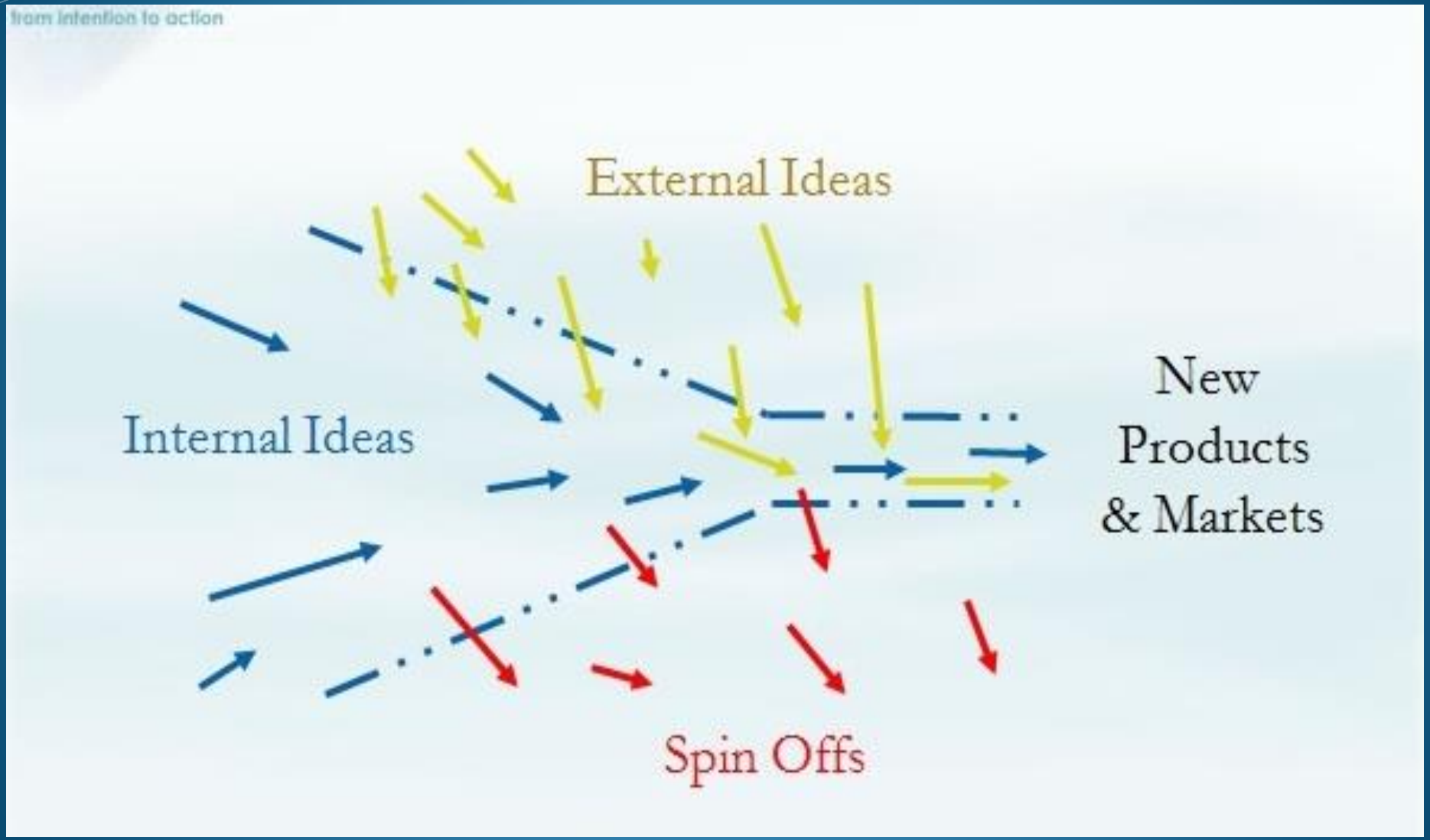
“The Smile Curve”



Abandoning the Linear Model

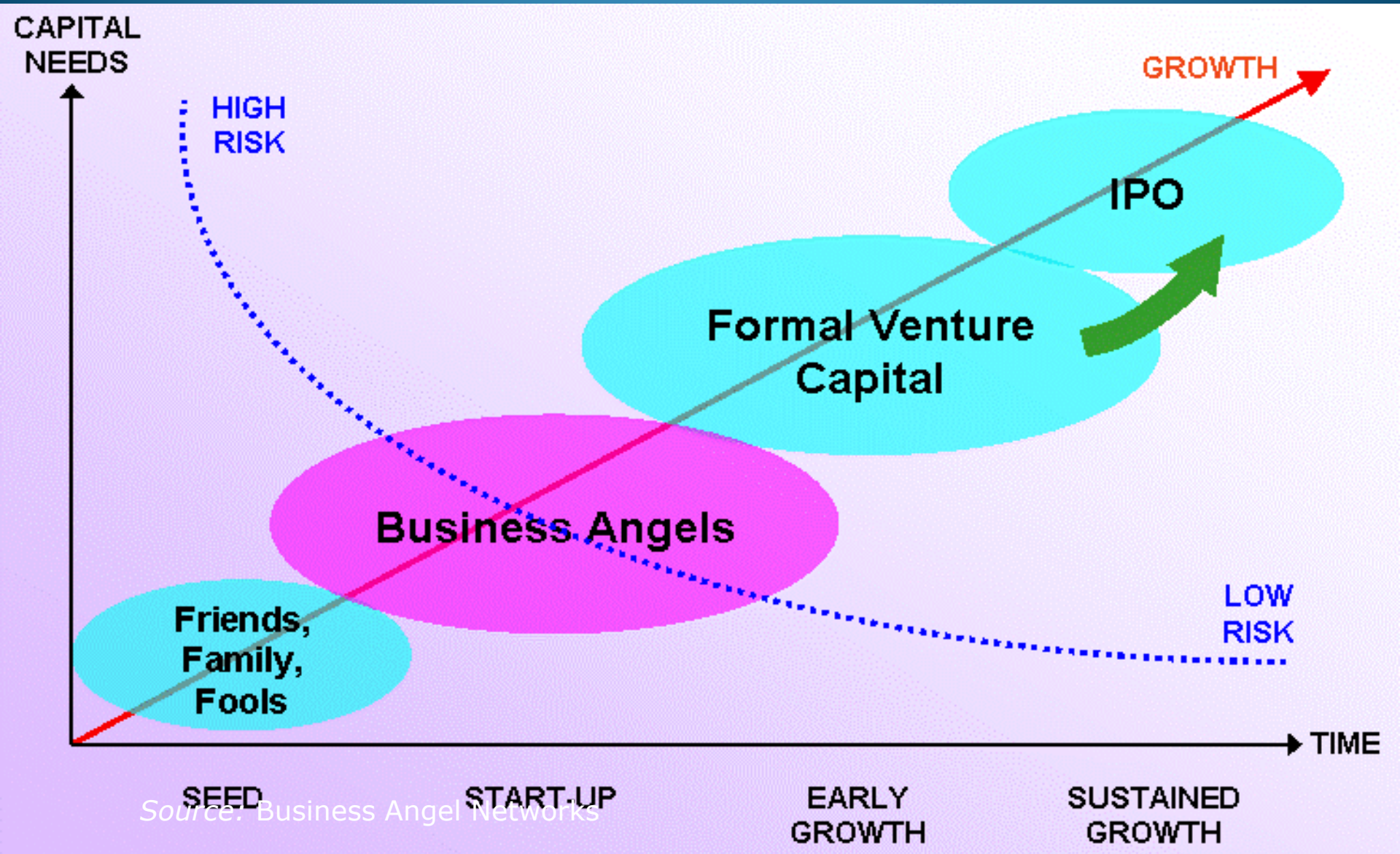


Open Innovation Model



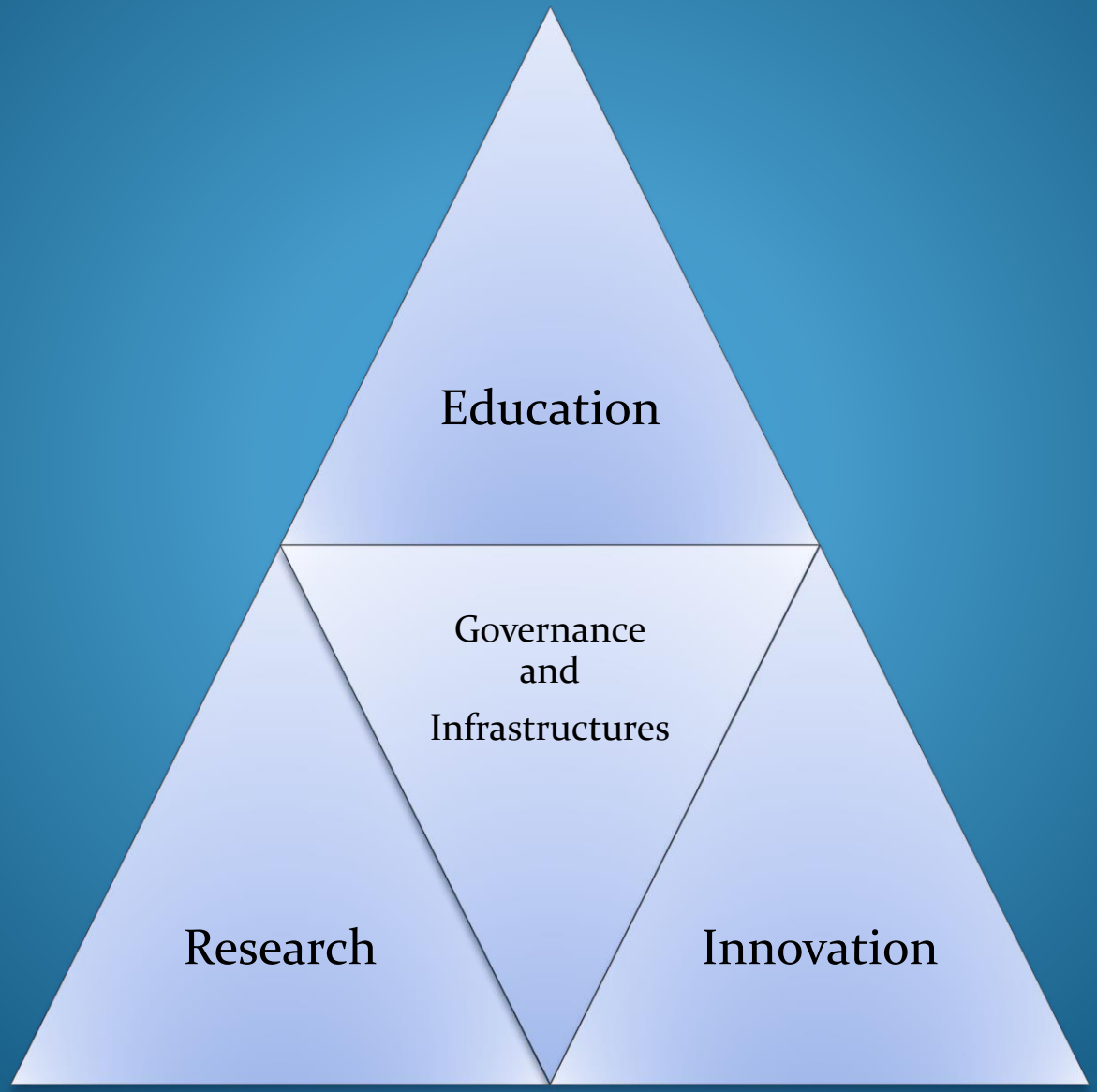
***Source*:** based on Van Welsum and Vickery (2004), Miroudot et al. (2009) and *Open Innovation:* The New Imperative for Creating and Profiting from Technology, H. Chesbrough, 2003

Diversified Roles in Funding



Source: Business Angel Networks

Knowledge Triangle



Soft Skills

- *Awareness*: Recognising your own strengths and weakness.
- *Imagination*: Identifying new patterns in complexity and opportunities in uncertainty.
- *Curiosity*: Challenging and thinking out of the box.
- *Regulation*: Keeping emotions under control.
- *Motivation*: Developing optimism and personal drive.
- *Empathy*: Reading emotions and motivation in other people.
- *Ability* to build and manage relationships.

Mindset categories

	Reactive	Receptive	Constructive
Attitude	We follow the rules	We do what we have to in smartest way	We look for competitive advantages
Position	Defensive	Acceptance	Conscious decision
Perceived impact	Threat	Competition neutral	Opportunities
Typical solution	Filter on pipe	Process change	Product development/innovation
Collaboration partners	Technical specialists	Responsible within the industry	Customers, suppliers, competitors

Outline

- Context
- Benchmarking
- The Innovation System
- The Digital Era
- Governance

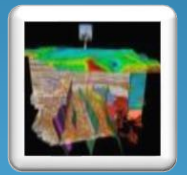
From Genomic research to Connecting Cars ...it's Only the Beginning

Genomics Research

Financial Analysis

Medical Imaging

Weather Prediction


Oil Exploration

Design Simulation

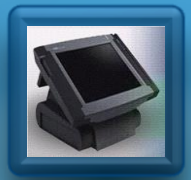
Cloud Computing

Data Center Refresh

Power Lines

Sensors

Home Storage


Point of Sale

In-Vehicle Infotainment

IP Phones

IP Cameras

Net book

Security

Learning

IPTV/IMS

Military/Aero

Digital Signage

Home Auto

Portable Medical

Net top

Gaming

Medical

Industrial PC

Printers

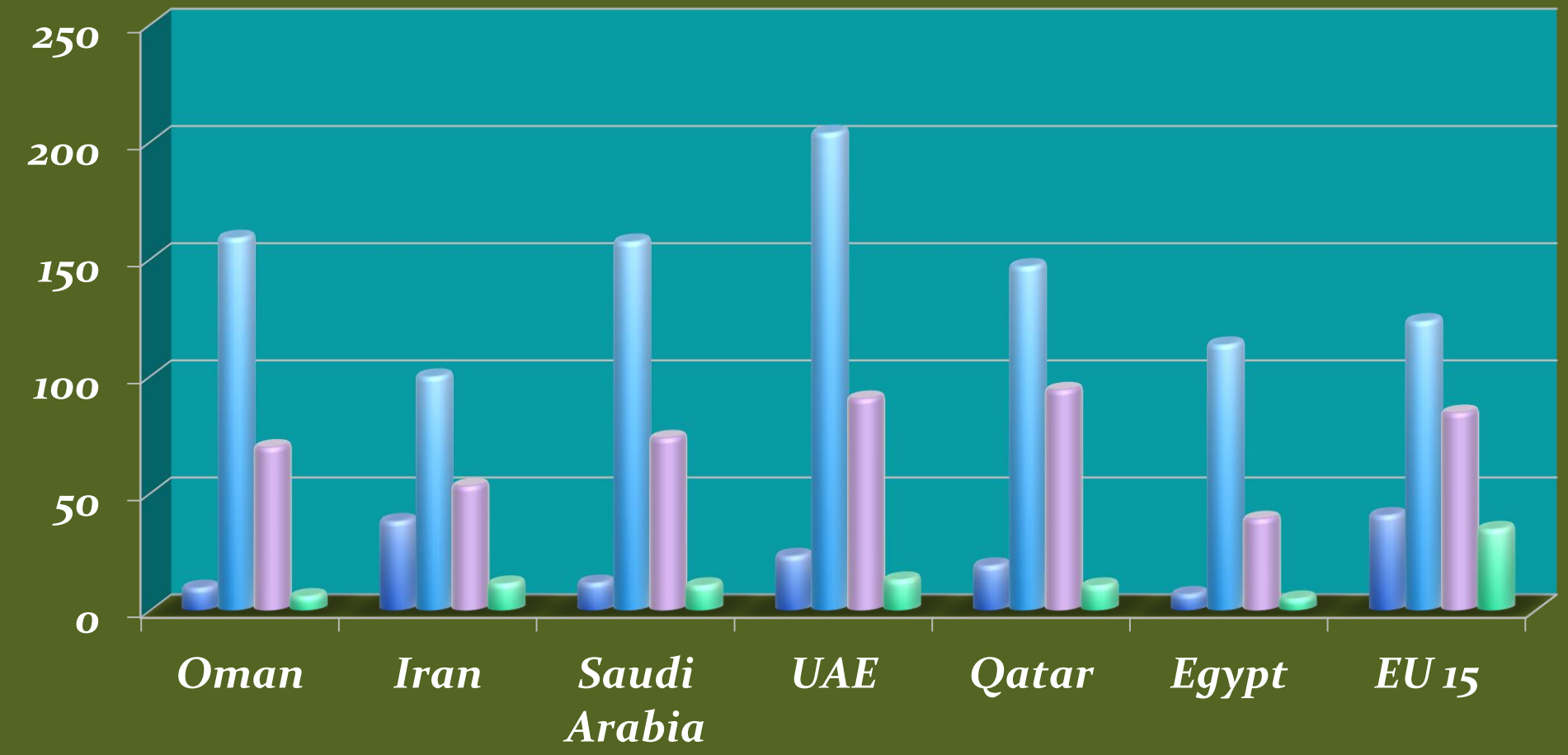
Transport

Robotics

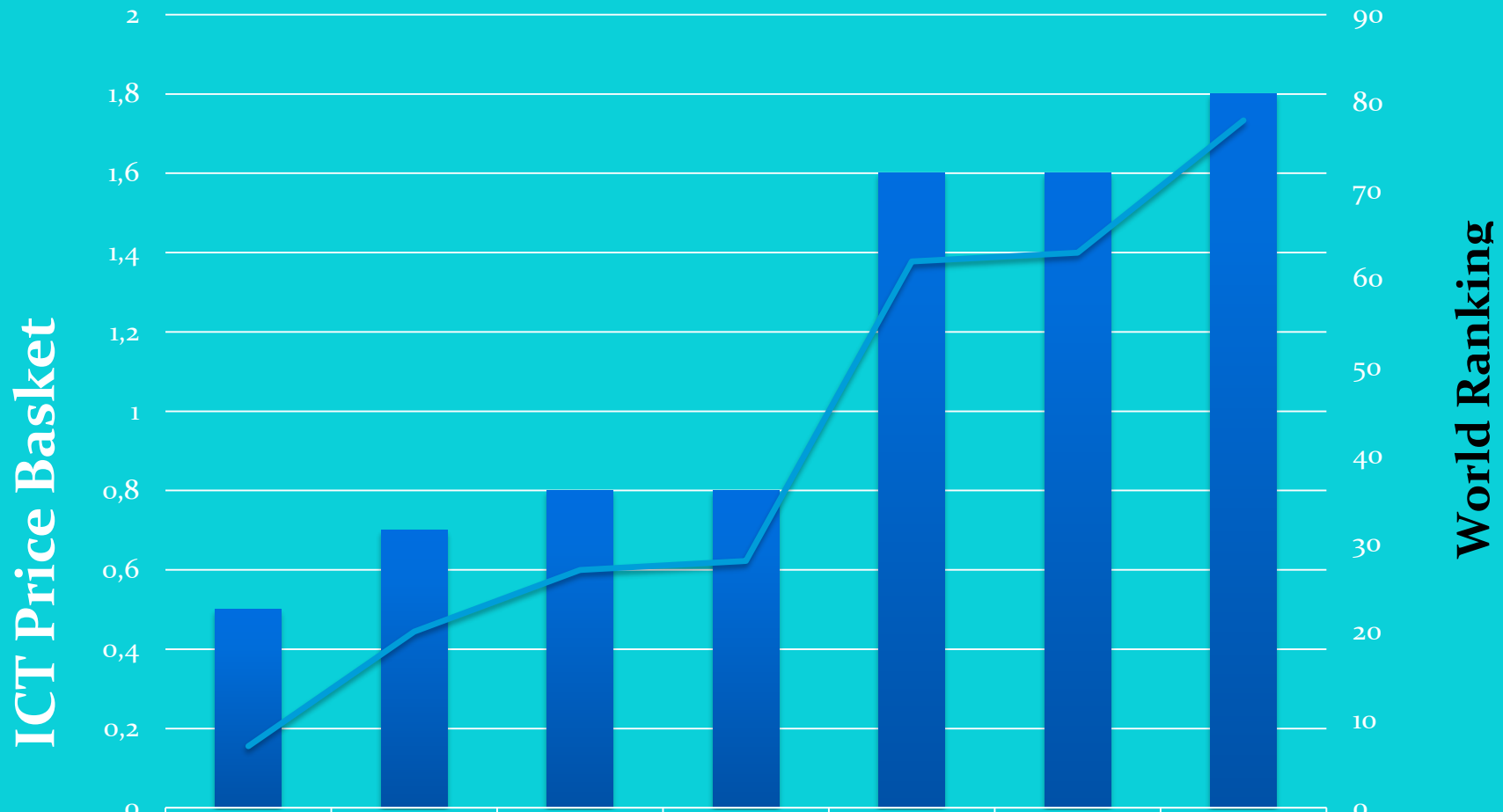
Factory Automation

MID

ICT for selected countries, 2015

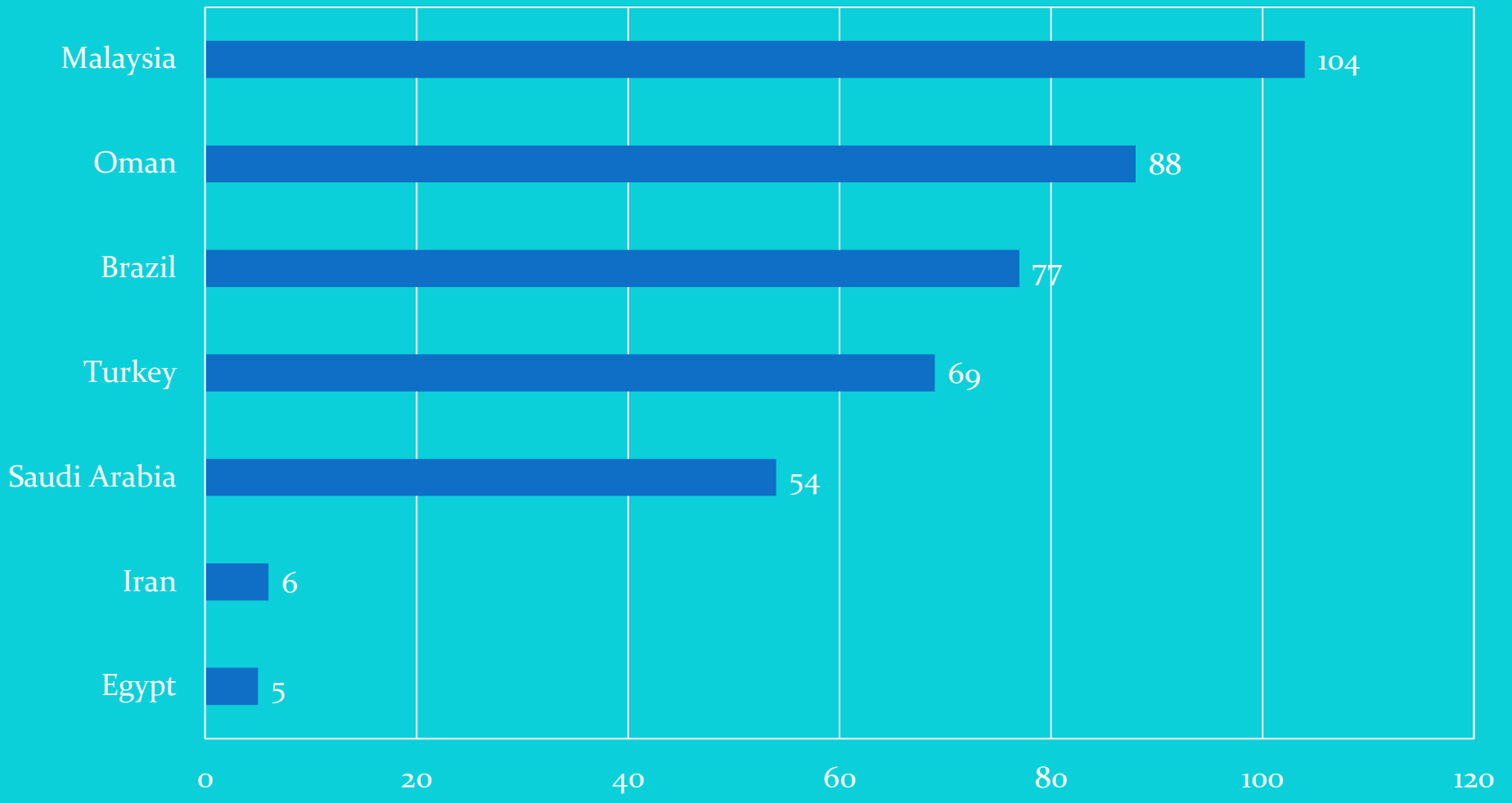


ICT Price Basket (2014)



	Iran	Oman	Korea	Saudi Arabia	Turkey	Malaysia	Brazil
Price Basket	0,5	0,7	0,8	0,8	1,6	1,6	1,8
World Ranking	7	20	27	28	62	63	78

Secure Internet Servers/million people (2014)



Source: The World Bank, 2016

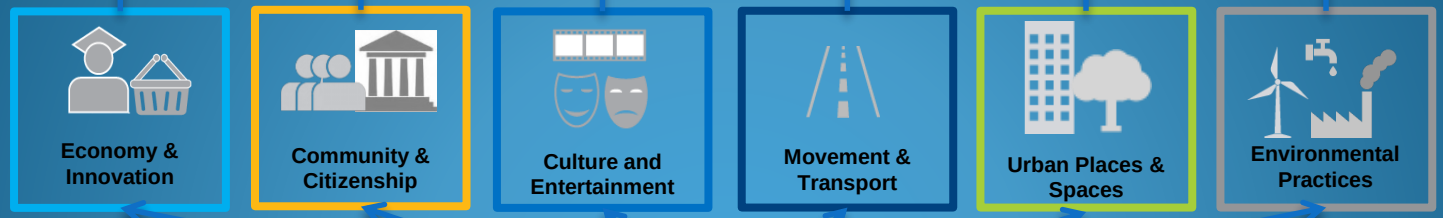
Digital City: Overview

"Smart" City Agenda

- POLICY CONTEXT
- LEADERSHIP
- ON-GOING MANAGEMENT

S&T CITY VALUE

- 3P PARTNERSHIP
- LIVING LABS



SMART INFORMATION SERVICES

TECHNOLOGY

- INSTRUMENTING
- INTERCONNECTING
- INTELLIGENCE

SOCIAL INFRASTRUCTURE

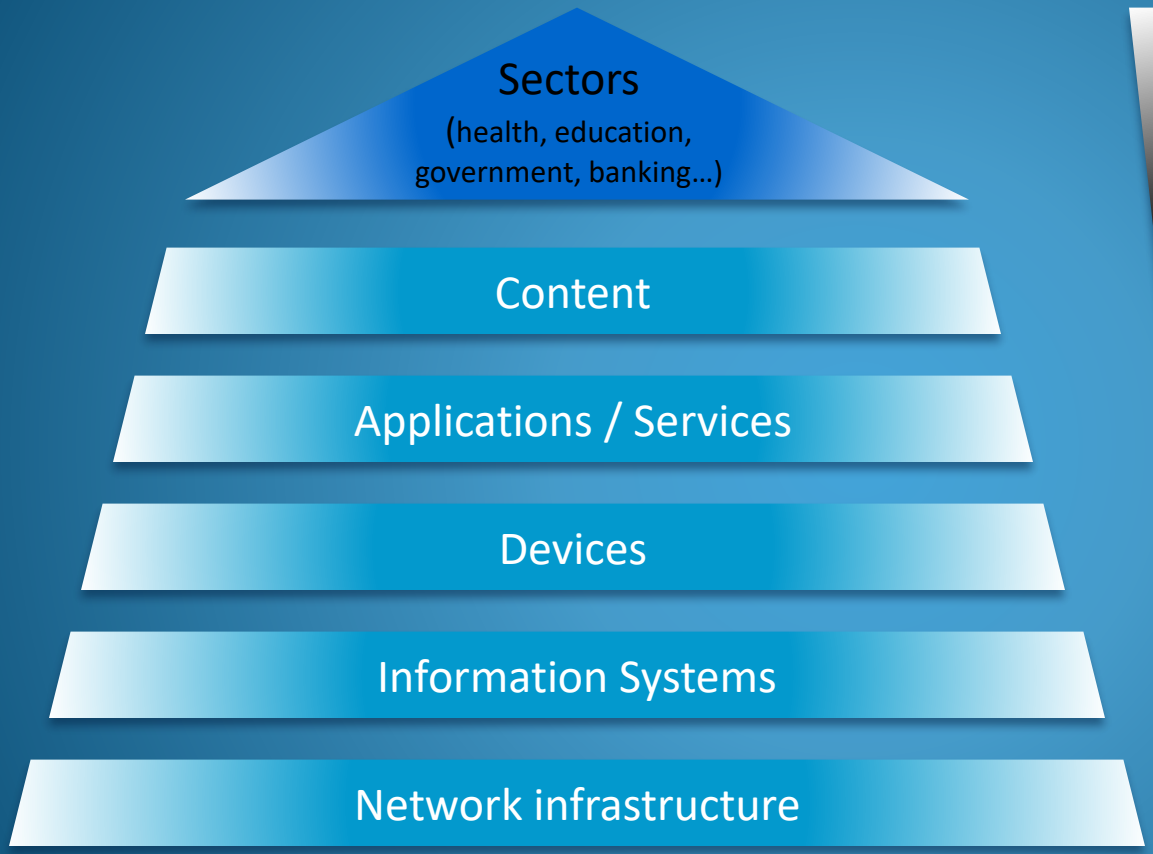
- KNOWLEDGE CITY
- CREATIVE CITY
- HUMAN CITY

MANAGEMENT

USER-DRIVEN OPEN INNOVATION ECOSYSTEM

PARTICIPATORY GOVERNANCE
SOCIAL INNOVATION

Beyond technology: the ecosystem



Outline

- Context
- Benchmarking
- The Innovation System
- The Digital Era
- Governance

Innovation ecosystem: Areas for Action

- Input (R&D, funding) output (publications, patents)
- Organising science, basic vs. applied research, University organisation, University – industry interface
- Technological readiness, Human capital, substantive vs. soft skills, Entrepreneurship
- Funding instruments & business services
- Regulation, red tape, getting markets to work, institutional frameworks
- ICT, broad-band, usage
- Behavioural, “smart”
- Institutions, policy coordination

UNCTAD: areas for reform

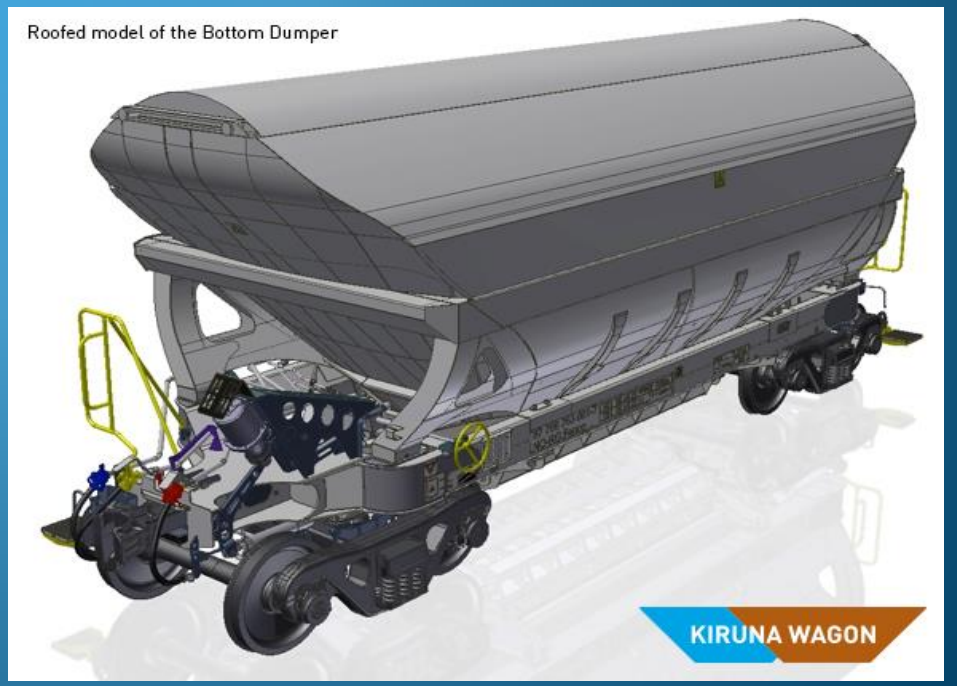
- The Governance System
- Financing R&D and innovation
- Supporting Knowledge-based firms
- Policies for new growth areas
- IPRs
- Regional Development Schemes
- FDI and technology transfer

Issues in FDI

- Continued financial sector sanctions
- Dominance of M&A – partly ruled out
- Dynamism associated with VC & entrepreneurship
- Trust, accounting, IPRs, dispute-resolution
- Semi-public sector
- Professional business services support
- Acceptance of win-win

Infrastructure needs, niche solutions

- Heavy haul supply chain (terminals and rolling stock) for mining
- Sustainability and maintenance in railway transport
- Cutting logistics costs for mining in half
- Requires private-public partnership (railways and mining in collaboration) as well as international participation



Hydrological systems and biomass – the Waterboxx

•Water savings of some 90% compared with conventional drip irrigation.

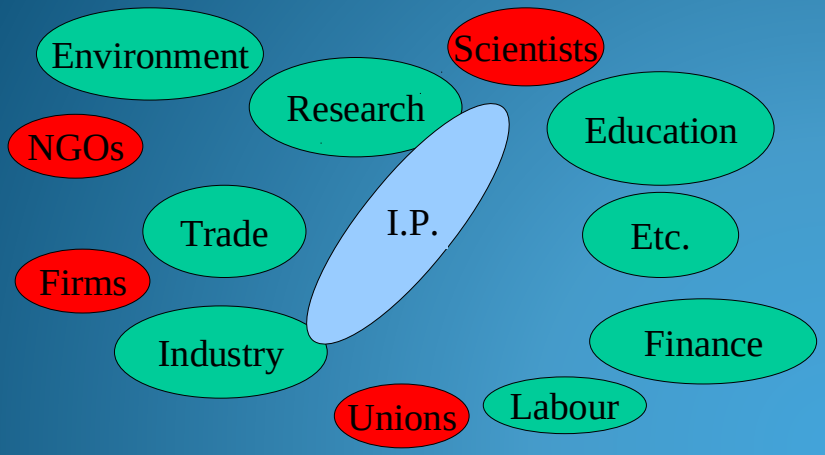
• Water wastage, e.g., through evaporation, is dramatically reduced (e.g. water diffused underground, without air contact).

• Pioneering knowledge of local species and root systems

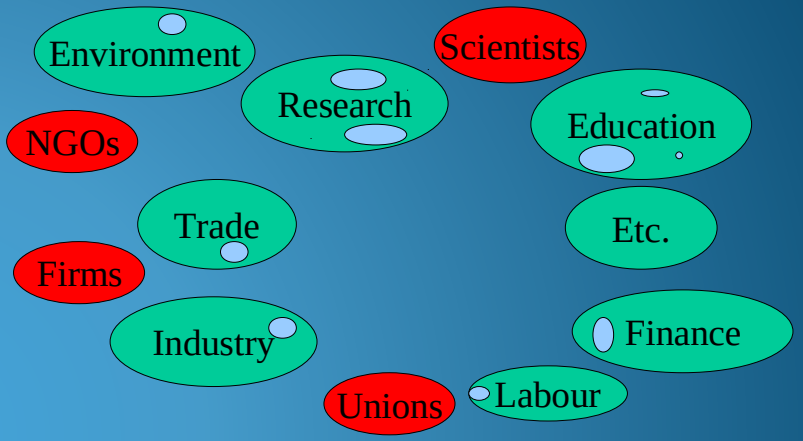
• Increased efficiency, reduced costs of fertilisers.

• Reduced maintenance costs and high robustness enabling greening and restoring now useless lands to productive purposes, and absorb CO_2

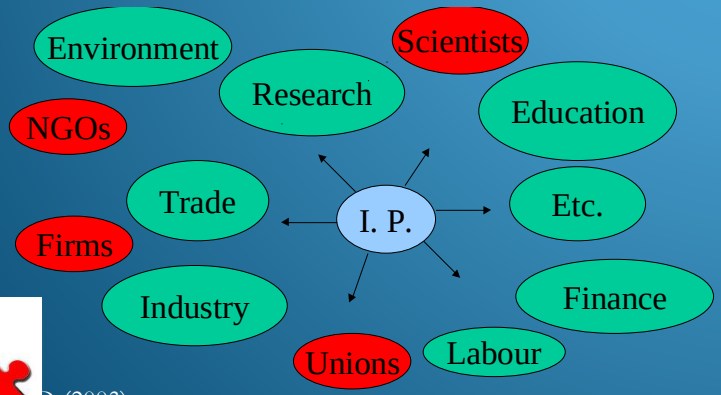
Traditional positioning of innovation policy



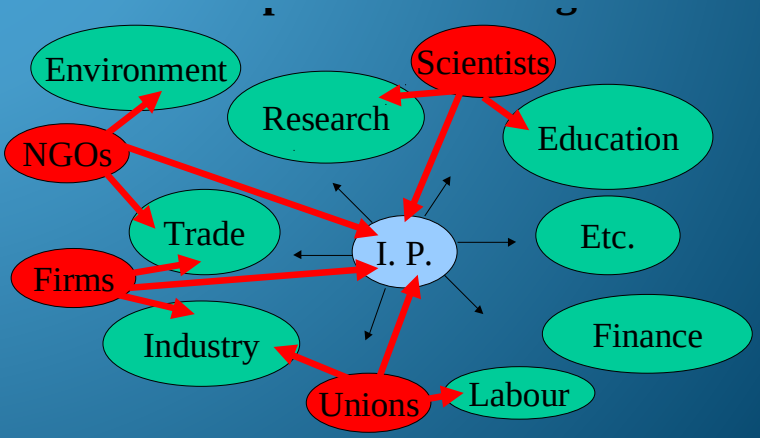
Implicit positioning of innovation policy



Explicit positioning of innovation policy



Explicit positioning of innovation policy with interactions



D (2003)

Recommendations (1)

1) *Upgrade the importance of STI policy and improve coordination in support of synergies between the main policy fields as well as at regional level, with a view to strengthening the implementation of innovation*

2) *Reduce the national R&D spending target to 1 per cent of GDP from public sources and 1.5 per cent from private ones*

3) M*ake funding of universities more competitive to drive improved performances in key dimensions, introduce an R&D "project" or "mission" funding scheme targeting prioritized areas, reform public procurement and public-private partnership, and broaden private sector R&D-support through a tax incentive*

Recommendations (cont. 2)

4) Leverage human capital, strengthen education institutions broadly, advance "learning for life", mobility and use of ICT, and instil enhanced talent attraction and management

5) Adjust the approach to Evaluation, incl. with a view to policy-experimentation, gauging the unexpected and taking direct as well as indirect results into account in support of the innovation system as a whole

6) Adopt a comprehensive strategy for attracting and benefitting from Foreign Direct Investment (FDI) as well as other external sources of funding, including Venture Capital (VC), by enacting conditions that sustain long-term partnerships and mutual win-win

Recommendations (cont. 3)

7. Further the credibility and usefulness of Intellectual Property Rights (IPR) through a comprehensive reform effort encompassing their entire life cycle, from patent application to dispute resolution, including awareness creation, training and professional support, for the purpose of maximising relevance to the innovation system

8) Nurture the knowledge economy across sectors, although with special policy support for start-ups and new growth areas, including through professional business services and an upgraded customer orientation

9) Mobilise ICT for Innovation and capitalising on "big data" and "smart" applications through strategies that link technology to people and induce innovation in response to every-day and sustainability issues