

# The innovation Ecosystem in Israel



**RAFI NAVE**

**OCTOBER 15<sup>TH</sup> 2015**

## **‘High Tech Nation’ – How Israel exploited its pivotal role in ‘the brave new world’ and helped it become a better world?**

- **Israel’s economy doubled in the past 20 years**  
[GDP/prs/yr : 17K → >35K]
- **The Hi-Tec sector exceeds 50% of the Export/output**
- **Thus, Hi-Tec is the locomotive that pulls the economy train. It is the enabler of Israel becoming a developed nation!**



# Israel Facts & Figures

- The largest per-capita number of **research papers**
- The largest per-capita number of **registered patents**
- The largest per-capita number of **startup companies**
- 70+ technology companies listed on NASDAQ  
(second only to the USA and China)
- 7 Nobel-prize winners in past 13 years



# This morning I got up and...

- ▶ My phone was bleeping telling me I had voicemail
- ▶ I returned the call using my Panasonic Cordless phone
- ▶ I had to send an urgent email so I used my Blackberry
- ▶ Arriving at the office I switched on my Notebook
- ▶ I went to my usual new sites and surfed the net
- ▶ I was presenting that day, but needed to bring an updated presentation



**Israeli Technology is Everywhere**

# Success Stories – Industry Breakthroughs

- ▶ USB Flash drive - Invented by M-Systems



- ▶ Firewall – Invented by Check Point



- ▶ Instant Messaging – ICQ



- ▶ Voice Mail - Developed by Comverse



- ▶ Pill Cam- Invented by Given Imaging



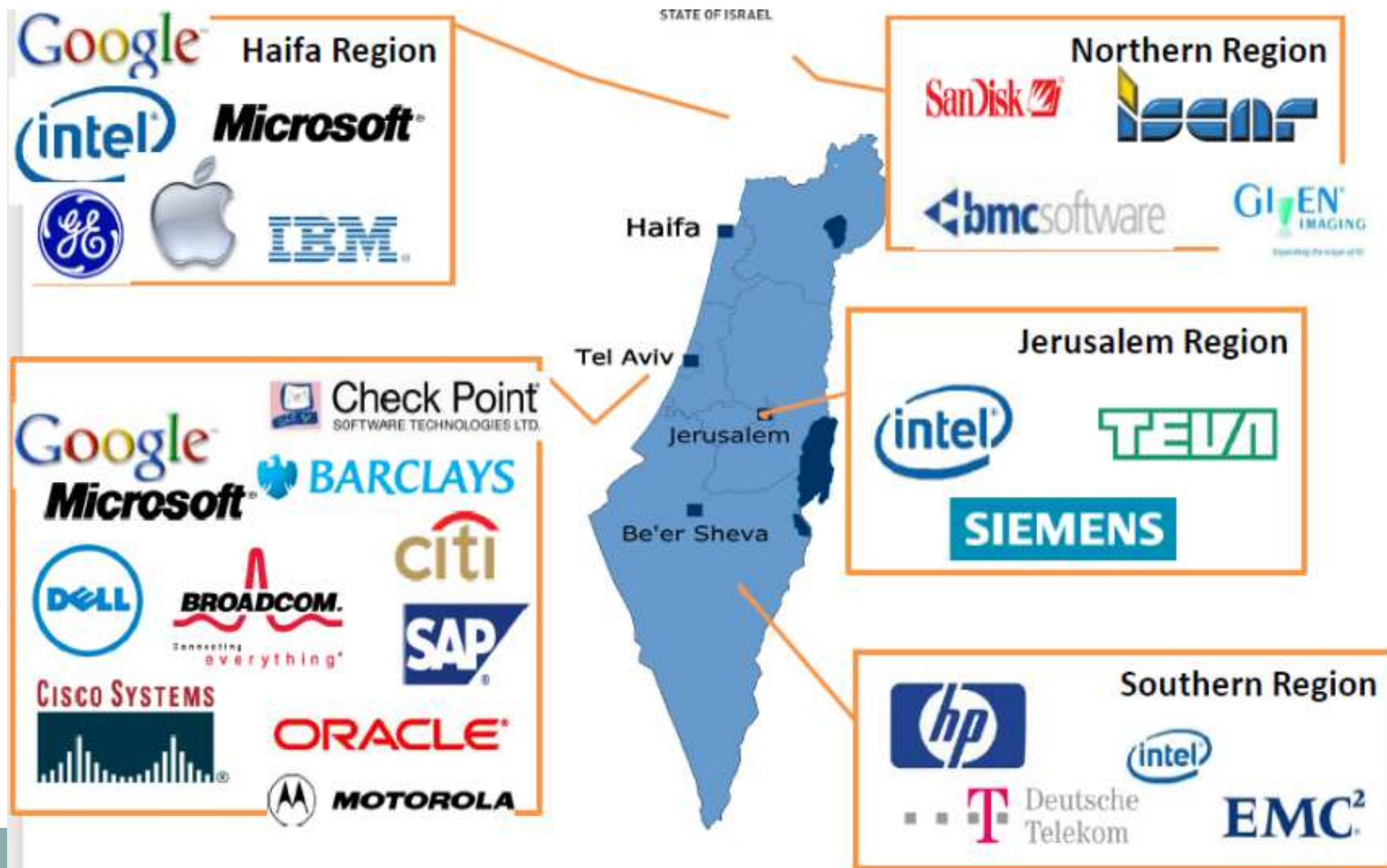
- ▶ Waze – Social navigation system



# Examples of Israel High Tech environment

- ▶ More than 50% of Israel's exports are from high-tech and life science industries
- ▶ Israel is No. 3 in the number of foreign companies traded in the US (after Canada & UK)
- ▶ Israel is No. 5 in VC's & PE investments in High Tech, bigger than any individual European country.
- ▶ The largest generic pharmaceutical company in the World is Israeli company ("Teva Pharmaceutical Industries Ltd")
- ▶ The largest producer of Generic agriculture crop protection chemicals in the World is Israeli company ("Makhteshim Agan Industries Ltd.")
- ▶ One of the worlds major chemical companies is an Israeli company (ICL - "Israel Chemicals Ltd.")
- ▶ Five of the 100 defense companies in the world are Israeli companies

## Multi – National companies presence in Israel





# Multinational Companies with R&D Centers in Israel

- ▶ Foreign multinational corporations have some 108,000 employees
- ▶ They sell goods and services totaling \$27 billion a year
- ▶ 70% of exports by multinational corporations in Israel are for the parent companies abroad
- ▶ Countries of origin: U.S. (46%), Europe (46%) and the rest of the world (8%)
- ▶ As of 2011 there are some 245 development centers by foreign companies

▶	AOL	▶	Intel
▶	Alcatel-Lucent	▶	Interpharm
▶	Athena SmartCard	▶	Kulicke & Soffa
▶	Avaya	▶	Nokia Siemens
▶	Agro Logic	▶	Marvell Semiconductor
▶	Applied Materials	▶	Microsoft
▶	AT&T	▶	Motorola
▶	AutoDesk	▶	Medtronic
▶	BMC Software	▶	Oracle
▶	Boston Scientific	▶	Paypal
▶	Broadcom	▶	Perrigo
▶	Computer Associates-CA	▶	Phillips
▶	CEVA	▶	PMC
▶	Cisco	▶	Qualcomm
▶	Convergys	▶	Red Hat
▶	Creo	▶	Samsung
▶	eBay	▶	SanDisk
▶	EMC	▶	SAP
▶	Freescale Semiconductor	▶	Siemens
▶	GE Medical Systems	▶	Sun Microsystems
▶	Google	▶	Teledata Networks
▶	HP (including HP Labs)	▶	Texas Instruments
▶	IBM	▶	Vishay
▶	Infineon	▶	Yahoo



# Startup Ecosystem Report 2012:

## The Global Startup Ecosystem Index

### THE TOP 20 STARTUP ECOSYSTEMS

While the United States is home to 6 of the 10 top startup ecosystems, other areas of the world are also growing exponentially. As detailed in the Startup Ecosystem Report 2012, published by the Startup Genome in partnership with Telefónica Digital and researchers at Stanford University and the University of California, Berkeley, the following city rankings were calculated based on success in 8 key areas:

**8**

TRENDSETTING  
SUPPORT  
TALENT  
DIFFERENTIATION

STARTUP OUTPUT  
FUNDING  
PERFORMANCE  
ENTREPRENEURIAL MINDSET

1 SILICON VALLEY	5 NEW YORK CITY	9 VANCOUVER	13 SAO PAULO	17 SINGAPORE
2 TEL AVIV	6 BOSTON	10 CHICAGO	14 MOSCOW	18 MELBOURNE
3 LOS ANGELES	7 LONDON	11 PARIS	15 BERLIN	19 BANGALORE
4 SEATTLE	8 TORONTO	12 SYDNEY	16 WATERLOO (CANADA)	20 SANTIAGO



**TOP 20  
STARTUP  
ECOSYSTEMS  
AROUND THE  
GLOBE**

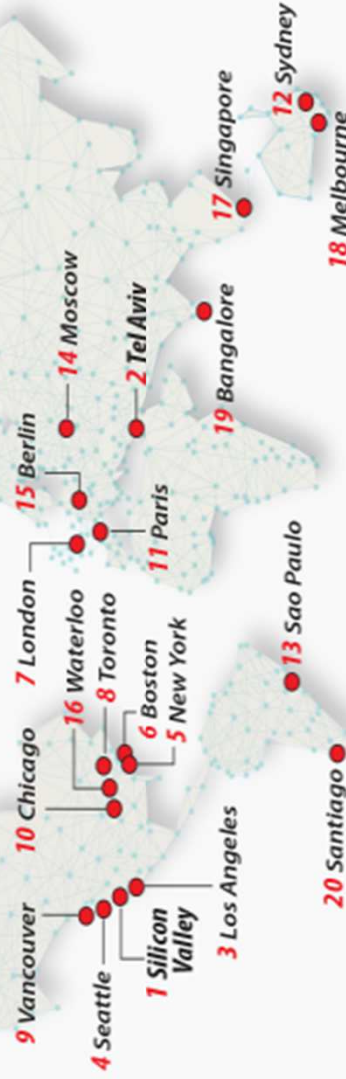


Source: <http://blog.startupcompass.co/pages/entrepreneurship-ecosystem-report>

# Move over, Silicon Valley HERE COMES TEL AVIV

While 9 of the world's top 20 start-up ecosystems are in North America, others are catching up. Israel has the highest density of start-ups in the world – Tel Aviv now ranks second to Silicon Valley.

## The world's top 20 start-up ecosystems



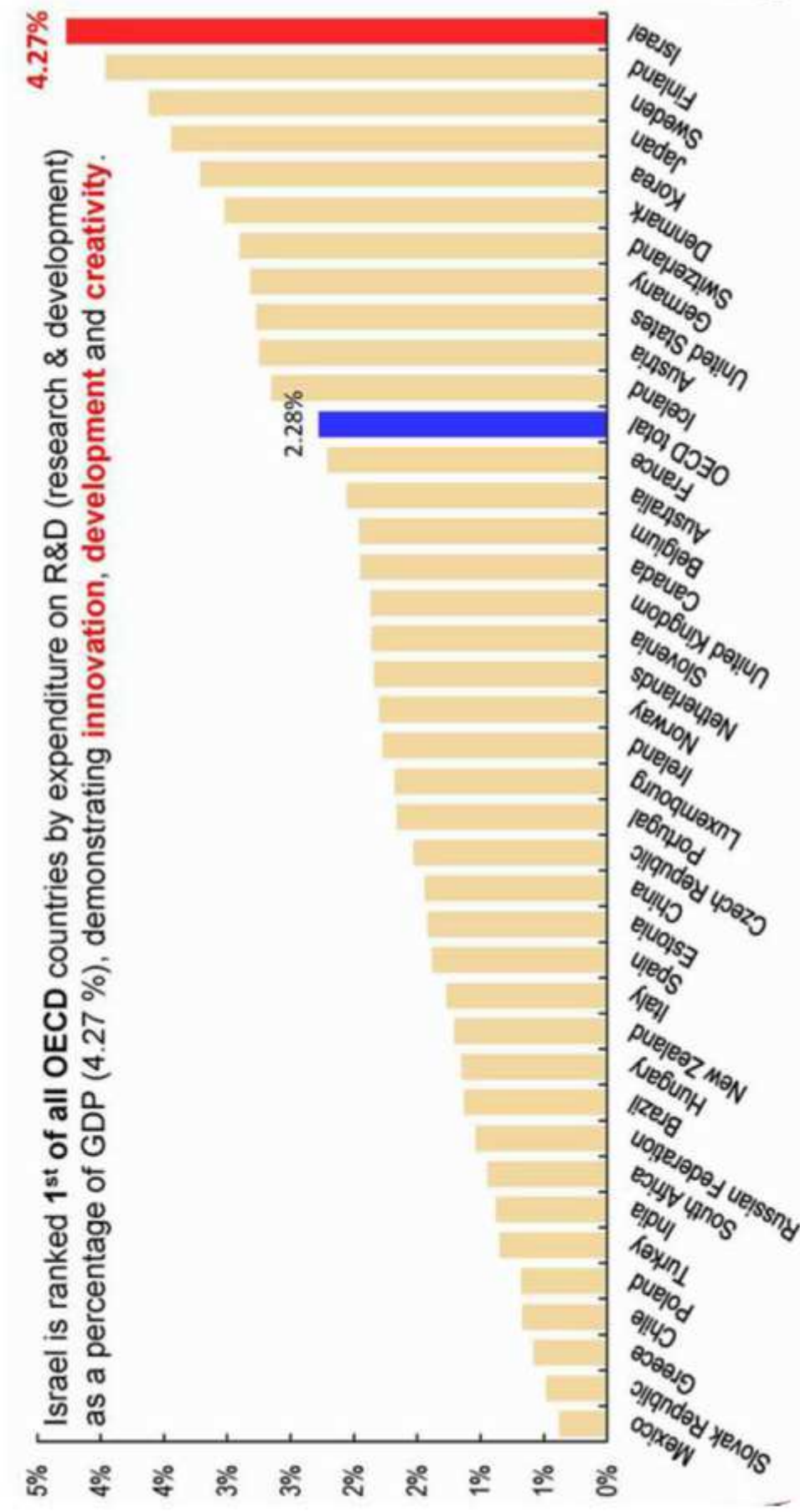
### The global start-up ecosystem index, based on

The Startup Ecosystem Report, 2012, ranks the world's top 20 start-up ecosystems based on 50 variables, using Silicon Valley as a baseline for comparison. Three categories are shown here.

Sources: The Startup Ecosystem Report, 2012; The Startup Genome Report

	Overall rank	Talent	Performance	Output
1	Silicon Valley	Silicon Valley	Silicon Valley	Silicon Valley
2	Tel Aviv	New York	Sydney	Tel Aviv
3	Los Angeles	Los Angeles	Tel Aviv	Seattle
4	Seattle	Tel Aviv	Boston	Bangalore
5	New York	Sydney	Toronto	Los Angeles
6	Boston	London	London	Chicago
7	London	Vancouver	Chicago	London
8	Toronto	Chicago	Los Angeles	Boston
9	Vancouver	Seattle	Vancouver	Sao Paulo
10	Chicago	Moscow	New York	Toronto
11	Paris	Singapore	Seattle	Moscow
12	Sydney	Boston	Waterloo	New York
13	Sao Paulo	Bangalore	Berlin	Vancouver
14	Moscow	Paris	Melbourne	Waterloo
15	Berlin	Sao Paulo	Sao Paulo	Berlin
16	Waterloo	Waterloo	Moscow	Paris
17	Singapore	Toronto	Bangalore	Melbourne
18	Melbourne	Berlin	Santiago	Sydney
19	Bangalore	Melbourne	Singapore	Singapore
20	Santiago	Santiago	Paris	Santiago

# Expenditure on R&D

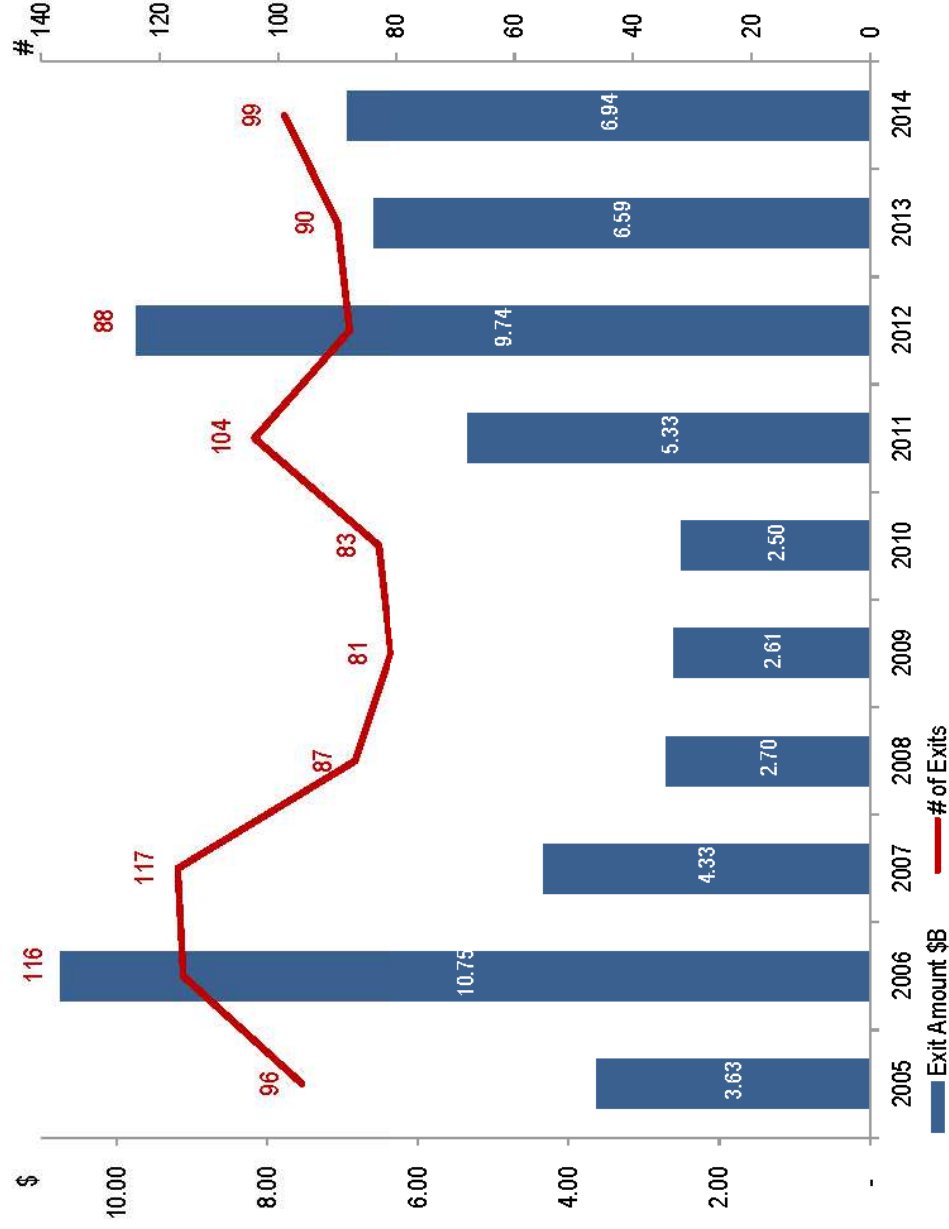




## High-Tech Exits 2005-2014

Israeli high-tech exits in 2014 reached \$6.94 billion, up 5% from 2013's \$6.59 billion and 29% above the \$5.4 billion 10-year average.

Excluding exits above \$1 billion, 2014 was the best year for Israeli exits in a decade, with 98 deals accounting for \$5.91 billion. On this basis, 2013 is considered the second best year as 89 deals attracted \$5.39 billion.



# Israeli Technology M&A Deals



HUAWEI

FOSUN  
PHARMA

Google™

ebay



SingTel

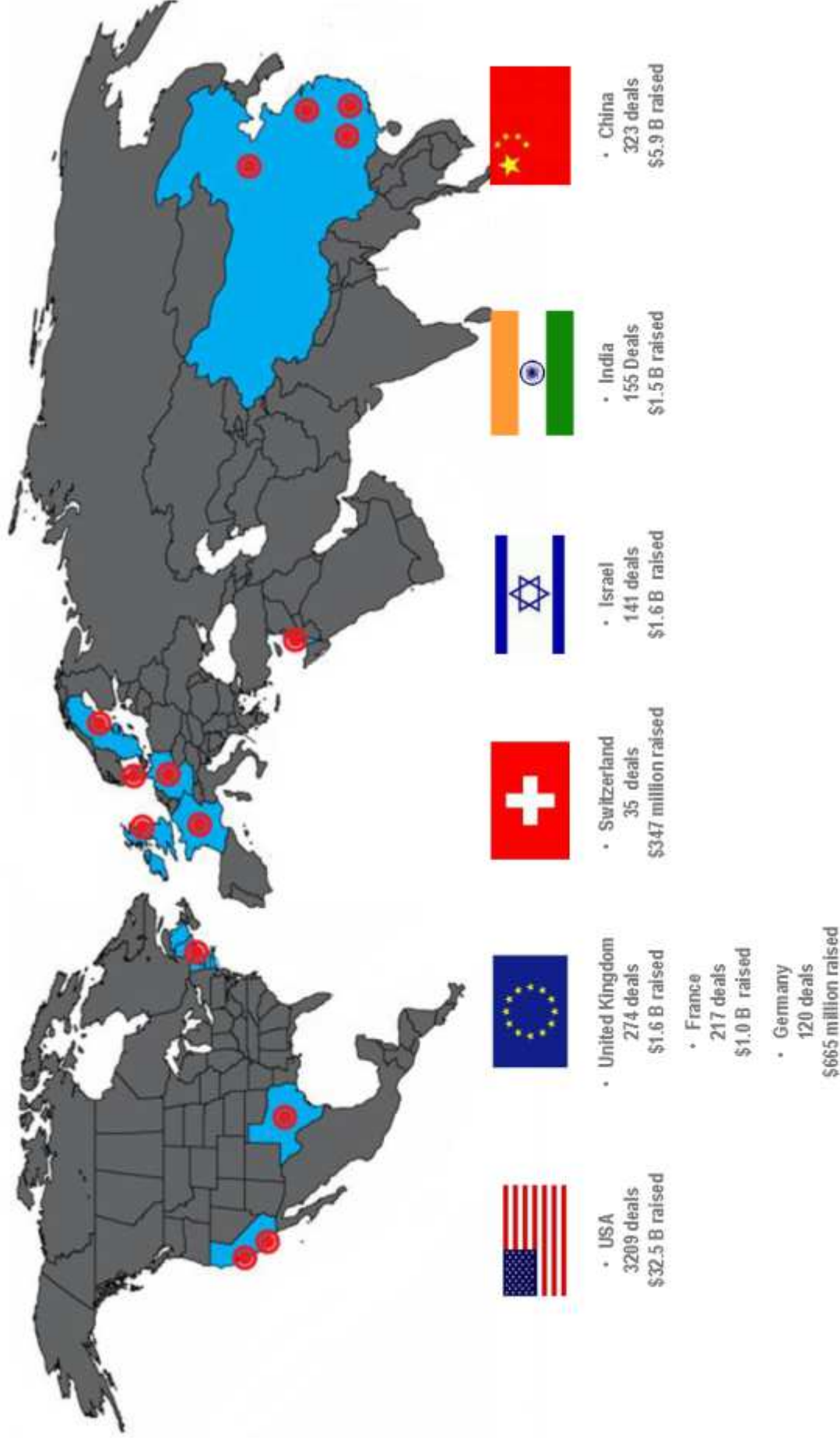
asia's leading communications company



Salesforce™



# Israel Is the 3rd Biggest Investment Hotbed- 2011



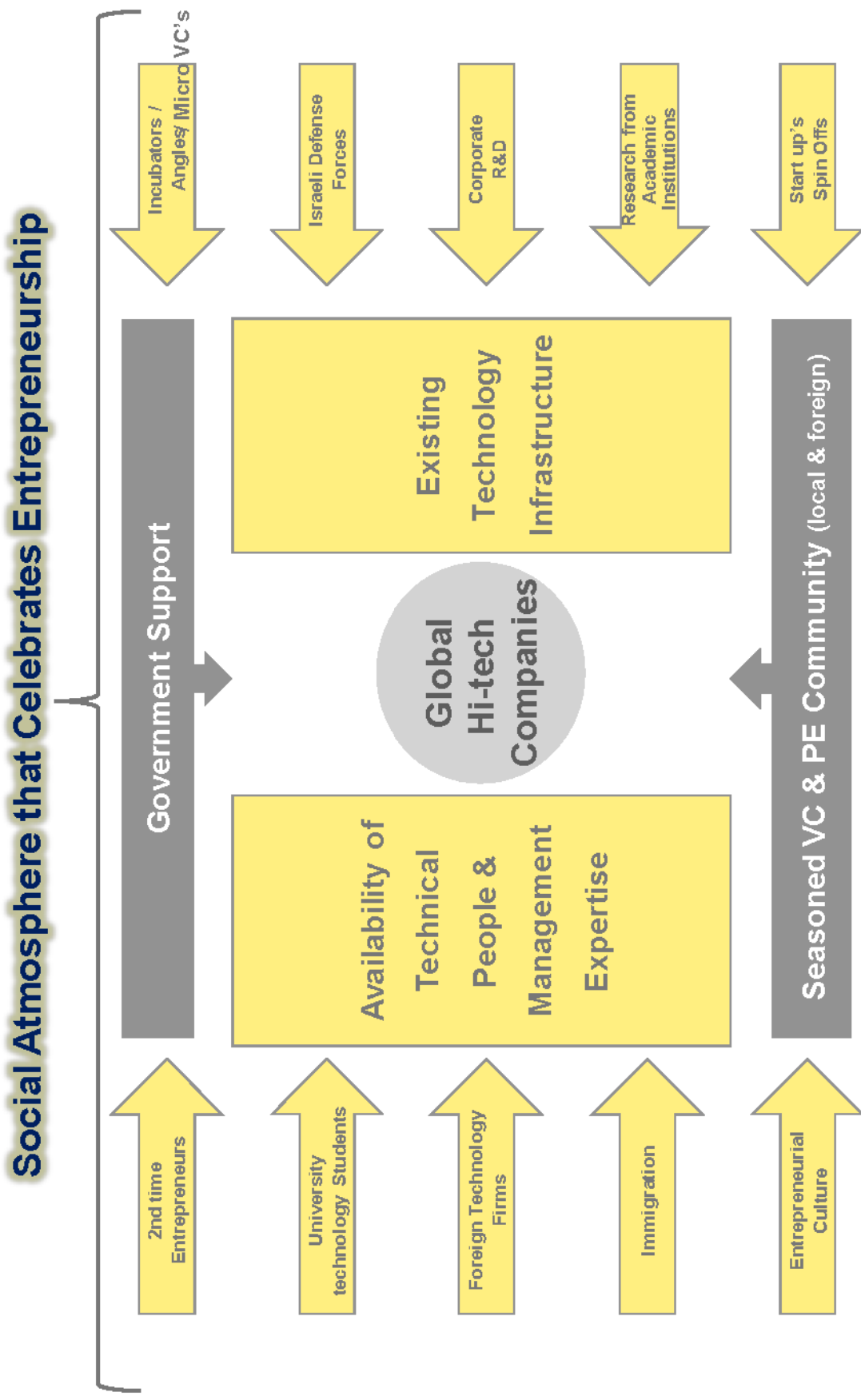
# How did it happen?

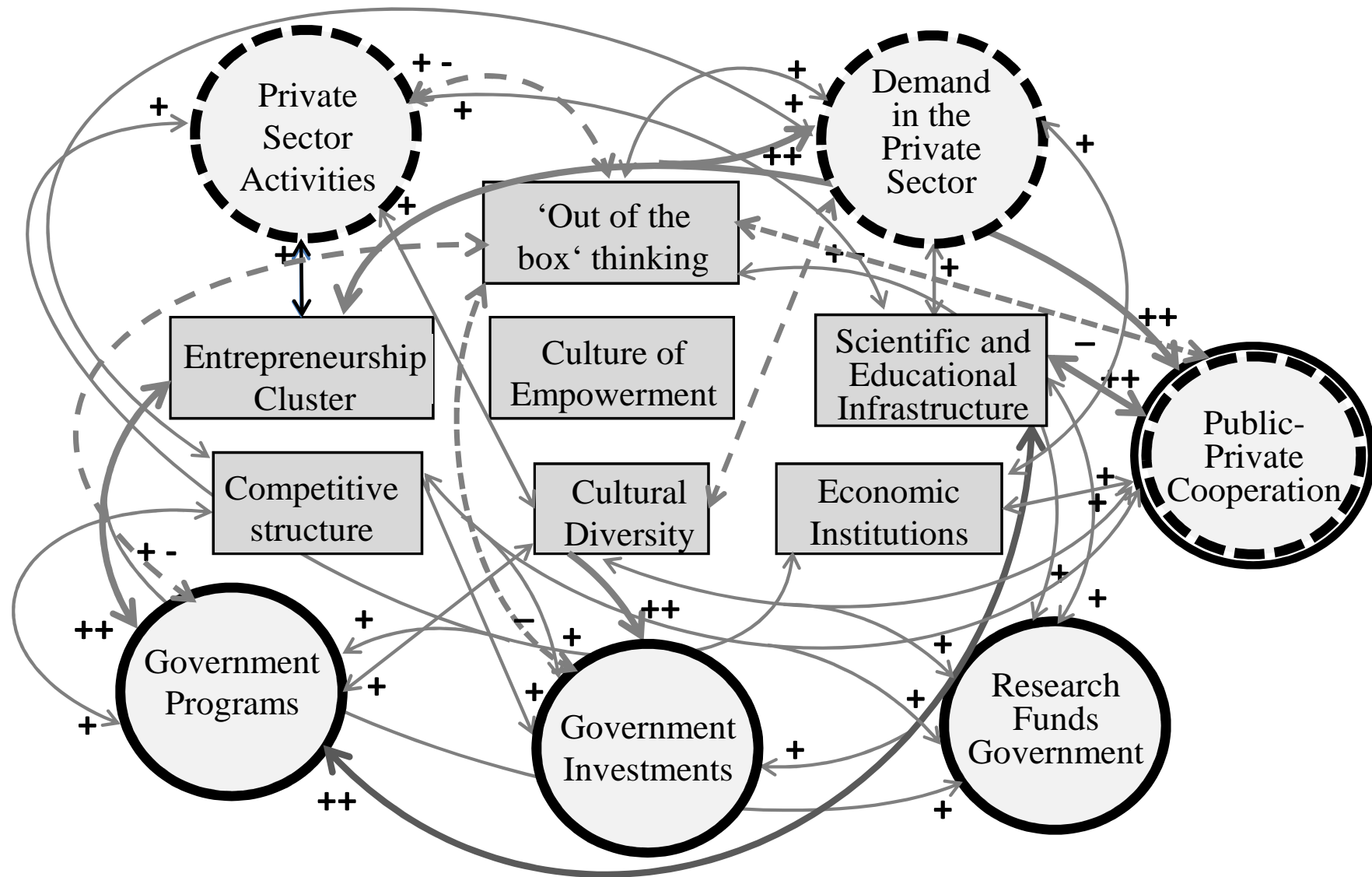


- **Israelis character & culture:**  
[ strong conviction ( ‘I know better!’ ), Chutzpah, don’t take ‘no’ for answer, utmost commitment to make things happen, not afraid of failures...]
- **Military experience: Teamwork, Command/Leadership**
- **The Russian immigration & Incubators**
- **Migration from Military to Civilian Apps**
- **Perfect timing for the mid-90s Internet bubble**
- **Availability of venture money for ‘crazy’ apps**
- **A phenomenon that fed itself – Perpetual!**



# Israel's Eco-System & Business Environment





*Israeli innovation ecosystem*

# Government support: Ministry of Economy OCS [ Office of Chief Scientist ]



**Execution of government policy for support of industrial R&D**

**Goal is not to make money but strengthen the industry**

**Enable but don't lead the market – “do no harm”**

**37 different programs to promote innovative R&D**



# Innovation Policy



**Neutral**

Eligibility depends on **technological level** and **business potential**

**Reciprocity**

Financing firms through **grants**, payable by **royalties** (no equity)

**Matching**

Investments are **matched to private money**



Mission for the next 20 years

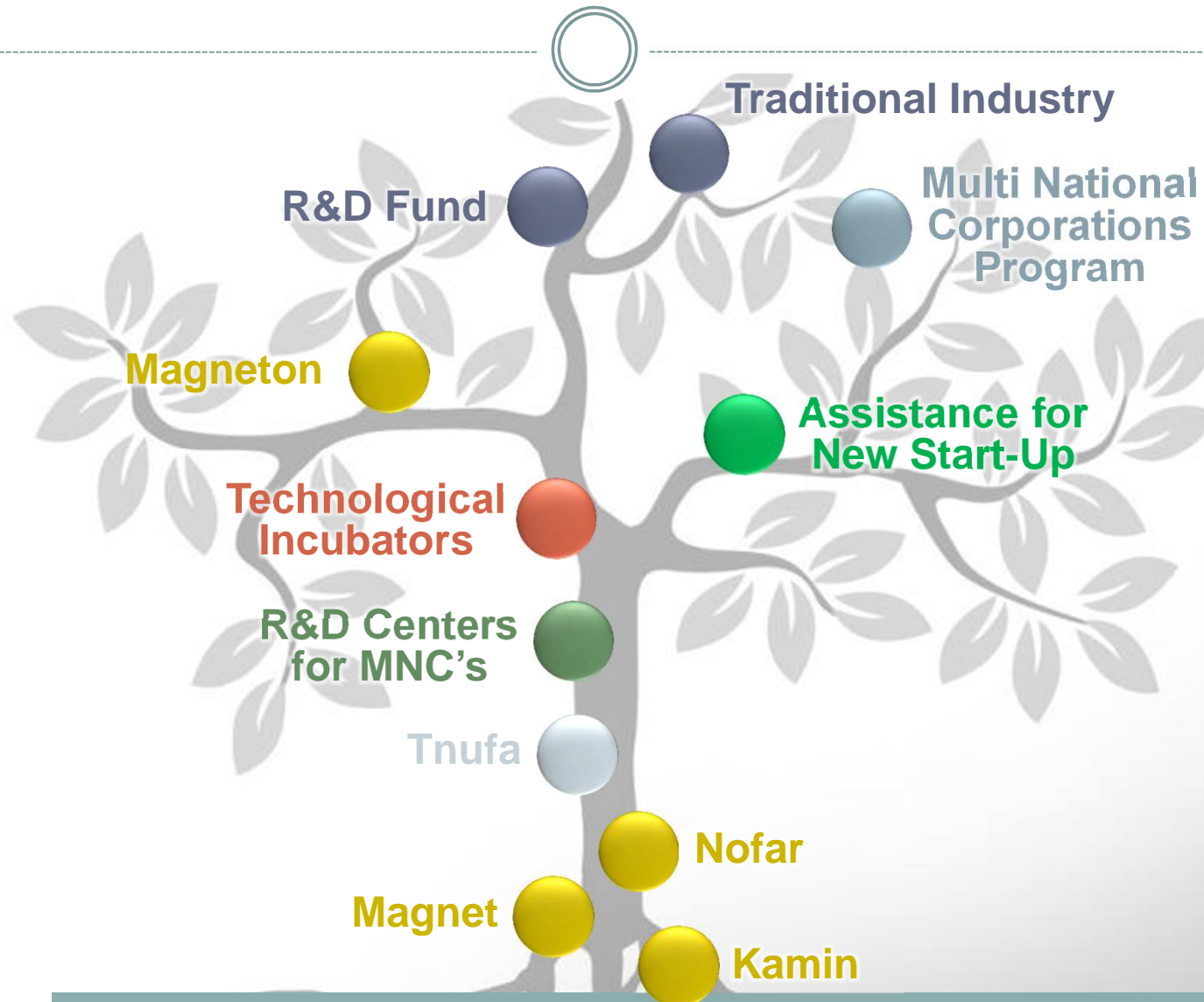


## **Remaining on the innovation peak**

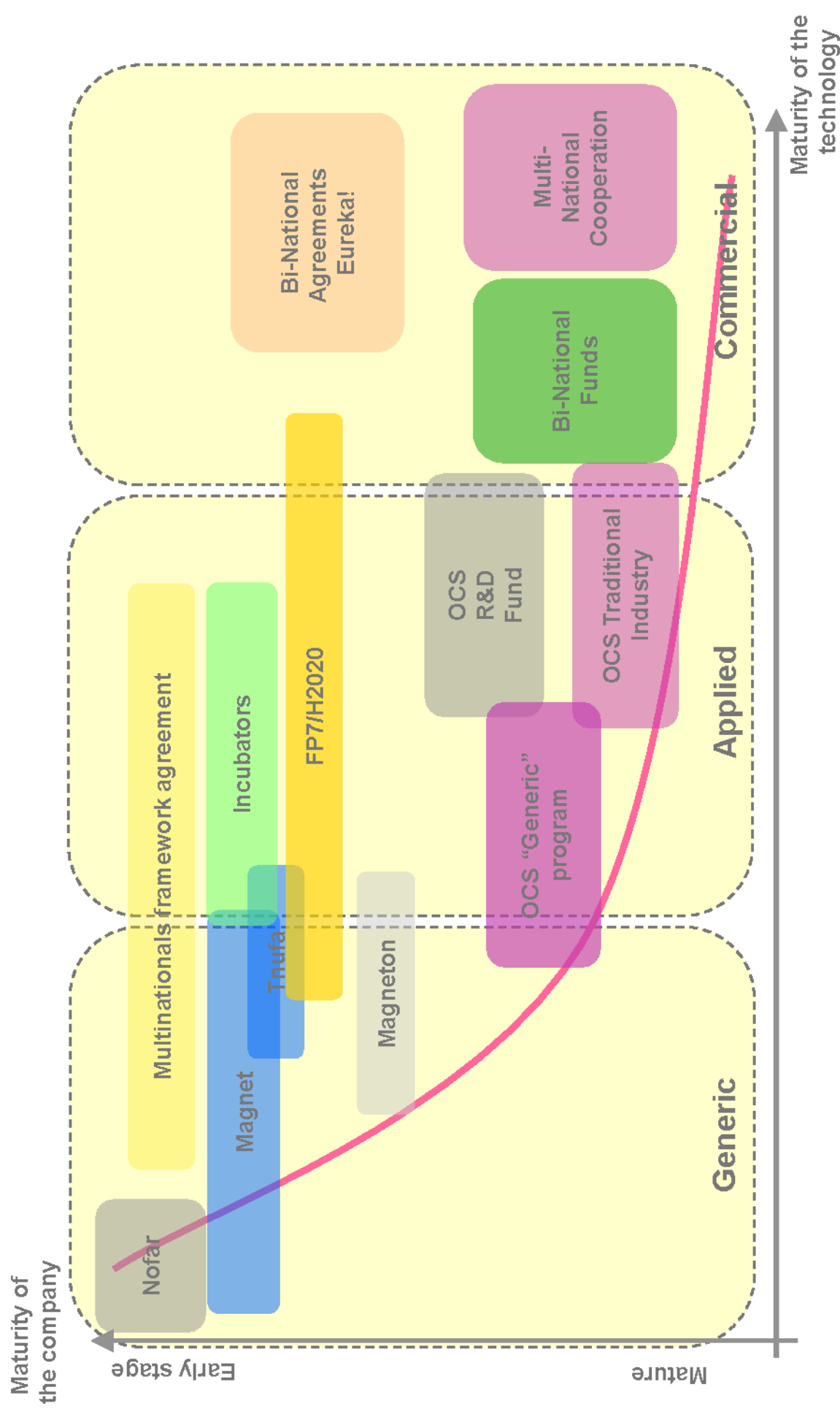
**while pulling up the rest  
of the economy**



## The OCS main programs:



# Government support





## Academia Industry Relation

- Direct access for industry professionals
- Safe platform for high risk ideas
  - Enable industry to safely cultivate cutting edge technologies
  - Enjoy leading researchers collaboration
- Retention opportunities for strong R&D employees
- Technological edge today requires vast horizontal knowledge
  - Example: Intel hiring more SW engineers than ever



# Typical Modes of Collaboration with MNCs

- Research
  - Faculty awards with no constraints (Intel, IBM, HP)
  - Open collaboration (IBM, Intel)
  - Involvement under NDA (J&J)
  - “First look” (others)
  - Joint research, labs and programs (MSR, HP)
- Tech commercialization
  - Partial ownership of incubator
  - Investing in Technion-born technologies
  - Establishing an accelerator
- Education
  - Internships to our students (IBM)
  - Tailored programs through the Unit for Extended Studies
  - Participation in university-industry forums (KCI)
  - Sponsoring special activities (BizTech, Scientists Night)

# Innovation & Entrepreneurship Ecosystem



- Technion R&D Foundation Ltd.
  - Technion Technology Transfer (T3) office
  - Industry Liaison office
  - On campus industrial park (Gutwirth)
  - Technion investment fund
  - Alfred Mann Institute at Technion (AMIT)
- Academic programs & courses
  - Technological Entrepreneurship course (Prof. Dan Shechtman)
  - Biotechnology Entrepreneurship (course & workshop)
  - Medical Entrepreneurship Course (T2Med)
  - Start-Up MBA
- Bronica Entrepreneurship Center (BEC)
  - BizTEC Entrepreneurship National Challenge
  - E-Club
  - Technion for Life (mentoring by Alumni)
- Various prizes & awards for students & faculty (e.g., Kaplan, Rich)



# A Sample of Strategic Industrial Partnerships

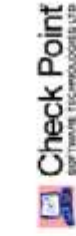
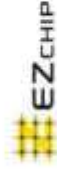
## Labs on Campus:

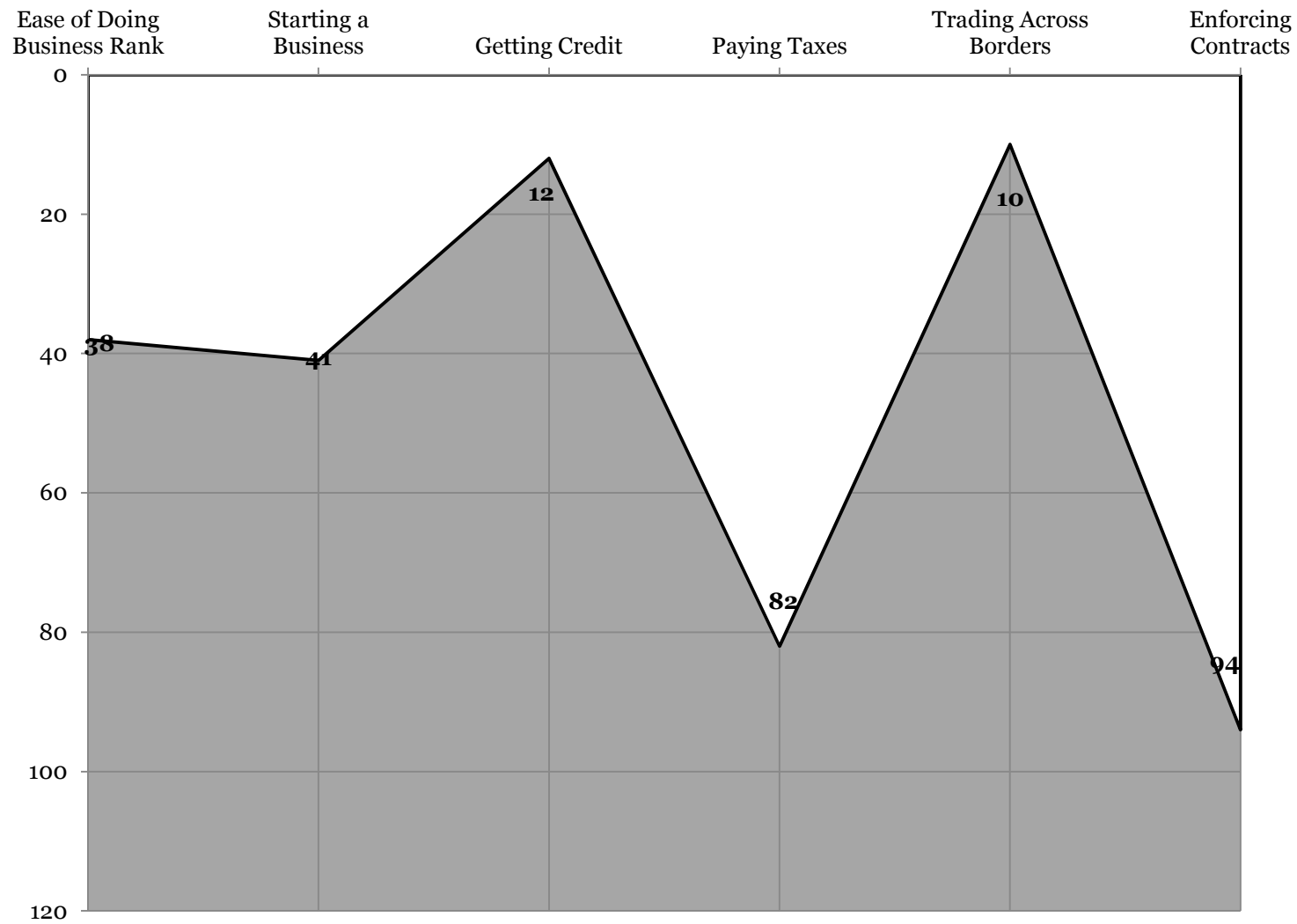
HP Labs Israel



Microsoft Israel Research and Development Center for  
E-Commerce Technologies  
Davidson Faculty of Industrial Engineering & Management

Intel Collaborative Research Institute of Computational  
Intelligence  
Computer Science and Electrical Engineering Faculties





*Israel: Ease of doing business, 2012*

Mapping Innovation Ecosystems – Prof Shlomo Maital - chapter 3

# Implications of Israel's Technology Entrepreneurship Eco-system



- It takes many elements that collaborate, while showing excellence, to succeed!
- The Eco-system is complex and diverse. There is no single ( or Few ) way(s) to succeed. Each sector and domain entails unique characteristics.
- Beyond the Technology and Business settings – it is PEOPLE who make it happen, with their culture & values, energies and adaptability.
- The Eco-system takes time to build and mature
- We are in a Global Village. The Eco-system must accommodate for international collaborations.



**GOOD LUCK!**



# The innovation Ecosystem in Israel



**BACK-UP**

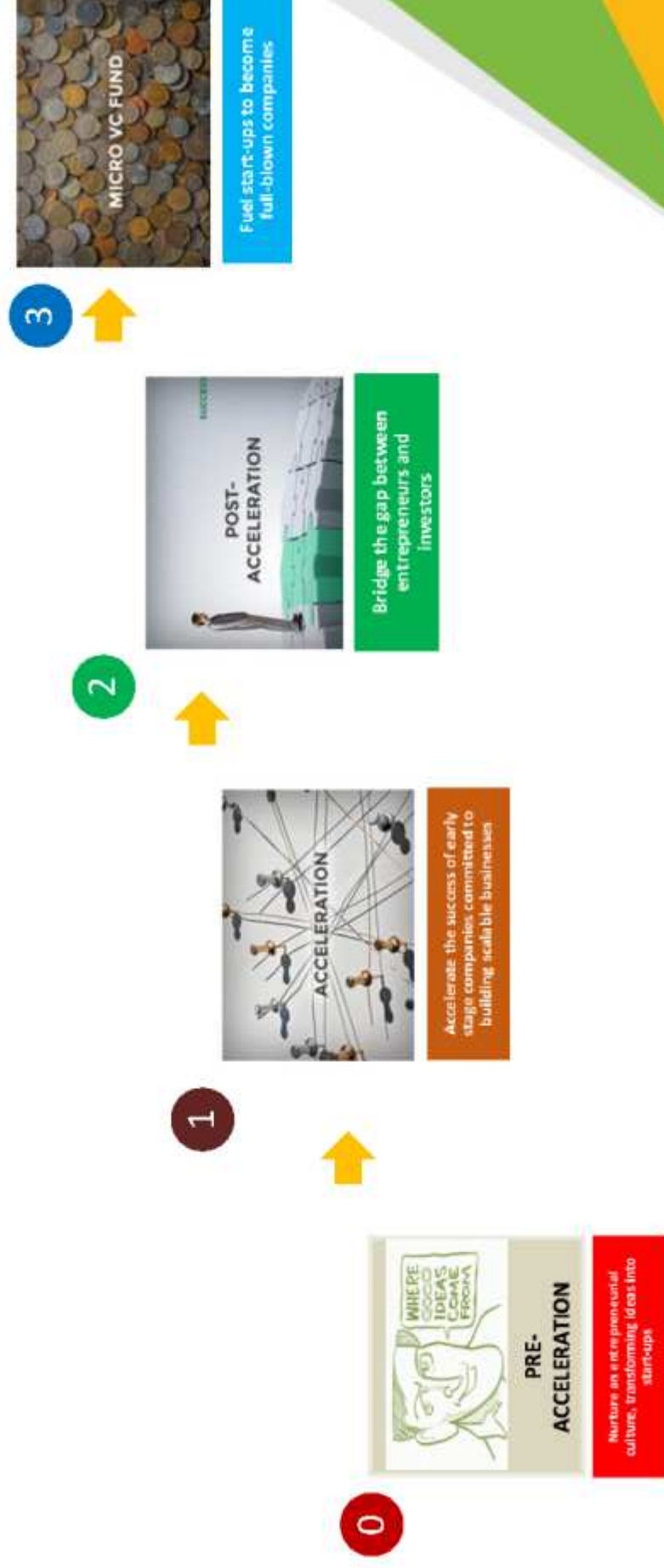
# The Israeli Economy - Highlights

	2008	2009	2010	2011	2012	2013*	2014*
GDP (nominal)	\$ 193 billion	\$205 billion	\$218 billion	\$233 billion	\$248 billion	\$250 billion	
Real GDP growth (local Currency)	4%	1.1%	5.0%	4.6%	3.1%	3.8%	3.3%
Population	7.3 million	7.5 million	7.6 million	7.8 million	7.9 million	8 million	
Export of goods and services	\$ 72 billion	\$63 billion	\$ 72 billion	\$80 billion	\$82 billion		
Rate of Increase in exports (exc. Diamonds)	18%	(9.9)%	10.8%	4.1%	4.2%		
Import of goods and services	\$ 75.5 billion	\$58 billion	\$68 Billion	\$82 Billion	\$85 Billion		
Unemployment rate	6.0%	9.5%	8.4%	7.1%	6.9%	6.8%	6.8%
Foreign investments	\$ 10 .7 billion	\$10.8 billion	\$18 Billion	\$7.5 Billion	\$0.8 Billion		
Inflation rate (year-end)	3.8%	3.9%	2.7%	2.2%	1.6%	1.6%	2.1%
USD-Exchange rate fluctuation	(0.9%)	(2.1%)	(4.9%)	4.7%	0.1%	(6.54%)	

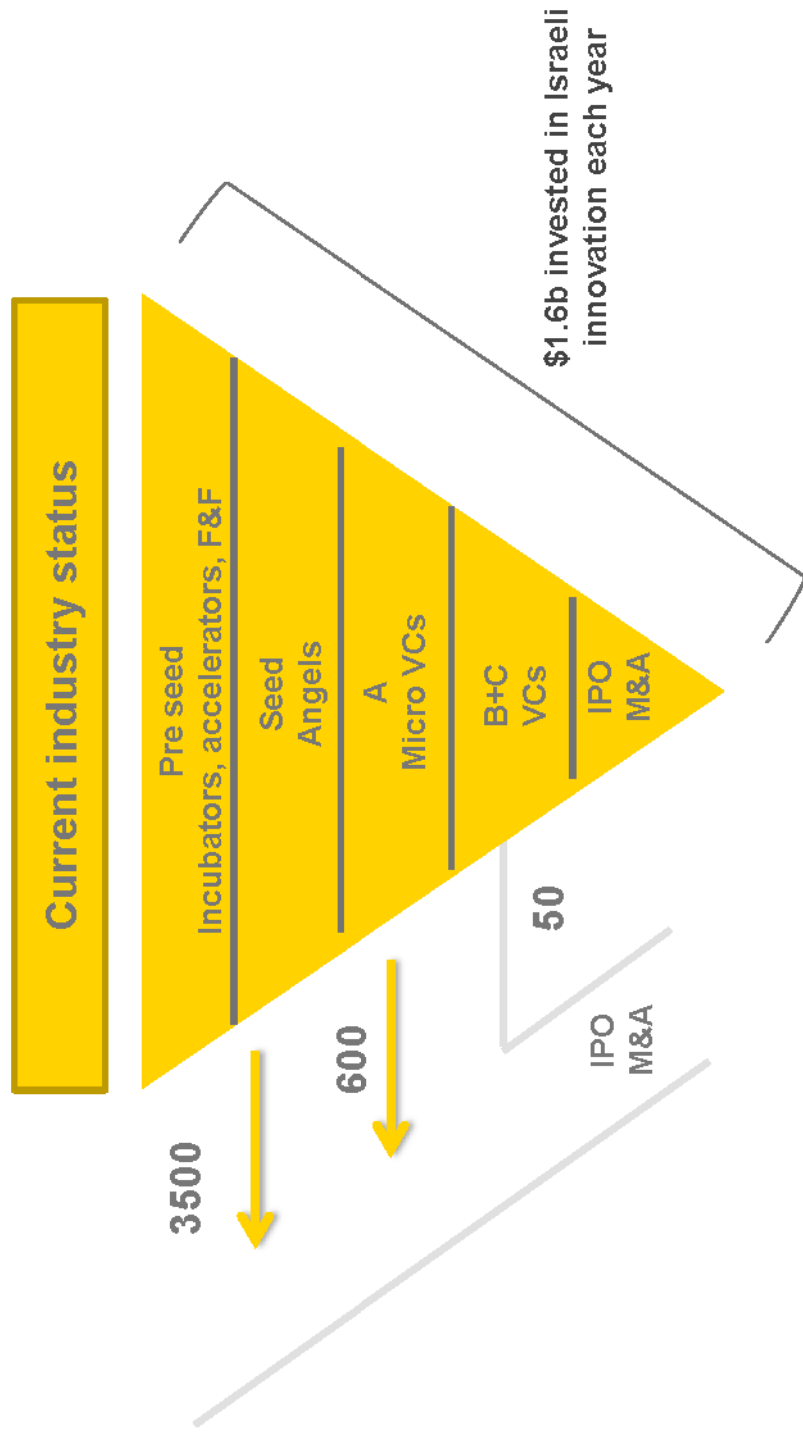
Source: Bank of Israel and central bureau of statistics  
(\*Per IMF)

# Startup Ecosystem Development

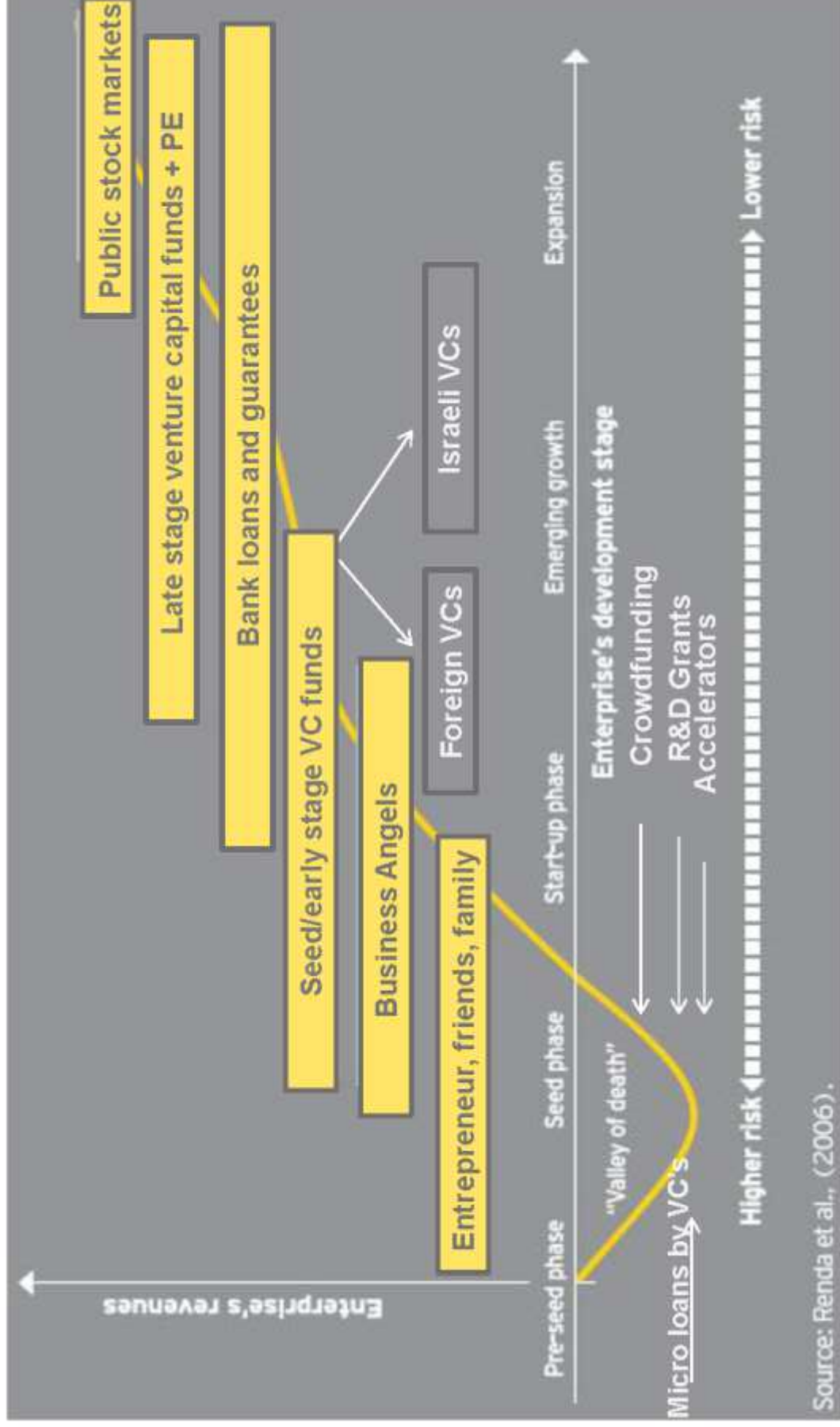
## *The End-to-End Innovative Approach*



# The entrepreneurs' investment flow



# Access to funding

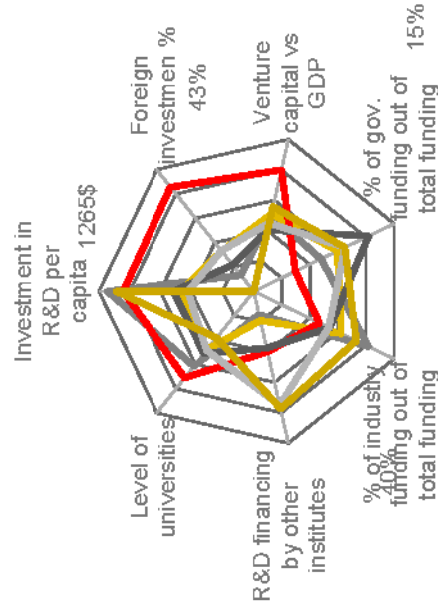


Source: Renda et al., (2006).

# Indices - IP and finance

## Financing

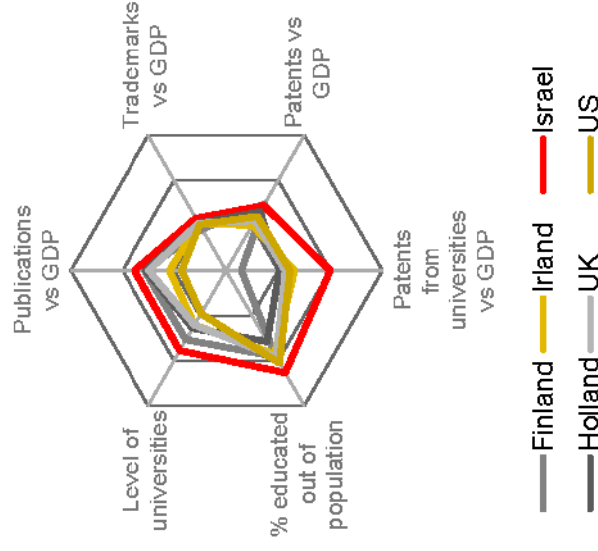
Level of R&D and sources of finance  
2010



Finland Ireland Israel  
Holland UK US

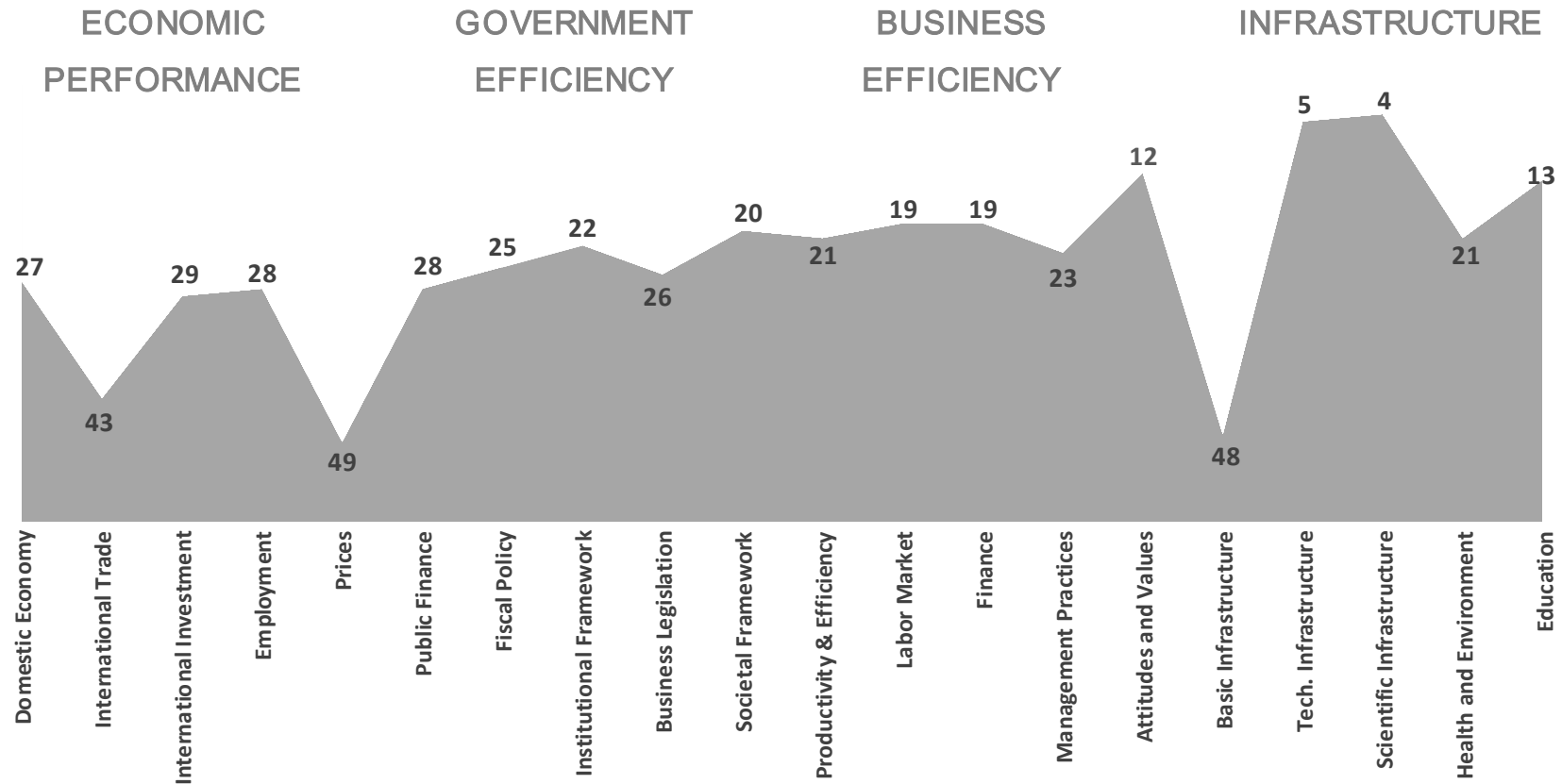
## Intellectual property

Education and R&D  
2010



Finland Ireland Israel  
Holland UK US

## COMPETITIVENESS LANDSCAPE



*Israel's competitiveness landscape (the numbers are rankings, out of the 59 nations included in the WCY survey) (Source: IMD World Competitiveness Yearbook, 2012).*



# Our Vision

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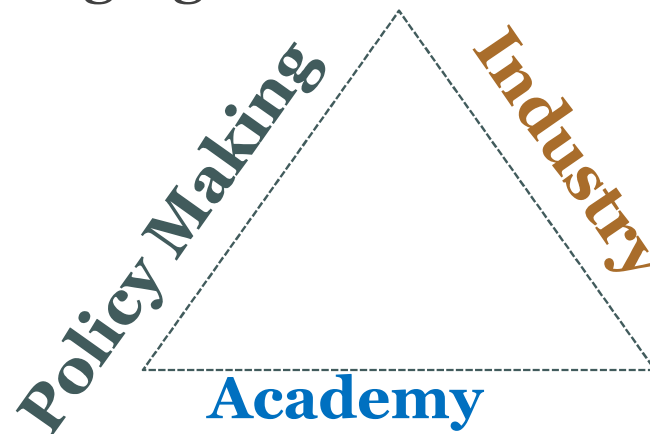
- The creation and dissemination of knowledge on innovation that impacts -
  - Research
  - Industry
  - Policy makers
- Implementing innovation methodologies in industrial organizations
- Position Israel as the leading innovation center worldwide.

# Our Strategy

Integration of **Top-Down** Policy – Making:  
resource Allocation



and **Bottom – Up** Processes within the  
organization:  
Managing the Innovation Process



# Top Down & Bottom Up

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## Top -Down: Recommendations

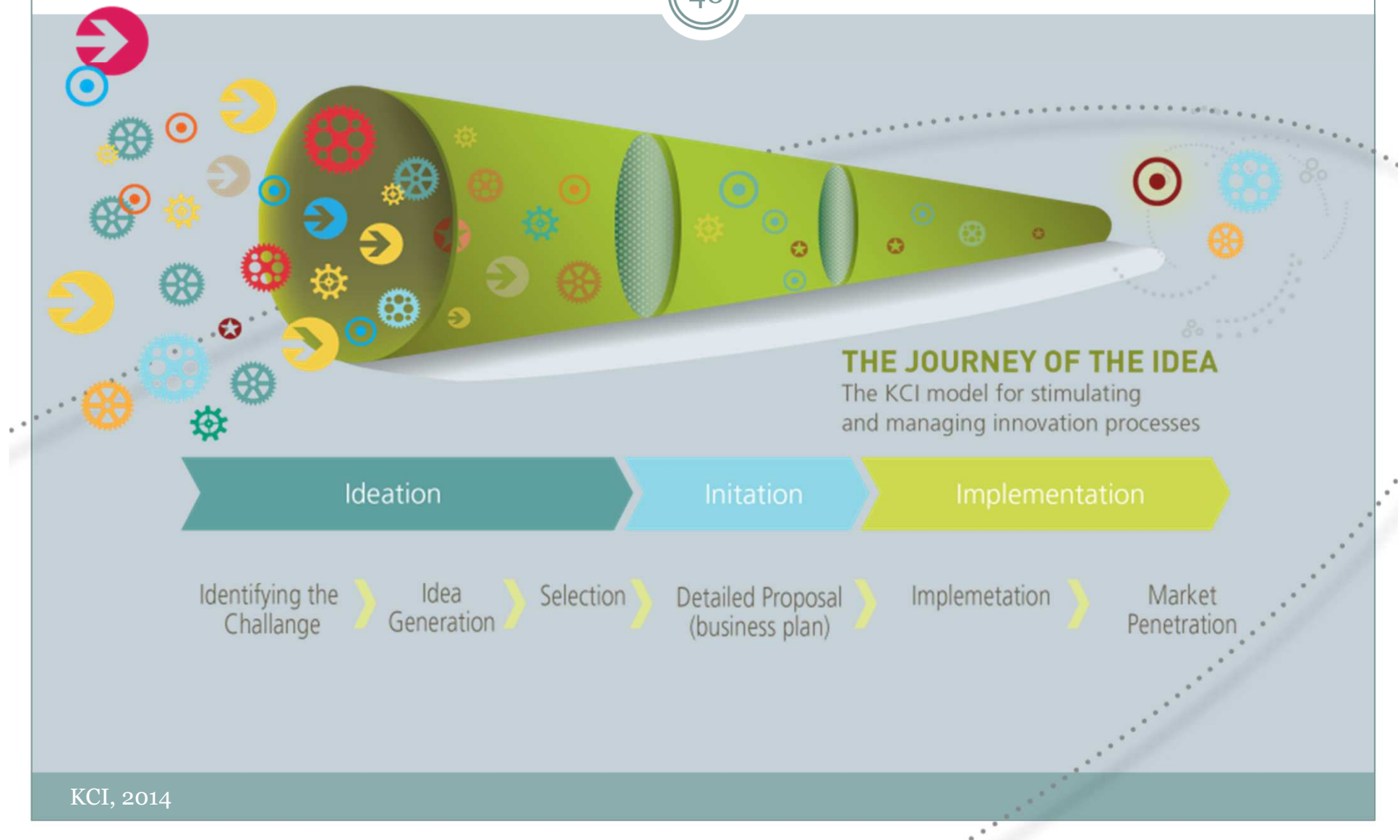
- Encouraging cooperation through government programs.
- Appointing an official governmental body to guide and support enterprises.
- Support the establishment of clusters on the basis of industries, sectors or geographical locations.

## Bottom – Up: Practical tools

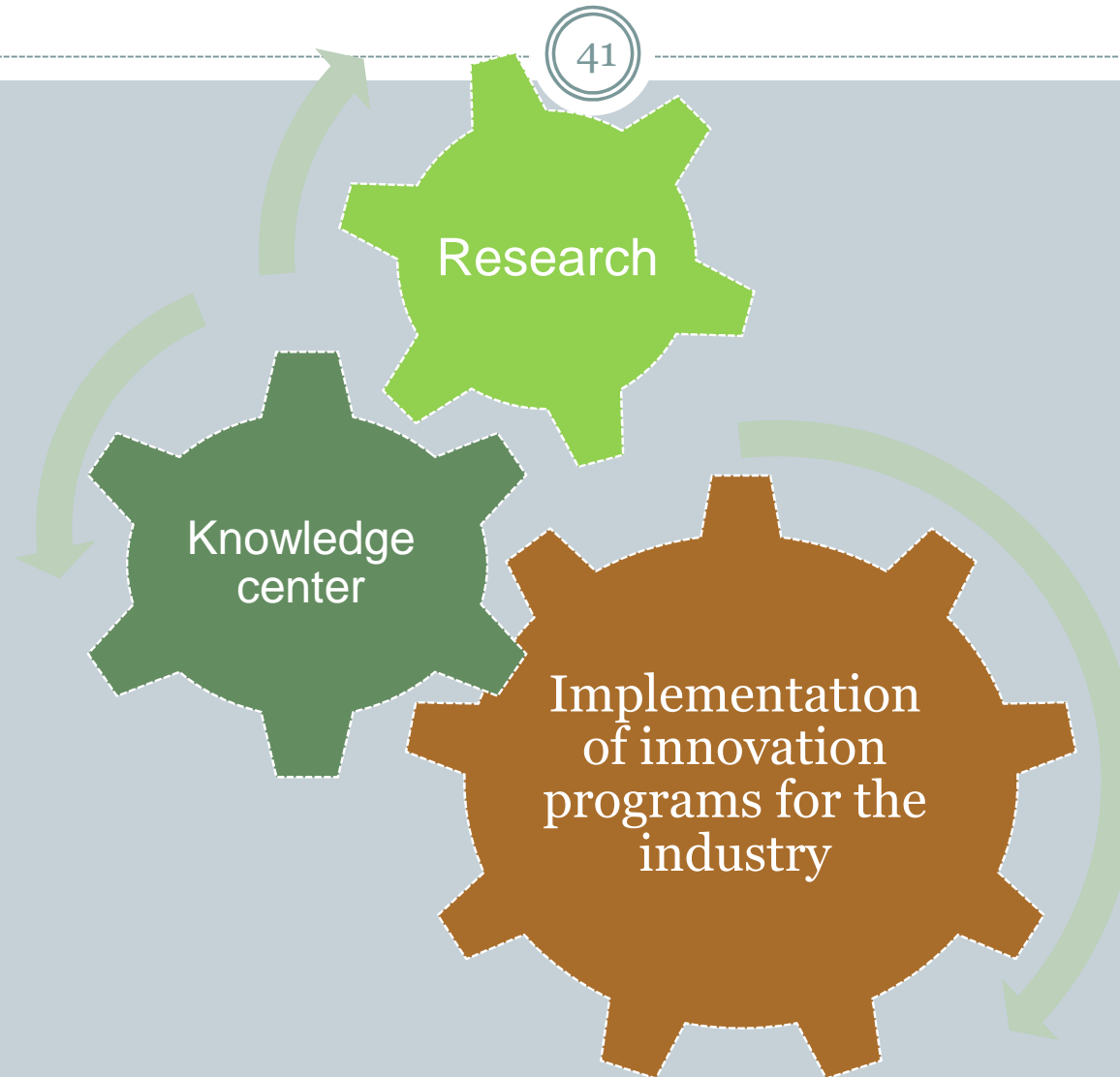
- ✦ Training and education programs for management innovation
- Mentoring by leading CEOs in the industry
- Cooperation between companies: joint R & D projects.

# The Journey of the Idea

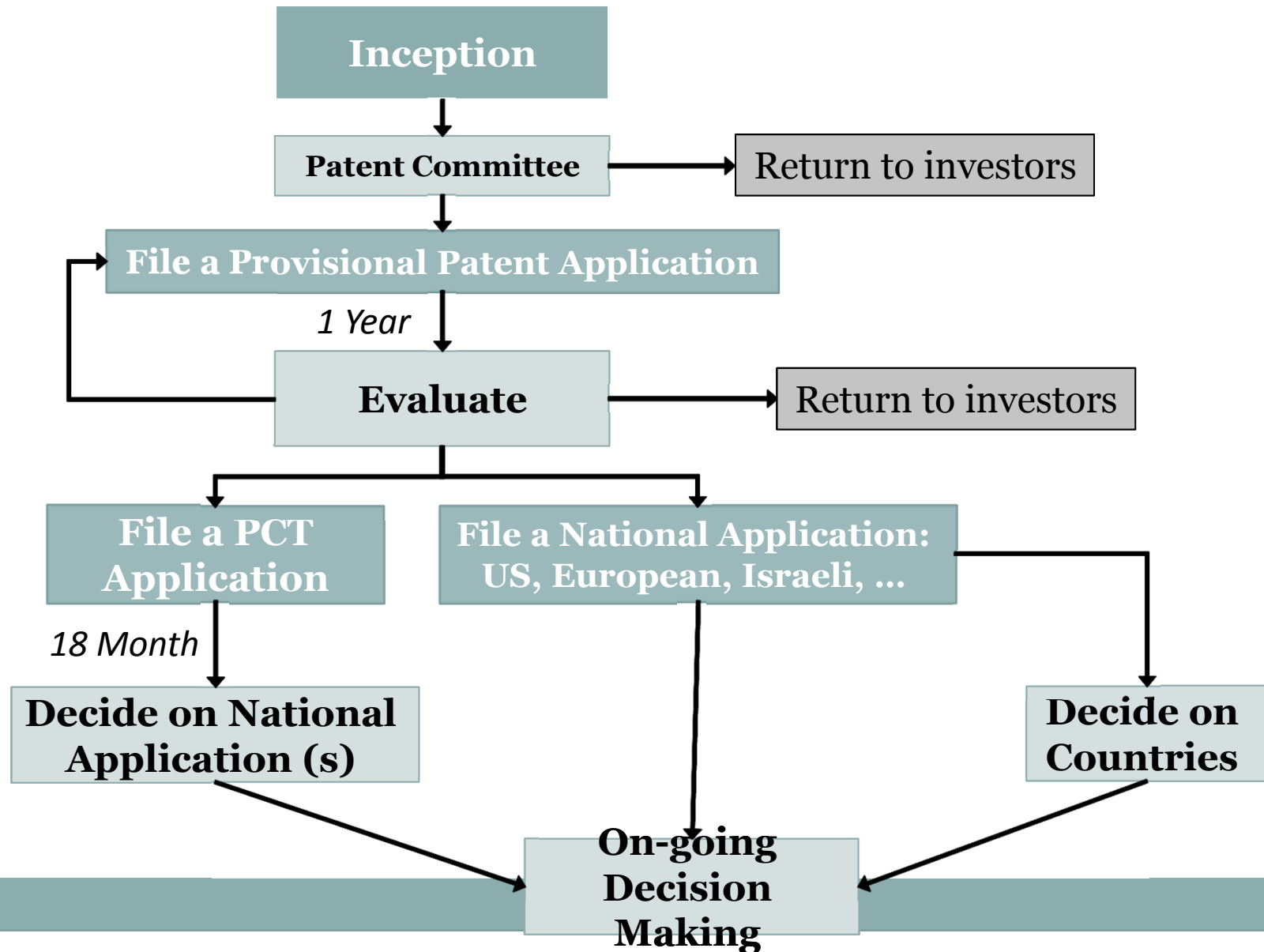
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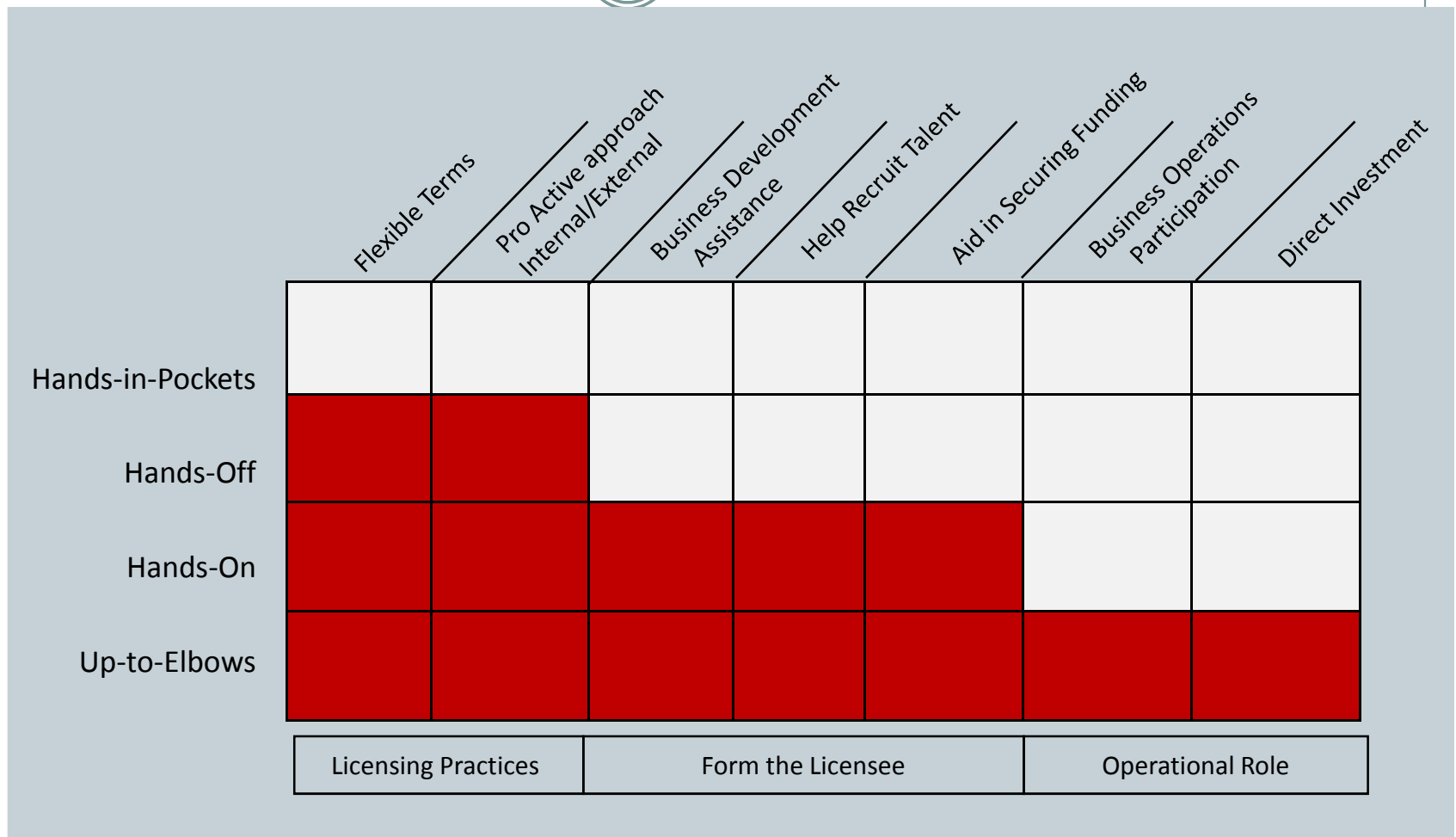
# 3 Major Fields



# Technology Transfer Process



# Models of Academic Approaches to Commercialization



	Flexible Terms	Pro Active approach Internal/External	Business Development Assistance	Help Recruit Talent	Aid in Securing Funding	Business Operations Participation	Direct Investment
Hands-in-Pockets							
Hands-Off							
Hands-On							
Up-to-Elbows							
	Licensing Practices		Form the Licensee			Operational Role	

*Technion chose "up-to-elbows"*

Source: MIT, AUTM, MRUN, U Michigan et al





# Facts and Figures

- 18 Academic departments
- Engineering, Natural Sciences, Medicine, Architecture
- 52 Research centers
- ~135 Academic programs (55 undergraduate, 80 graduate)
- 13,000 Students (9,000~ BSc, 2500~ MSc, 1000~ PhD, 600~ MD)
- ~ 100,000 Academic degrees awarded
- 565 Faculty members
- 1,100 Technical and administrative staff
- 250 Clinicians
- 870 Adjuncts and instructors
- 360 researchers on external research grants
- 300 acre campus, 90 buildings
- 4,200 dormitory beds



# Interdisciplinary Research Centers

1984 Asher Space Research Institute (ASRI)

1993 Grand Water Research Institute (GWRI)

2003 Russell Berrie Nanotechnology Institute (RBNI)

2007 Lokey Center for Life Sciences and Engineering (LS&E)

2008 Grand Technion Energy Program (GTEP)

2009 Technion Autonomous Systems Program (TASP)

2013 Technion Computer Engineering Center (TCE)

# Some Research Facilities



- Photovoltaic Laboratory
- Micro Nano Fabrication Unit (MNFU)
- Electron Microscopy Center
- Genomics Center

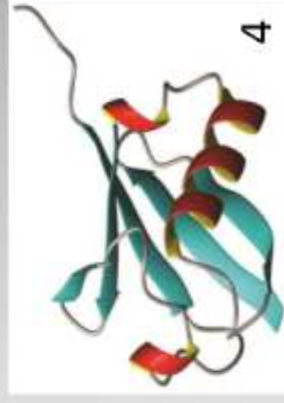
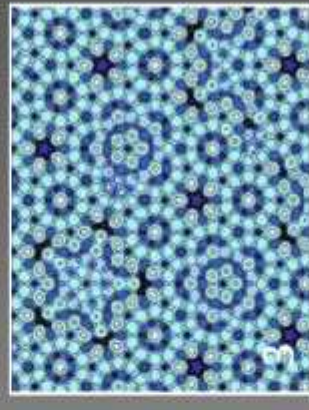
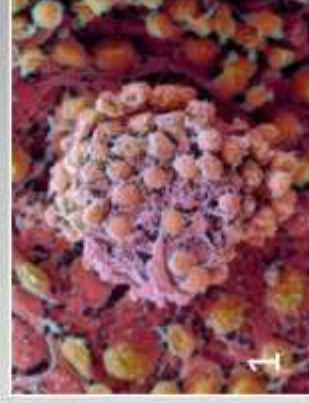




# Some Research Highlights



- Stem cells
- Parkinson's drug – Azilect
- Quasicrystals
- Ubiquitin
- Lempel -Ziv algorithm
- Tissue Engineering





# Nobel Prizes



**2004 – Avram Hershko**  
Nobel Prize in Chemistry  
Technion



**2004 -Aaron Ciechanover**  
Nobel Prize in Chemistry  
Technion



**2011 - Dan Shechtman**  
Nobel Prize in Chemistry  
Technion



**2013 - Ariele Warshel, Class of 1966**  
Nobel Prize in Chemistry  
USC





## Foreign Associates in the US National Academy of Engineering

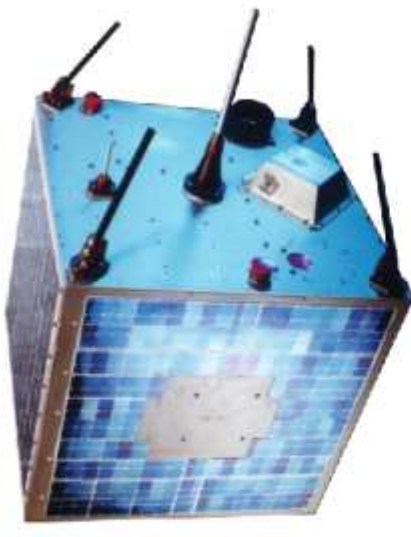


- Israel: 12 foreign associates
  - 8 from the Technion
  - 4 from other universities (2 Weizmann, 1 each in TAU and BGU)
- For comparison:
  - France has 11 foreign associates where no single institution has more than one
  - Canada has 15 foreign associates where the top two universities (Toronto & McGill) have 3 each
- Technion is second only to Cambridge University (11 foreign associates) among universities outside the USA

# A Sample of Technion Firsts



- First university in Middle East
- First (and only) department of Aerospace Engineering in Israel
- Most of the engineering programs in Israel were first launched at Technion
- First Israeli university to place a satellite in space
- First Israeli university to establish a Nanoscience & Nanotechnology center
- First Israeli university to launch programs for underprivileged applicants
- First Israeli university to establish branches overseas (JTCII, TGIT)





# A Sample of Technion Related Commercial Success Stories (10 Years or Older)



- Azilect – an anti Parkinson drug
- Mazur – robotics technology for spine operations
- Insightec – non-invasive operations
- Disk-on-key – memory sticks
- PillCam – a substitute to colonoscopy
- Rewalk –exoskeleton device that enables paraplegics to walk



# A Sample of Technion Related Commercial Success Stories (Last Few Years)



- Trusteer (Cyber security company led by Technion alum) bought by IBM for \$800M
- Invision Biometrics (gesture recognition company led by Prof. Ron Kimmel) sold to Intel for an undisclosed amount
- Iron Dome (missile interception system developed by Technion graduates at Rafael) reaches 87% success rate in operation Pillar of Cloud
- Plus500 (algorithmic trading company led by 4 recent Technion alumni) sells some of its stocks for \$500M
- Cortica (a picture-based search engine company led by Prof. Josh Zeevi) raises \$20M in Series C Funding and is now valued at \$200M
- Mapal Green Energy (water purification company led by a Technion alum) was contracted to clean the Thames River water







# Technion Technologies Attract the Attention of World Leaders



# Technion Goes Global: Strategic Alliances



## JTCII

Joan & Irwin Jacobs  
Technion-Cornell Innovation Institute  
New York City, USA  
2011



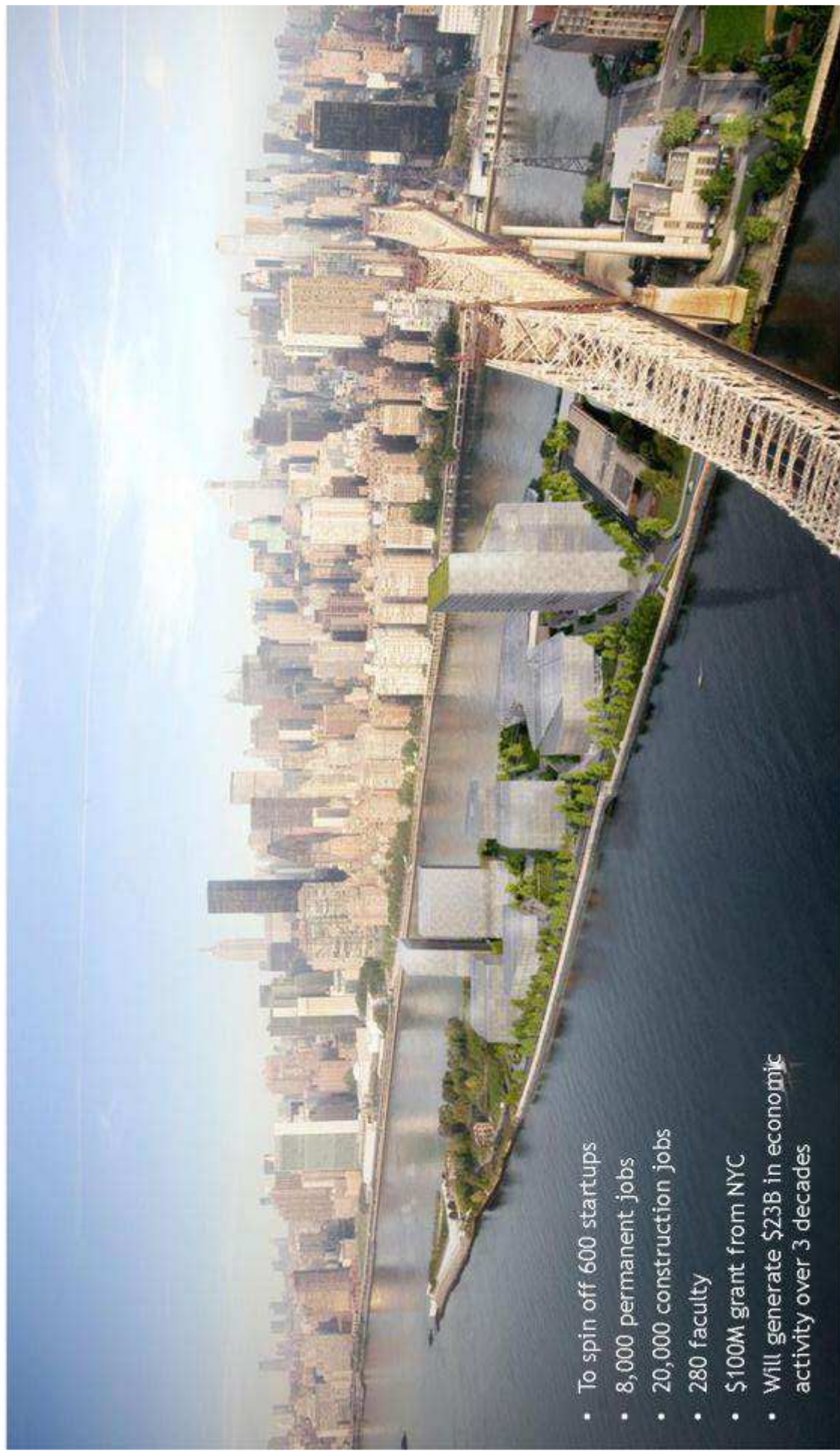
## TGIT

Technion-Guangdong Institute of  
Technology with Shantou University  
Guangdong, China  
2013





# Technion-Cornell Partnership



- To spin off 600 startups
- 8,000 permanent jobs
- 20,000 construction jobs
- 280 faculty
- \$100M grant from NYC
- Will generate \$23B in economic activity over 3 decades



# Technion-Guangdong Partnership







# A Sample of Additional Academic Partnerships



## USA:

- Cornell (JTCII for Applied Engineering)
- Johns Hopkins • U Michigan (Medical)
- Yale (Economics, Homeland Security)
- USC (iPodia Alliance)



## Canada:

- University Health Network (Toronto)
- Waterloo U
- McGill U



## Singapore:

Cooperation in tissue engineering with two universities (NUS, NTU) supported by the NRF (\$20M)



## Australia:

- Sydney University - photonics
- Sydney University – tissue reengineering





# A Sample of Additional Academic Partnerships



**EU 7th Framework Programme**  
(Total approved funding: ~ €100M)



**France:**

- Companies (Total, Veolia, Servier, Sanofi, Mérieux, Havas)
- Universities & Research Institute (Inserm, École Polytechnique)



**Germany:**

- Umbrella Symposia: Aachen - Jülich – Technion
- Minerva Centers
- Hasso Plattner Institute





# Technion International

- BSc in Civil & Environmental Eng.
- Full-time one year international MBA
- Freshman year in Russian, English
- Student exchange programs with ~150 universities
- Post-doctoral students from dozens of countries
- Extended education programs for foreign students
- Engineers Without Borders (EWB) programs
- SciTech summer camp at the Pre-University Center
- Workshops on entrepreneurship

[www.ise.technion.ac.il](http://www.ise.technion.ac.il)

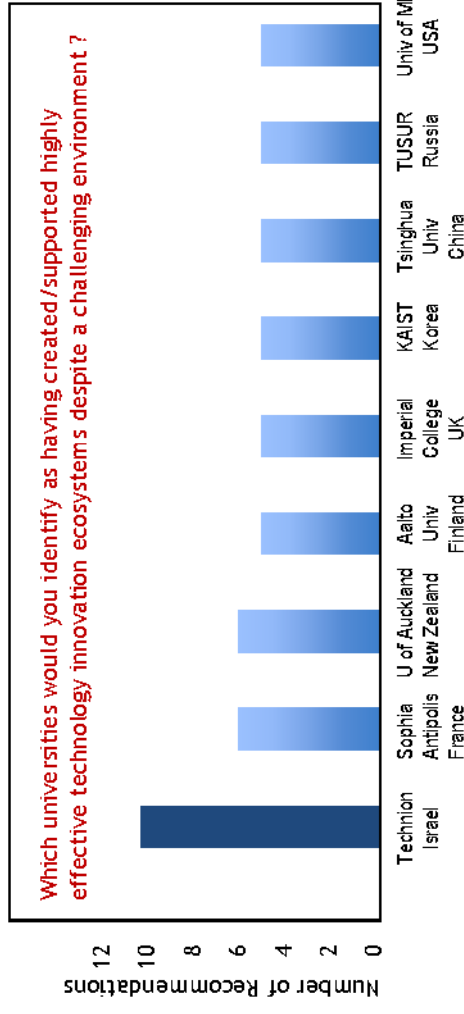
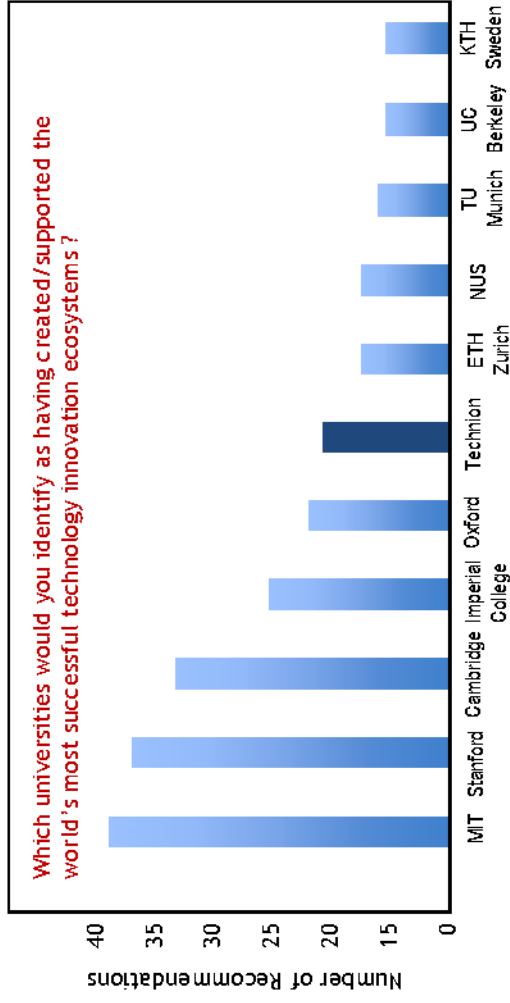
# Innovation: MIT Survey



## Global comparison of innovation & entrepreneurship centers –

Technion placed 6th in the world for creating the “most successful technology innovation ecosystem,” after MIT, Stanford, Cambridge, Oxford and Imperial College.

But, when the question was modified to “creating effective technology innovation ecosystems **despite a challenging environment**,” Technion was placed 1<sup>st</sup>.





# Current Top Priority Technion Projects

- Faculty recruitment
  - “First Steps” – setup costs for new labs and equipment
- Support to our Students
  - Fellowships for MSc and PhD students
  - Special programs for minorities, Ethiopian Jews, ultra-orthodox, IDF veterans & reservists
- Research centers & programs
  - Technion Integrative Cancer Research Center (TICRC)
  - Technion Computer Engineering (TCE)
  - Nano-Photonics, Quantum Computing
  - Environmental health, Samson II, Energy and many more ...
- Physical facilities
  - Technion 21C campus
  - Undergraduate Students Village
  - Second Life Science Research building
  - Renovation & refurbishing of older buildings

# Industry – Academy Cooperation



## Nofar

Bridge the gap between know-how within academia and the needs of the industry  
OCS participation : 90%, industrial company: 10%, Up to \$125K for a period of 15 months

## Kamin

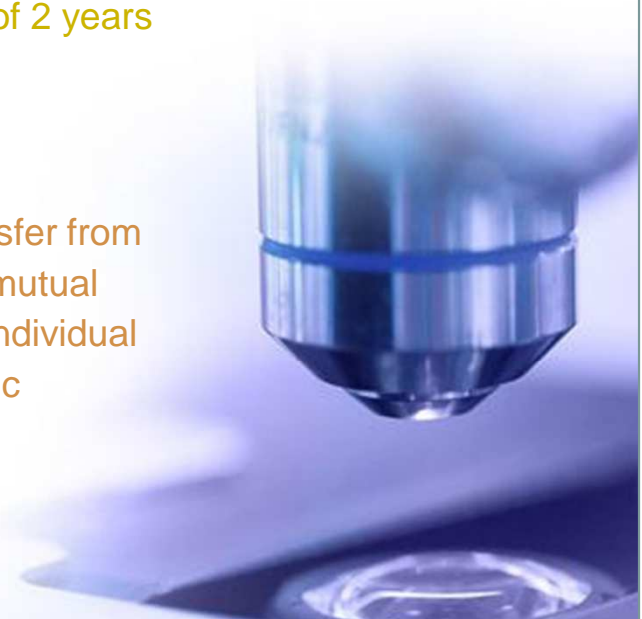
designed to translate academic research achievements into technologies of interest to the Industry  
OCS participation: 85-90%, rest by the research institute, up to \$800K for a period of 2 years

## Magent

consortium of several Israeli academy and industry members  
OCS participation: 66% from industry expenses and 80% from academy budget  
(3-5 years, no royalties)

## Magneton

promotes technology transfer from academia to industry via mutual cooperation between an individual company and an academic research group  
OCS participation: 66%, up to \$760K





## Seed Incubating

## Incubators Program

### Incubator Program

- 20 incubators across the country
- 7 peripheral (preferred conditions)
- 1 biotechnology (Rehovot)
- 1 industrial (Haifa)
- International Investors

### International Collaborators







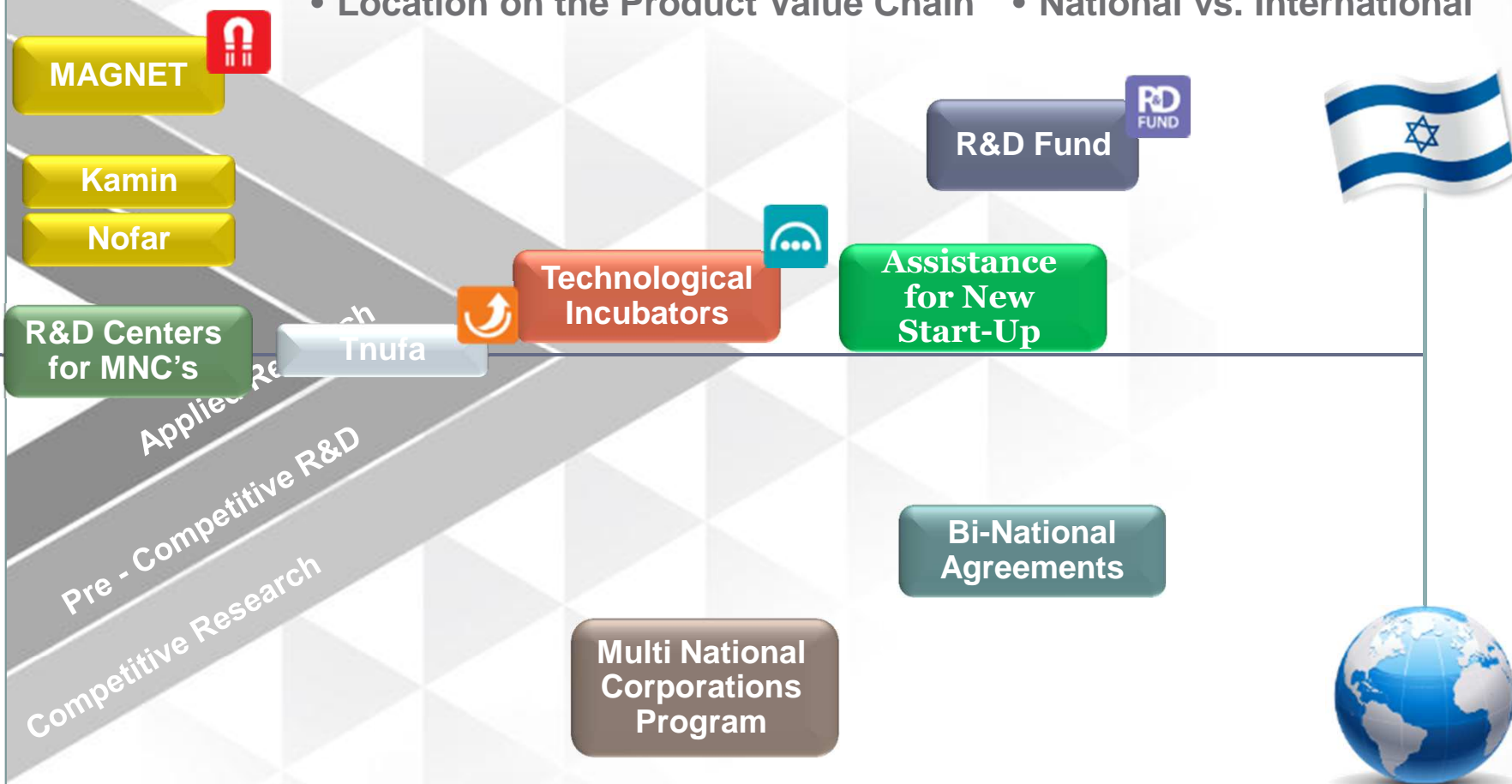
### Criteria





# The OCS programs:

- Location on the Product Value Chain
- National vs. International



המשולש המשובץ צריך להחילף את המשולש האפור החיצוני (הבהיר ביותר)  
competitive research צריך להיות על המשולש המשובץ  
לדעתי צריך המשבצות צריכות להיות יותר בולטות

Nurit Eyal; 19/11/2014



# International Collaborations

## The European



**BIRDF-with U.S.A.**

**SIIRD-with Singapore**

**CIIRDF - with Canada**

**KORIL-RDF - With S. Korea**

### European Framework:

- FP7 – 2,100 Israel proposals were approved, enjoyed grants of 840M Euros
- Horizon 2020 – 2014-2020, 70 Billion Euros budget
- EUREKA - incorporates 40 national funding schemes