REPUBLIC OF ESTONIA
GOVERNMENT

Turning R&D Into Economic Value

- What's Effective in Practice

Dennis Tsu

Nov. 2017

Innovation Perspectives

Agenda/Objectives

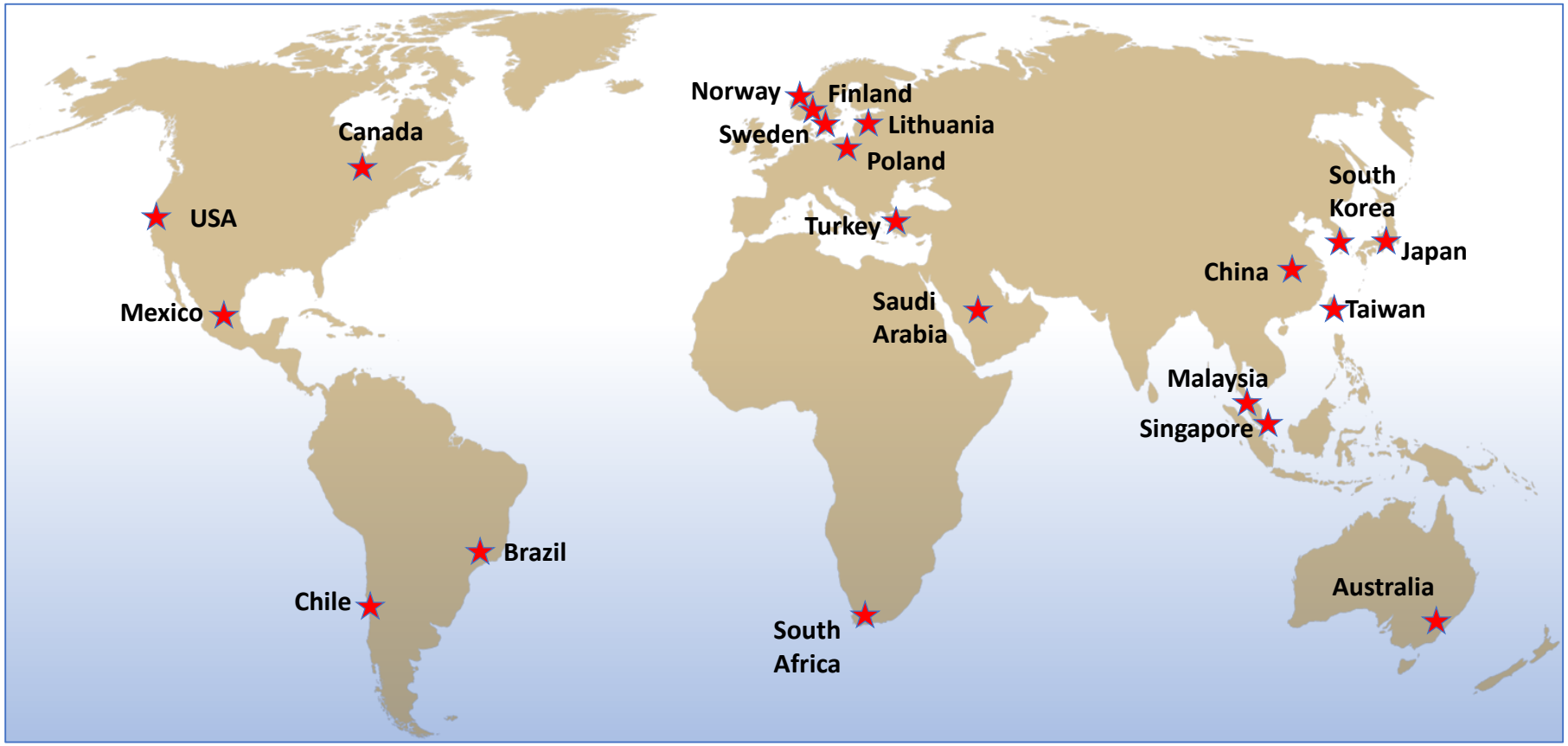
- Provide a Silicon Valley & a global perspective on how to turn R&D into economic value

- This is a manageable process
- That requires an Innovation Eco-system

- Biggest challenge for Estonia = critical mass

Personal Background

Global Perspective on Innovation



Two forms of R&D:
Academic & Corporate

- Academic R&D
  - At universities, research institutions
  - Two sources of funding:
    - Government, foundations – focused on “social impact”
    - Companies – focused on commercial impact

- Corporate R&D
  - Maybe done inside or outside of the company
  - Funded by the company’s profits
  - Focused on ROI

Three ways to commercial value:

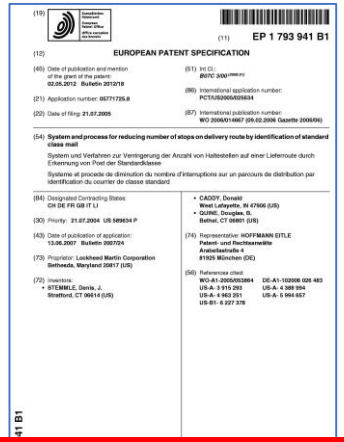
License – Typically to a Medium-large company

New Start-up Company => New product or service

Government New program or service

R&D has to get to the market to have economic (commercial) value

The Challenge:



(19) (11) EP 1 793 941 B1

(12) EUROPEAN PATENT SPECIFICATION

(45) Date of publication and mention of the grant of the patent: 02.05.2012 Bulletin 2012/18

(21) Application number: 05771725.8

(22) Date of filing: 21.07.2005

(51) Int Cl.: B07C 3/00 (2006.01)

(86) International application number: PCT/US2005/025934

(87) International publication number: WO 2006/014667 (09.02.2006 Gazette 2006/06)

(54) System and process for reducing number of stops on delivery route by identification of standard class mail

System und Verfahren zur Verringerung der Anzahl von Haltestellen auf einer Lieferroute durch Erkennung von Post der Standardklasse

Système et procede de diminution du nombre d'interruptions sur un parcours de distribution par identification du courrier de classe standard

(84) Designated Contracting States: CH DE FR GB IT LI

(30) Priority: 21.07.2004 US 589634 P

(43) Date of publication of application: 13.06.2007 Bulletin 2007/24

(73) Proprietor: Lockheed Martin Corporation Bethesda, Maryland 20817 (US)

(72) Inventors:
• STEMMLE, Denis, J.
Stratford, CT 06614 (US)

• CADDY, Donald
West Lafayette, IN 47906 (US)
• GUNE, Douglas, S.
Bethel, CT 06801 (US)

(74) Representative: HOFFMANN EITLE
Patent- und Rechtsanwälte
Arabellastraße 4
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(56) References cited:
WO-A1- 2005/053864 DE-A1-102006 026 483
US-A- 3 915 293 US-A- 4 388 994
US-A- 4 963 251 US-A- 5 994 657
US-B1- 6 227 378

97+%

Worldwide – only 1 to 3% of patents ever get commercialized

WHY?

Commercialization is Hard Work

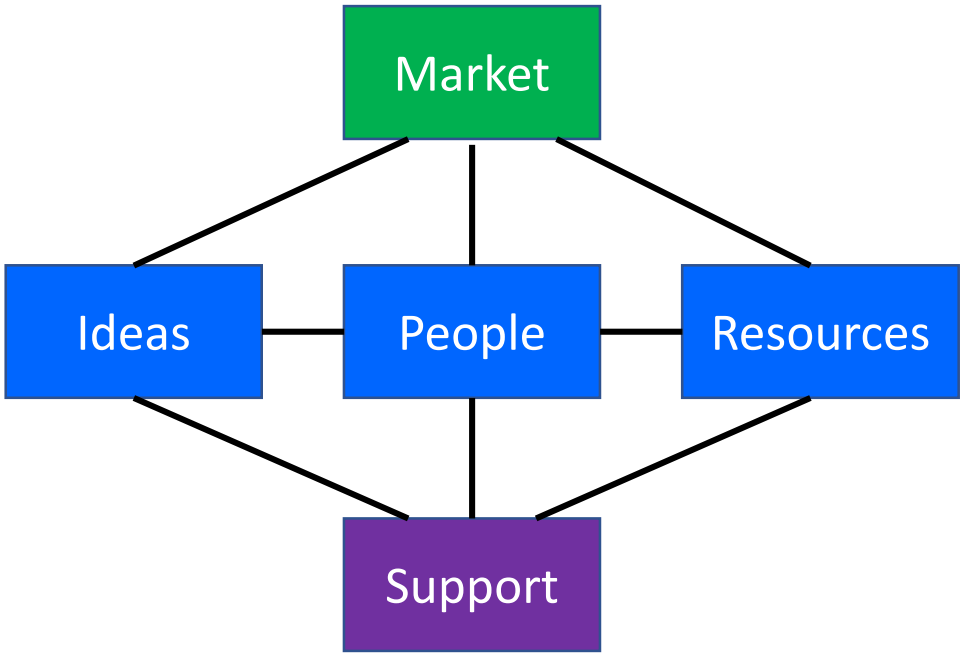
Repeatable success requires a process.

Commercialization requires a different set of skills and a mindset that most researchers/research institutions do not have.

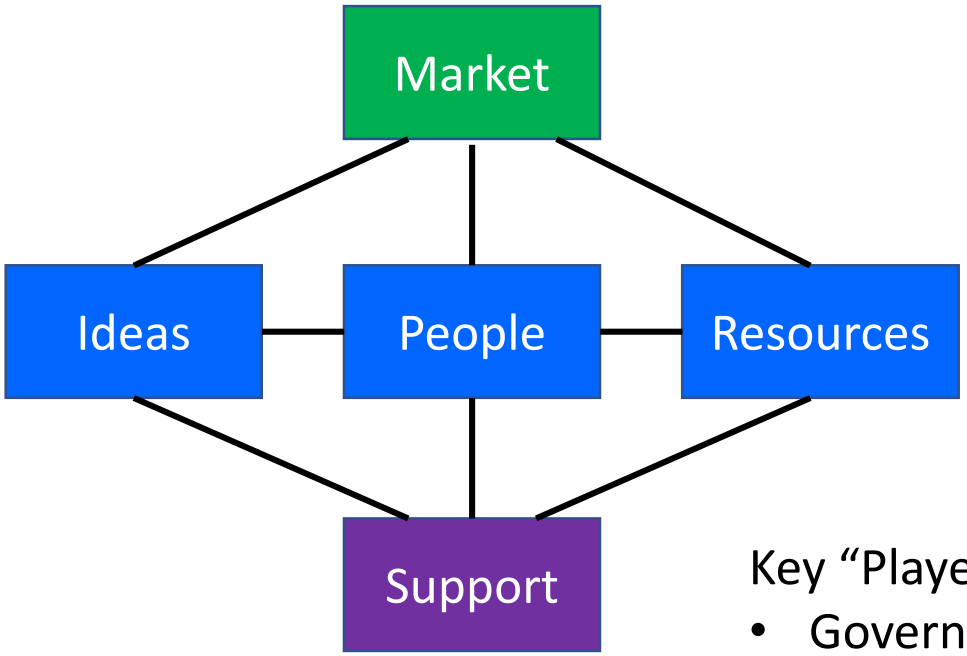
Many institutions (incubators, universities, governments) do not have the critical mass required to develop, sustain the required skills.

Everyone is in a global competition.

Key Elements of an Innovation Ecosystem



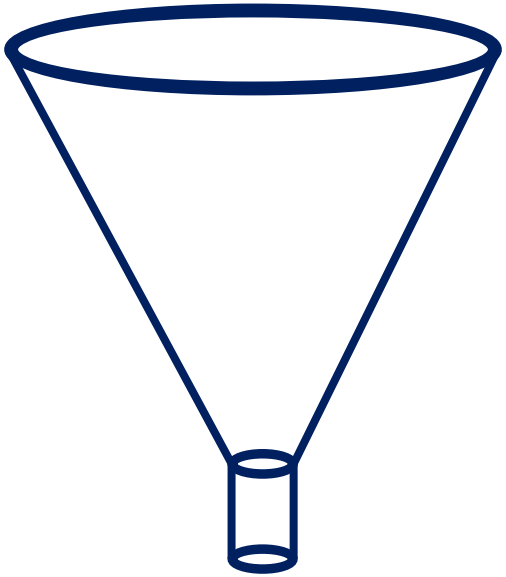
Key Elements of an Innovation Ecosystem

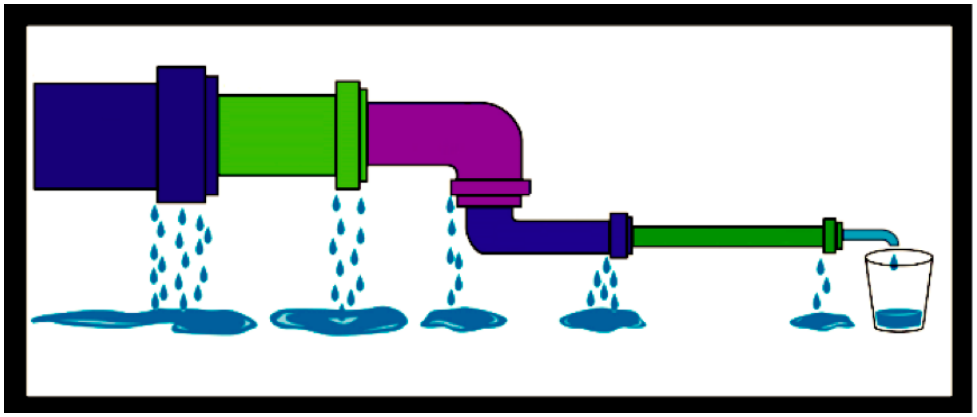


Key "Players" in the Ecosystem

- Government
- Universities/Research Labs
- Existing Large Companies
- Risk Capital
- Entrepreneurs

Process for Turning R&D into Value



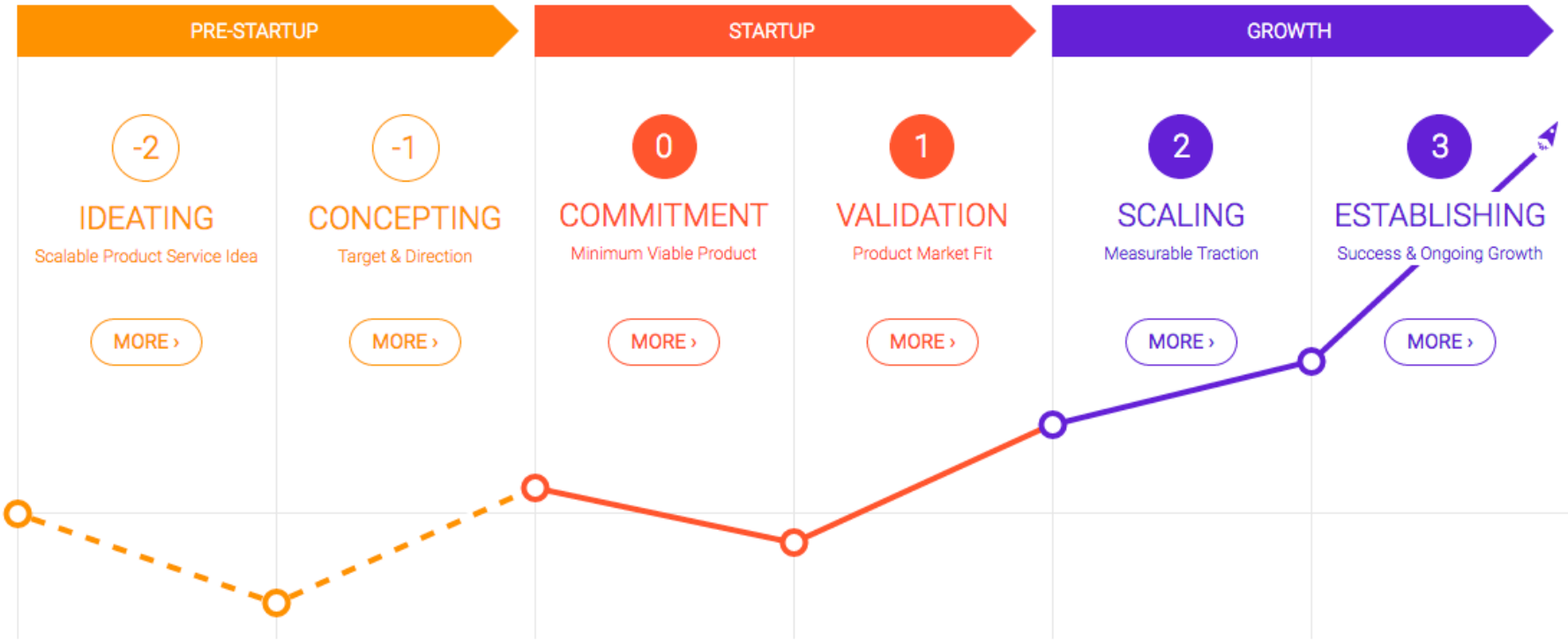


Two common descriptions:
- Funnel
- Leaky pipeline

Key concepts:

1. Filter/leaks – only a small % of ideas will succeed
2. Process/Steps/Progression
3. Time

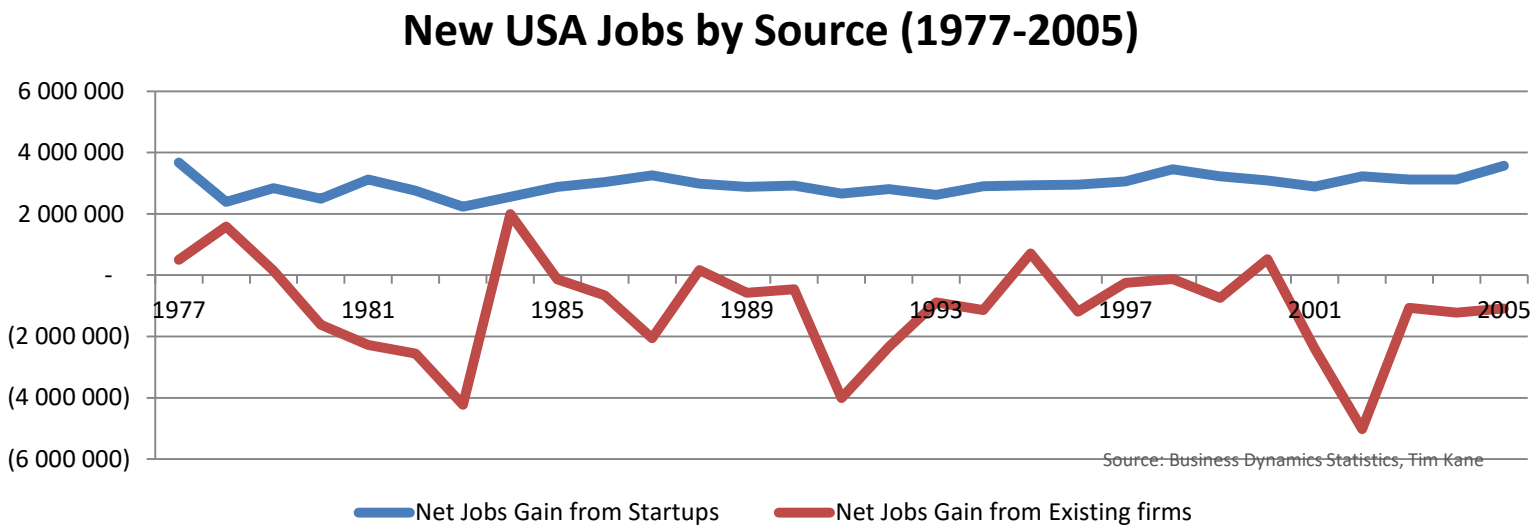
STARTUP ESTONIA



Motivation / Incentives

This is hard work – why bother?

Start-ups, Entrepreneurs Create Jobs



Net Jobs Gained by Source 1977-2005	
From Startups	+ 85,674,601
From Existing Firms	- 30,423,864

Key Issue – Motivating the Professor

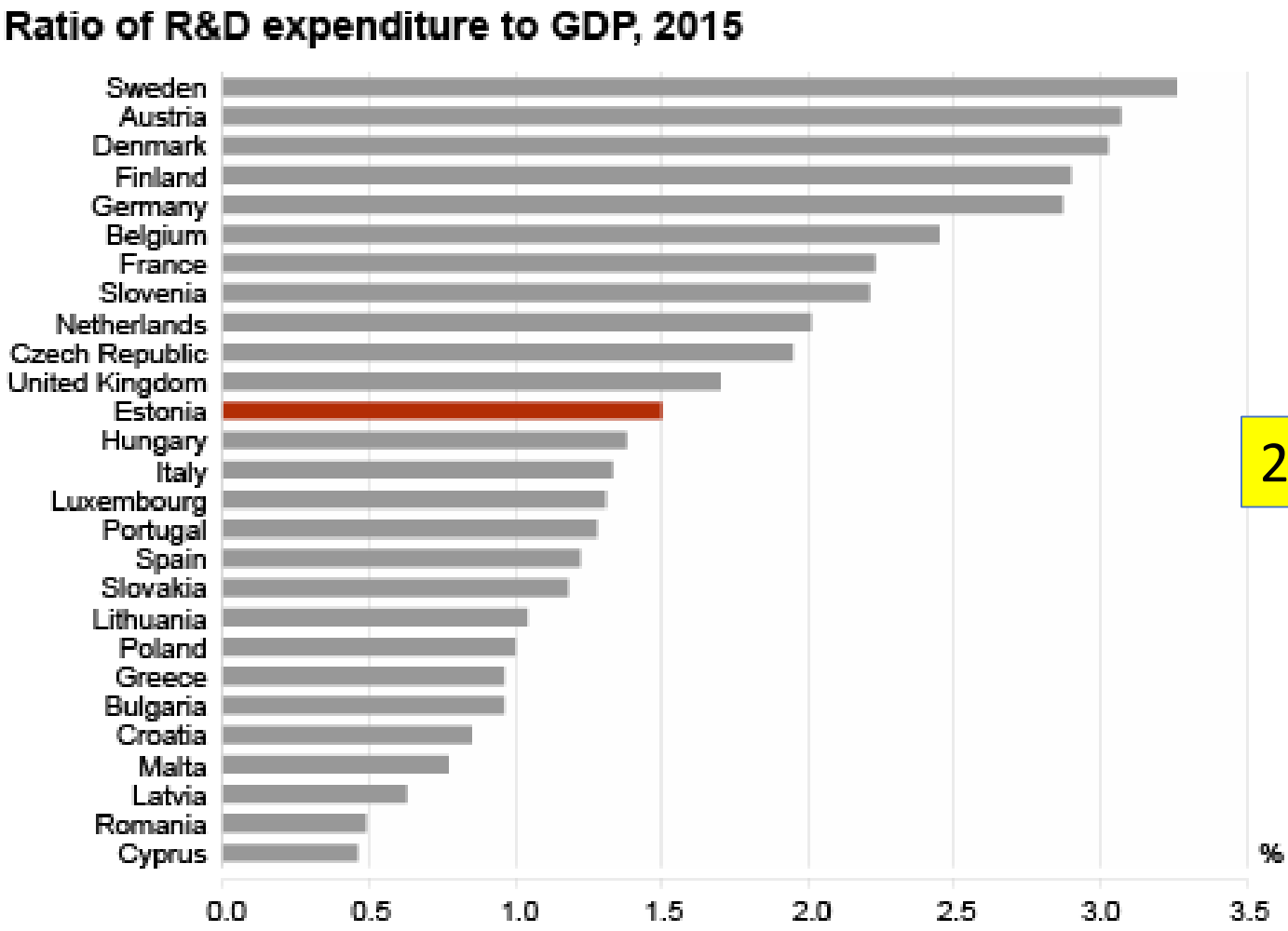
Financial

Reputation

Tenure/Security

Attracting students

Starts With R&D



2015 ~$500m

Source:
Statistics Estonia

ESTONIA – R&D Spending (GERD)

	2011	2012	2013	2014	2015
EU (28 countries)	1.97	2.01	2.03	2.04	2.03 (p)
Euro area (19 countries)	2.04	2.1	2.11	2.14	2.12 (p)
Belgium	2.16	2.36	2.44	2.46 (e)	2.45 (p)
Bulgaria	0.53	0.6	0.63	0.79	0.96 (p)
Czech Republic	1.56	1.78	1.9	1.97	1.95 (p)
Denmark	2.97	3	3.01	3.02	3.03 (e)
Germany	2.8	2.87	2.82	2.89	2.87 (ep)
Estonia	2.31	2.12	1.73	1.45	1.5 (p)
Ireland	1.54 (e)	1.56 (e)	1.56 (e)	1.51 (e)	..
Greece	0.67	0.7	0.81	0.84	0.96 (p)
Spain	1.33	1.29	1.27	1.24	1.22
France	2.19	2.23	2.24	2.24	2.23 (p)
Croatia	0.75	0.75	0.82	0.79	0.85
Italy	1.21	1.27	1.31	1.38 (e)	1.33 (p)
Cyprus	0.45	0.43	0.46	0.48	0.46 (p)
Latvia	0.7	0.67	0.61	0.69	0.63 (p)
Lithuania	0.9	0.89	0.95	1.03	1.04 (p)

Gross R&D Spending as % of GDP

Source: EU

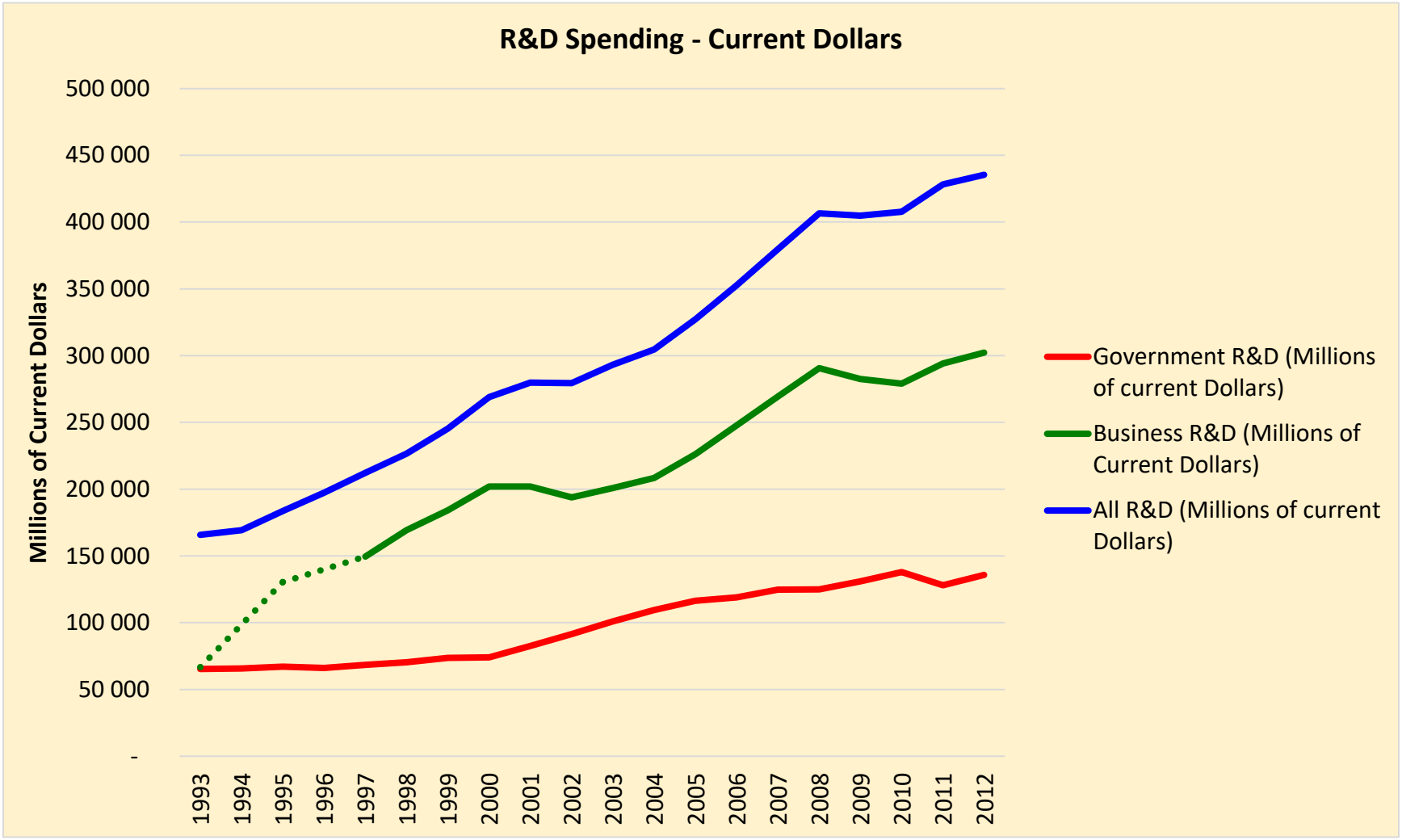
Research investment 'not a luxury, but a necessity,' Estonian leader tells other EU members

INSIGHTS 18/10/2017 08:50

#eu2017ee

Estonian Prime Minister Jüri Ratas at the European Research Excellence conference in Tallinn (photo: Science|Business)

US R&D Spending – last 20 years



SOURCES: National Science Foundation, National Center for Science and Engineering Statistics, Federal Funds for Research and Development (various years), National Patterns of R&D Resources (various years), Survey of Industrial Research and Development (various years) and Business R&D and Innovation Survey (various years);

How to Allocate Your R&D funding?

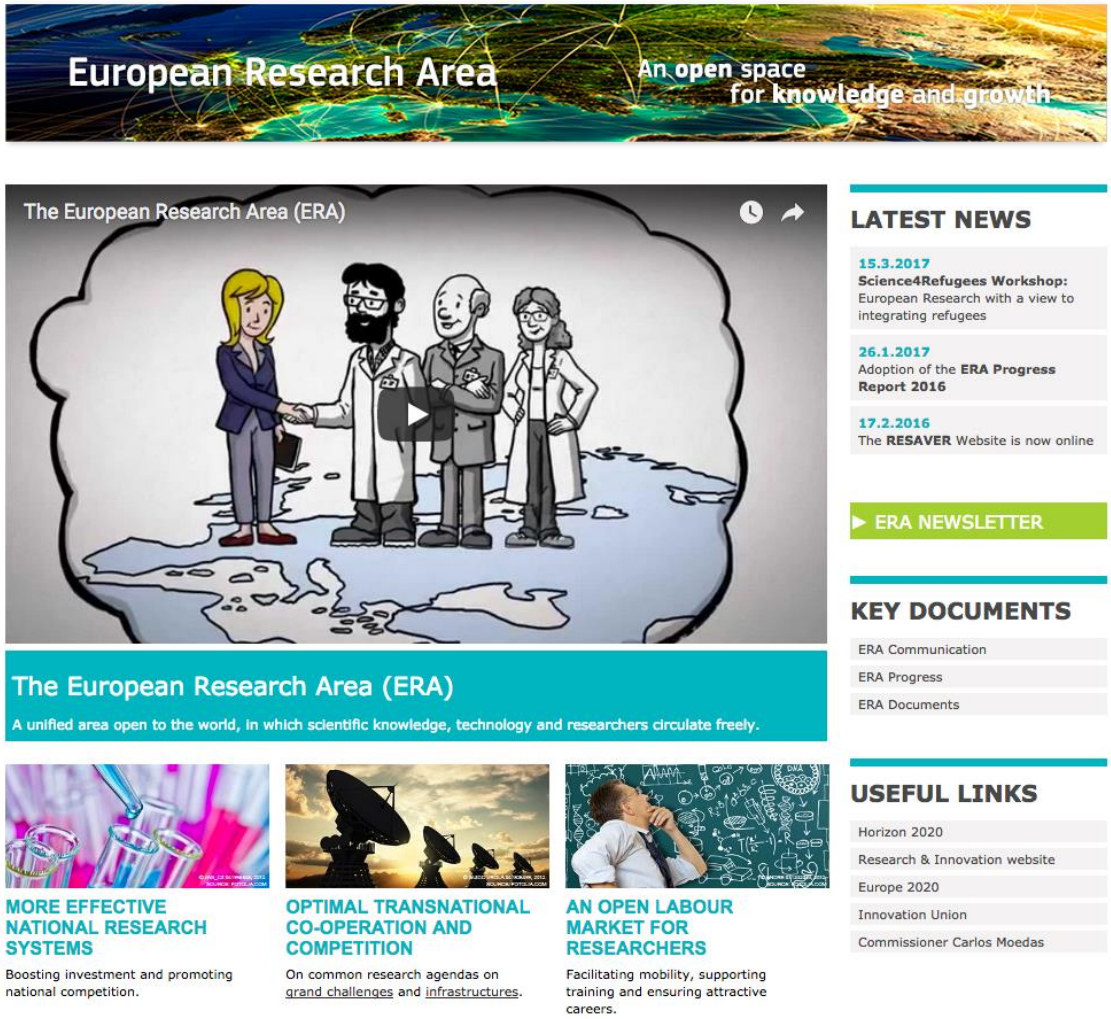
Spread thin – across many areas/ideas?

Focused on a few areas/ideas?

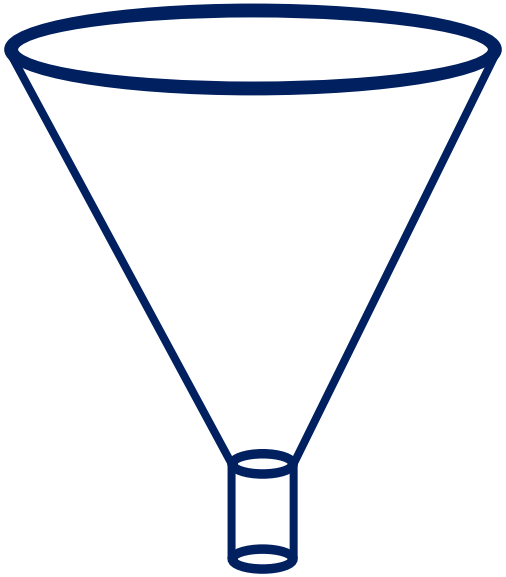
Open ERA

Both a positive and a negative Influence

Concern = "Brain Drain"

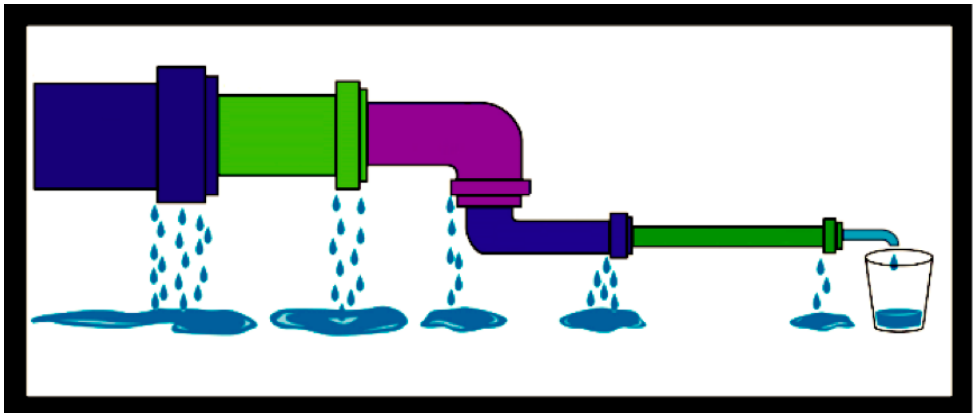


Process for Turning R&D into Value



So what are the filters/

what are the steps?



US VC Rule – Market Size

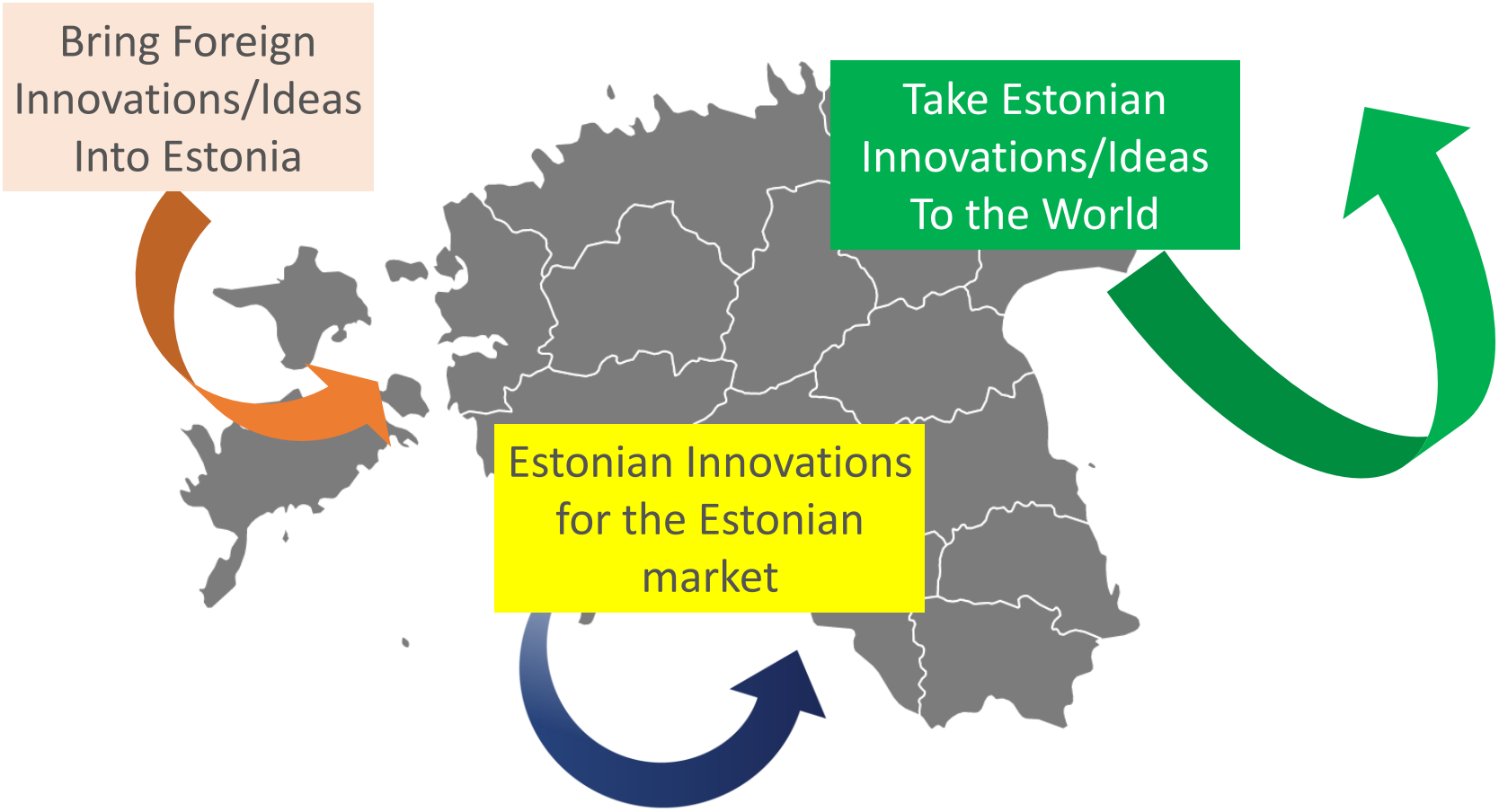
Russell Siegelman
Partner, Kleiner Perkins Caufield & Byers

The most important requirement is a large market opportunity in a fast-growing sector.

We like a company to have a $100 million to $300 million revenue stream within five years.

This means that the market potential has to be at least $500 million—or more, eventually—and that the company needs to achieve at least a 25 percent market share.

Innovation Markets/Models in Estonia



Requires Customer Knowledge

Who is(are) the customer(s)?
- *influencer/decision maker/buyer/user*

How will they buy?
- *retail/distributor/on-line/other?*

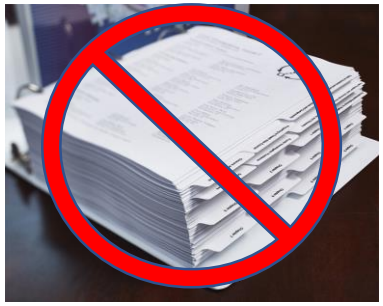
What are their decision criteria?
- *price/capacity/capabilities/features/ service/reliability/brand/etc…*

What are they using today?
- *What do they like?*
- *What do they not like? Why?*

Programs to increase customer/market <u>understanding:</u>

- Industry Associations
- University-Enterprise partnerships
- Student internships
- Overseas programs
- Coaches/mentors

Value Proposition



<60 seconds

- Easy to use format = NABC
  - **N**eed - what's the customer's need/problem?
  - **A**pproach - how are you solving it (your approach)
  - **B**enefits/Cost - what's the benefit to the user (vs. the cost)
  - **C**ompetition - why are you better than the competition

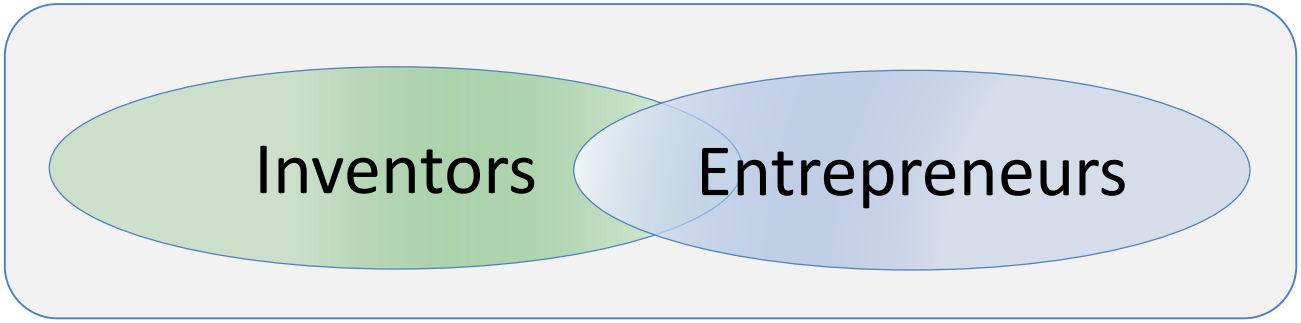
Competition

swissôtel Hotels & Resorts

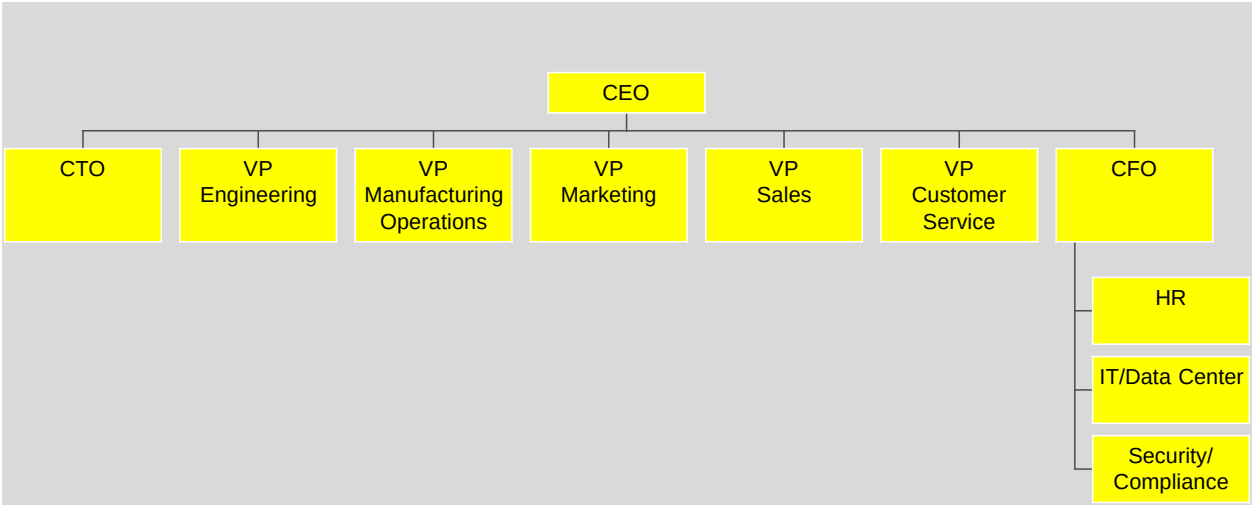
airbnb

- Competition is good. It proves the market exists.
- Everybody has competition
- **Why are you better? Why should I change?**
- Not just current – anticipate the future, reactions

Team



Starting Point



<u>Key Issues:</u>
Timing of hires
Experience, background
Compensation

Business Model & Business Plan

Venture Pitch Outline:

1. Hook/describe problem (need) faced by customer
2. Discuss the market
3. Describe your solution (approach) and bring it to life
4. Show benefits and customer validation
5. Identify competition and positioning
6. Explain business model - how you will make money
7. Introduce the team, people involved
8. Discuss current status, milestones, roadmap
9. Give financial projections and major risks
10. Ask for what you need

10 slides
20 minutes

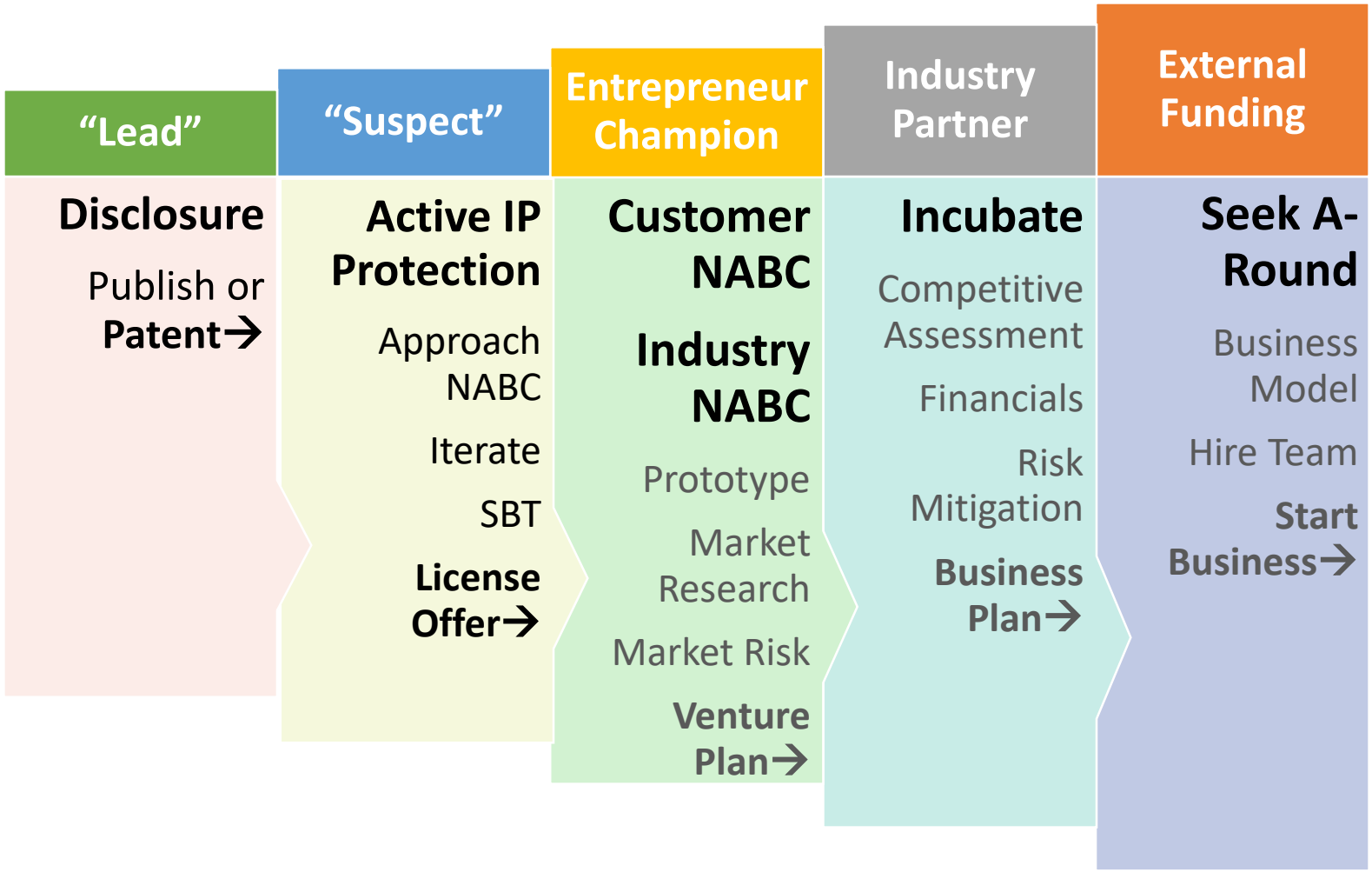
You need coaches/mentors who have done this

Financing

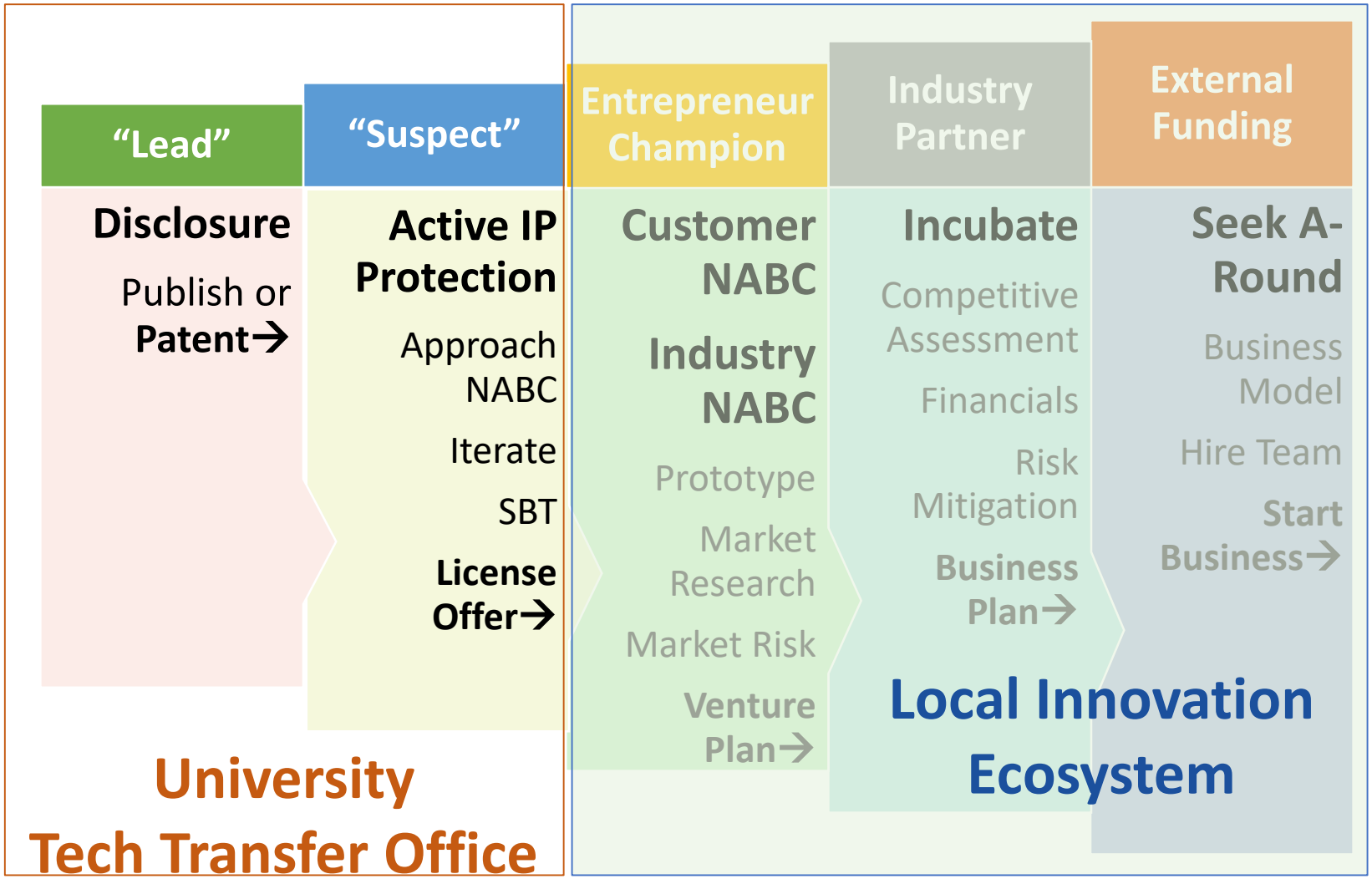
- Starting a company requires money/funding
- By definition – a risky, unproven venture
- Who is going to provide the funding?

- "Risk Capital"
  - Friends and family
  - Seed/angel investors
  - Family offices
  - Venture Capital
  - Government?

Process Requires Multiple Skills



How It Works at Stanford, MIT & Others

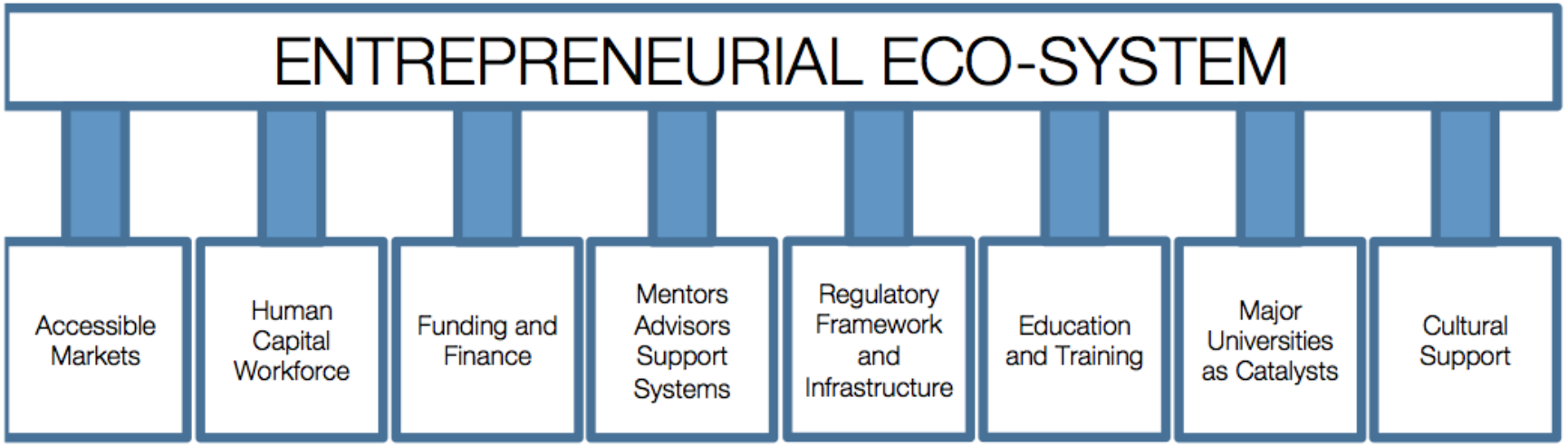


Critical Mass Requirements

- A Silicon Valley VC will receive over 300 business plans per year
- And invest in about 5 start-ups
- It takes practice and experience to know when/how to invest

How to achieve that critical mass in Estonia?

8 Pillars - Successful Entrepreneurial Ecosystems



Source: Entrepreneurial Ecosystems around the Globe and Company Growth Dynamics World Economic Forum

World Economic Forum – Entrepreneurial Ecosystems Around the Globe

Exhibit 2-1: Entrepreneurial Ecosystem Heat Map by Continent/Region: Pillars Readily Available in Your Region

Pillar	US - Silicon Valley	US - Other Cities	North America	Europe	Aus/NZ	Asia	MEA	South/Central America and Mexico
Accessible Markets	92%	83%	85%	72%	69%	68%	68%	62%
Human Capital Workforce	93%	87%	90%	81%	81%	73%	50%	71%
Funding and Finance	91%	76%	82%	57%	69%	44%	55%	45%
Mentors/Advisers/ Support Systems	91%	72%	78%	52%	58%	38%	36%	35%
Regulatory Frame-work/Infrastructure	67%	57%	62%	54%	54%	39%	55%	42%
Education and Train-ing	80%	62%	70%	60%	38%	34%	32%	27%
Major Universities as Catalysts	88%	67%	75%	52%	42%	30%	23%	27%
Cultural Support	90%	64%	75%	33%	35%	26%	45%	16%
Average Score	86%	71%	77%	58%	56%	44%	45%	41%

Universities

UNIVERSITY OF TARTU

TTÜ

TALLINN UNIVERSITY OF TECHNOLOGY

Estonian Business School

TALLINN UNIVERSITY

Three “products” from the universities:

- Research/Ideas/ Technology
- Entrepreneurial students
- Culture

Talent Pool

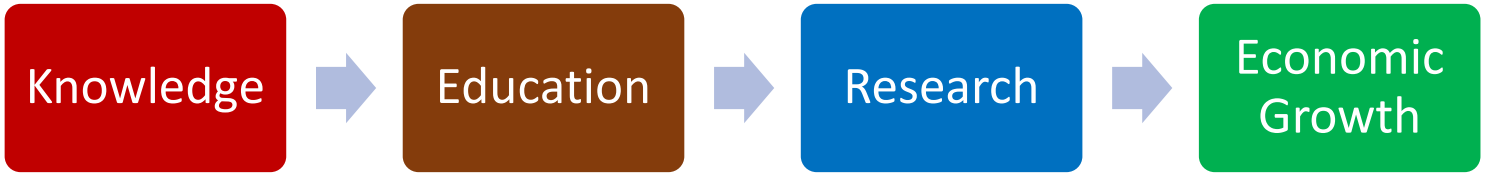
What do these companies all have in common?

Talent Pool

What do these companies all have in common?

Founded by STUDENTS

Evolving Role of the University



"Knowledge is replacing other resources as the main driver of economic growth…". *Harvard President - Drew Faust*

HARVARD UNIVERSITY

"Universities now play that fundamental research role that Bell Labs and Xerox Park and IBM research used to play in earlier times." *Stanford President - John Hennessy*

Stanford University

University Support of Entrepreneurship

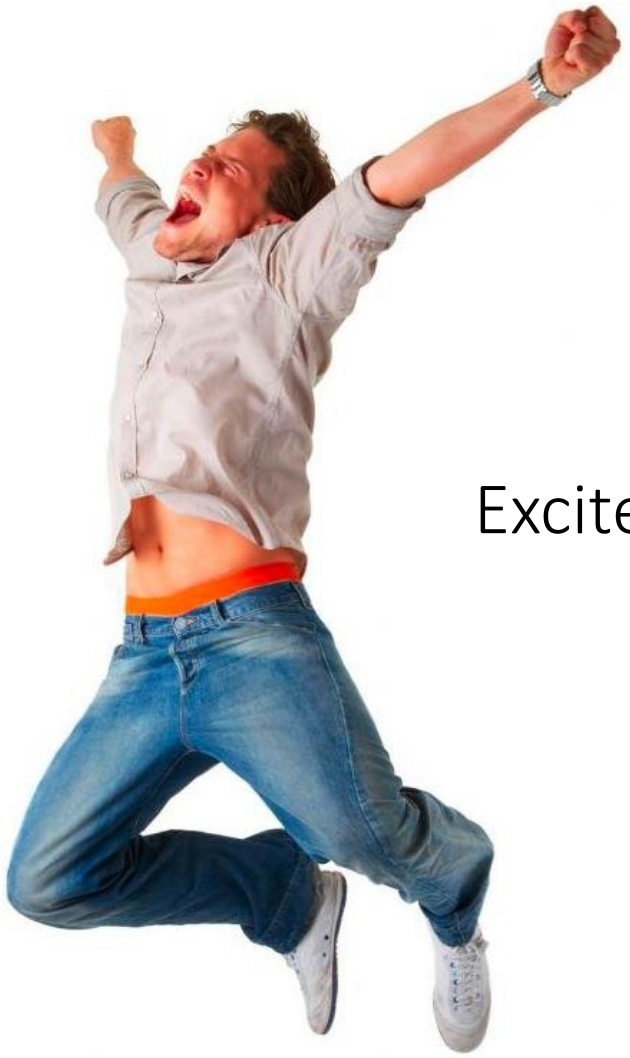
People

How do you feel about Innovation?

Anxious?

People

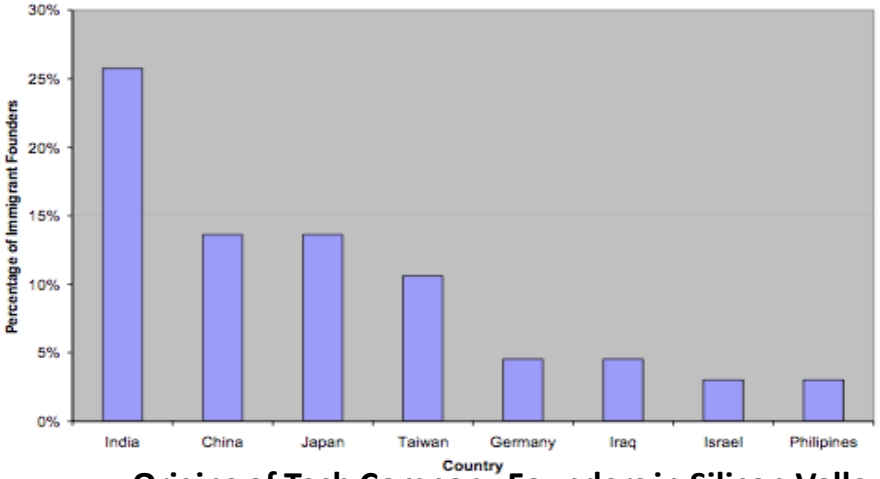
Anxious?



Excited!

Talent Pool – Competition for Talent

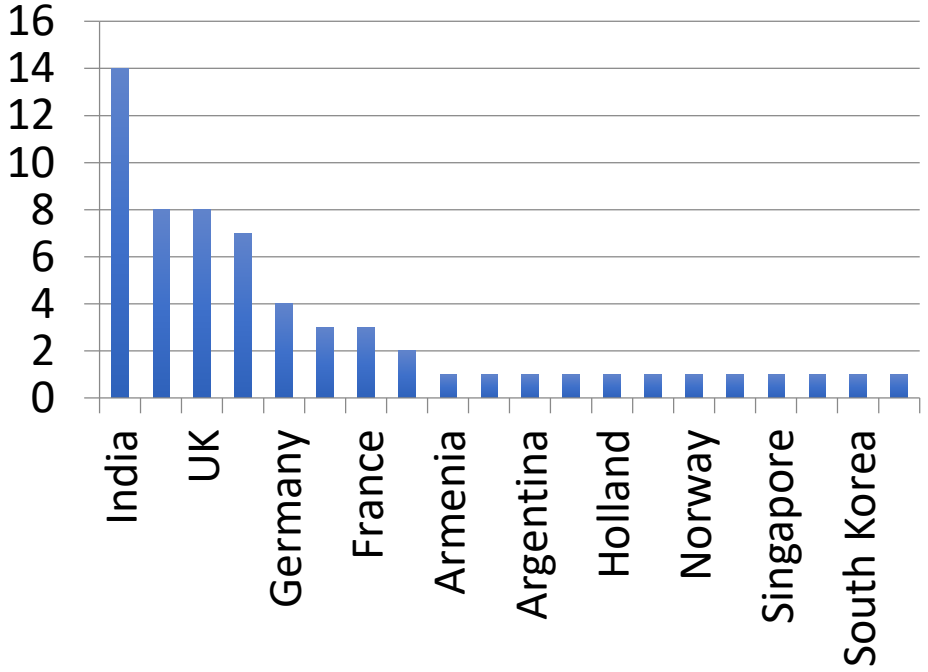
2007 - 52.4% of start-ups in Silicon Valley have immigrants as key founders



Origins of Tech Company Founders in Silicon Valley

Source: Duke & UC Berkeley Study - 2007

2016 - 51% of US Billion Dollar Startups have immigrants as key founders



70% of key management or product development positions are held by immigrants

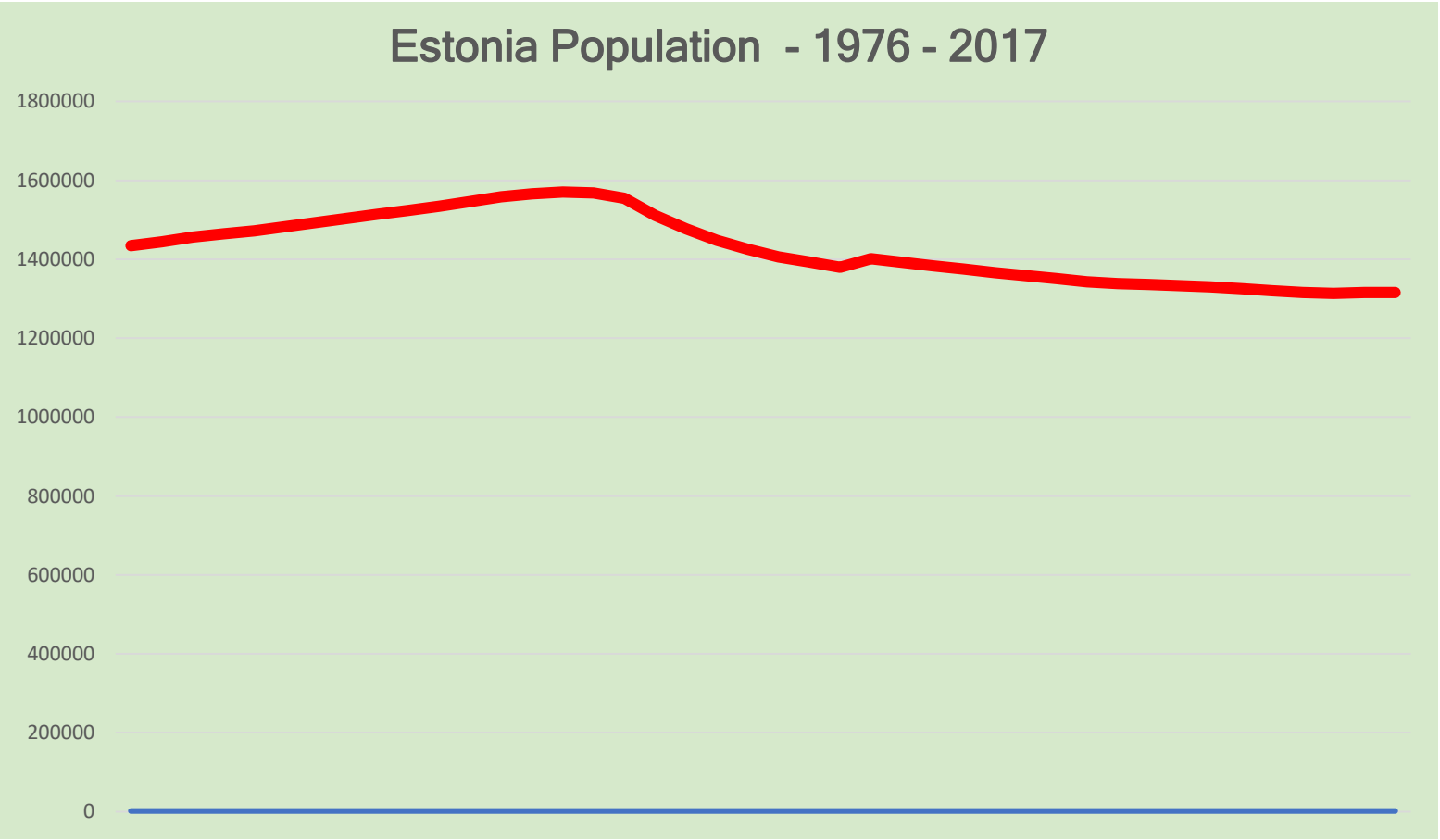
Source: National Foundation for American Policy, March 2016

START-UPCHILE

- Anyone, anywhere in the world can submit a business plan to the Chilean government
- If they like it, they send you 2 visas and invite you to move to Chile and start your company
- When you land, you get US$40,000 to get started
  - No equity to the Chilean government
- Expectation that 75+% will fail
  - And that they will stay in Chile and try again

Building the talent pool of Chilean-based entrepreneurs

Biggest challenge = scale



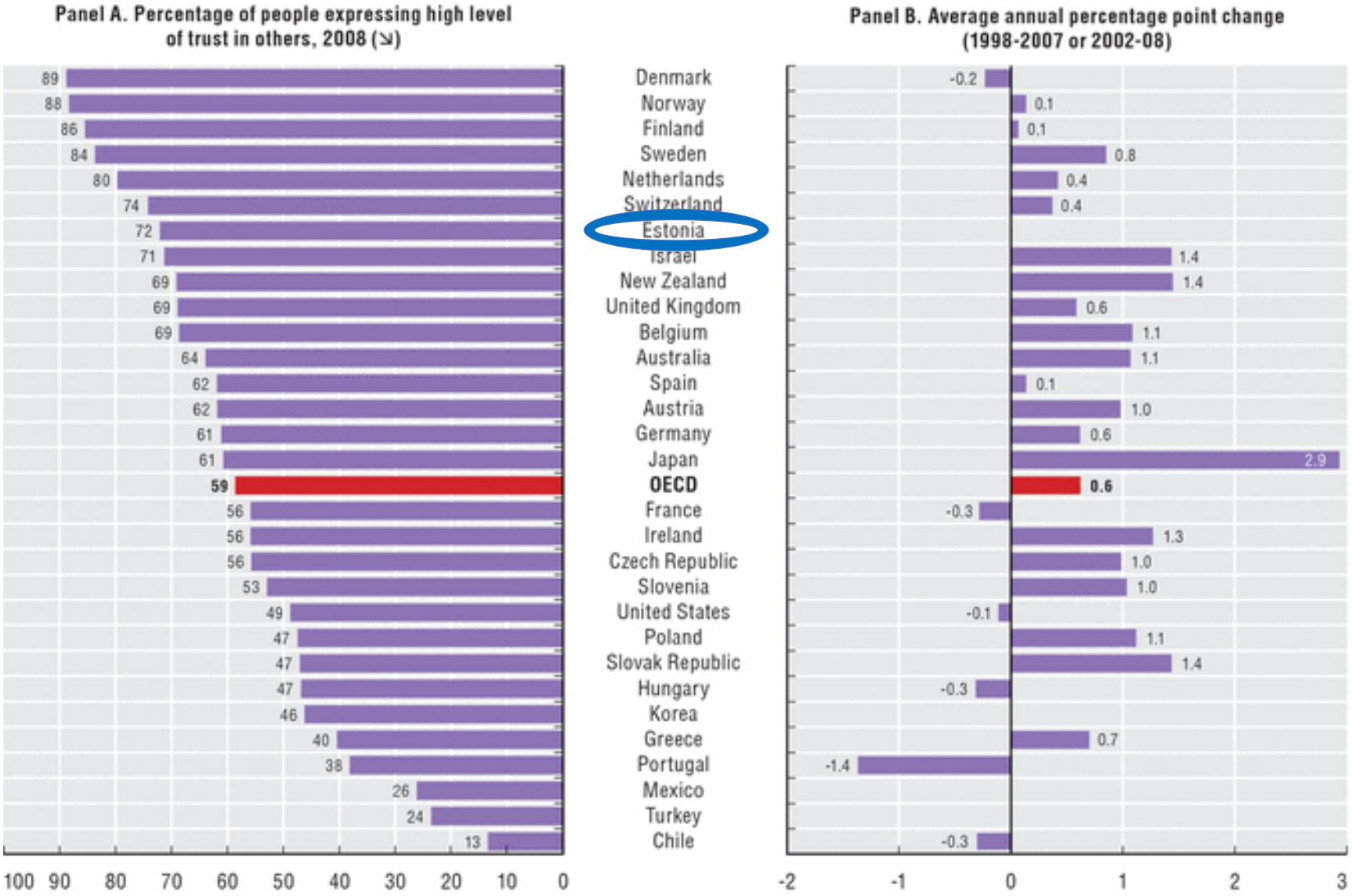
Alternative Models ?

	1976	2016
Estonia	1.4m	1.3m
Singapore	2.3m	5.6m
Israel	3.6m	8.5m

Tolerance of Failure

- "I have not failed, I've just found ten thousand ways that won't work." – Thomas Edison
- “It's fine to celebrate success but it is more important to heed the lessons of failure.” – Bill Gates
- “Failure is success if we learn from it.” – Malcolm Forbes
- "Success is going from failure to failure without loss of enthusiasm." – Winston Churchill
- “Failure happens all the time. It happens every day in practice. What makes you better is how you react to it.” – Mia Hamm

Social Trust Index



www.oecd.org/els/social/inequality

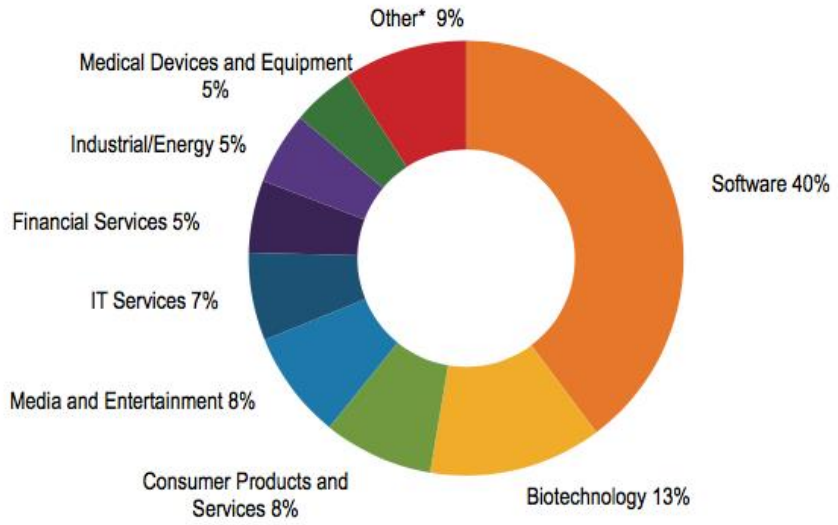
Risk Capital

Key Requirements:

- Deal Flow
- Constructive/supportive regulatory environment
- Opportunities to Exit/Liquidity

2015 VC Investments – by Sector

Figure 3.04
Venture Capital Investments in 2015 By Industry Sector
(% of Dollars Invested)



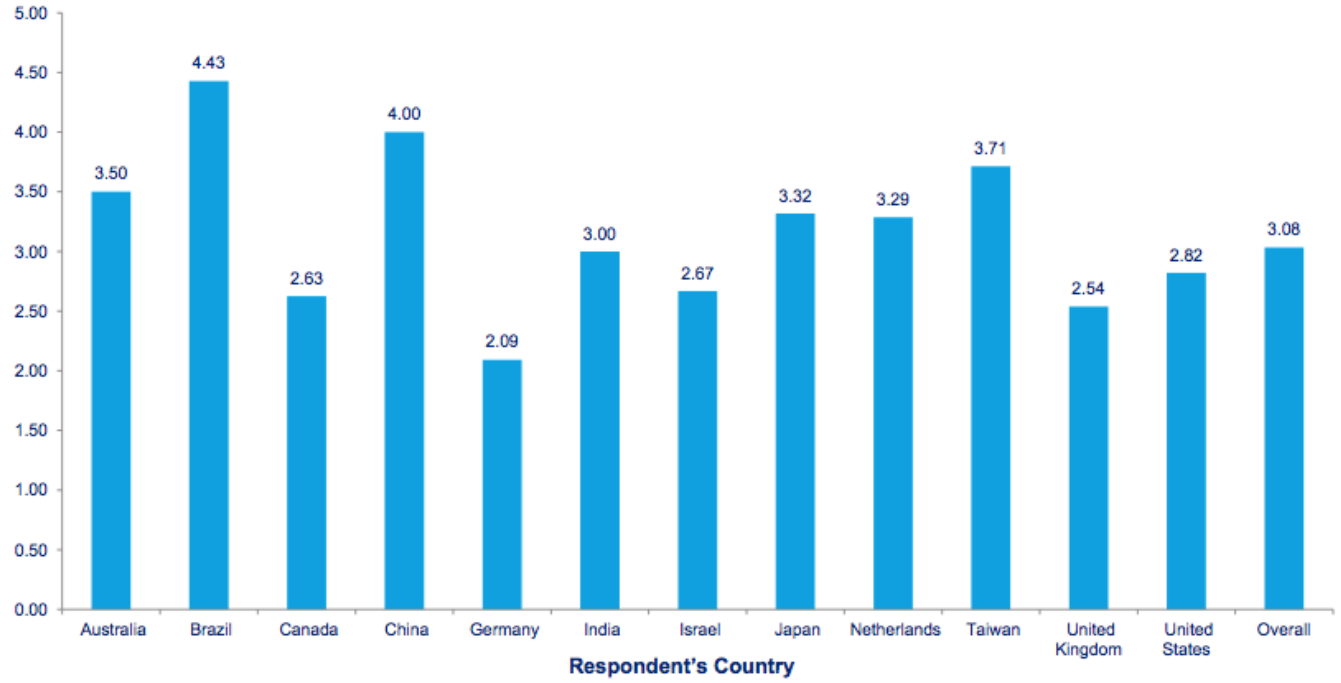
*Includes: Retailing/Distribution 2%, Healthcare Services 1%, Semiconductors 1%, Computers and Peripherals 1%, Telecommunications 1%, Business Products and Services 1%, Electronics/Instrumentation 1%, and Networking and Equipment 1%

Source: NVCA

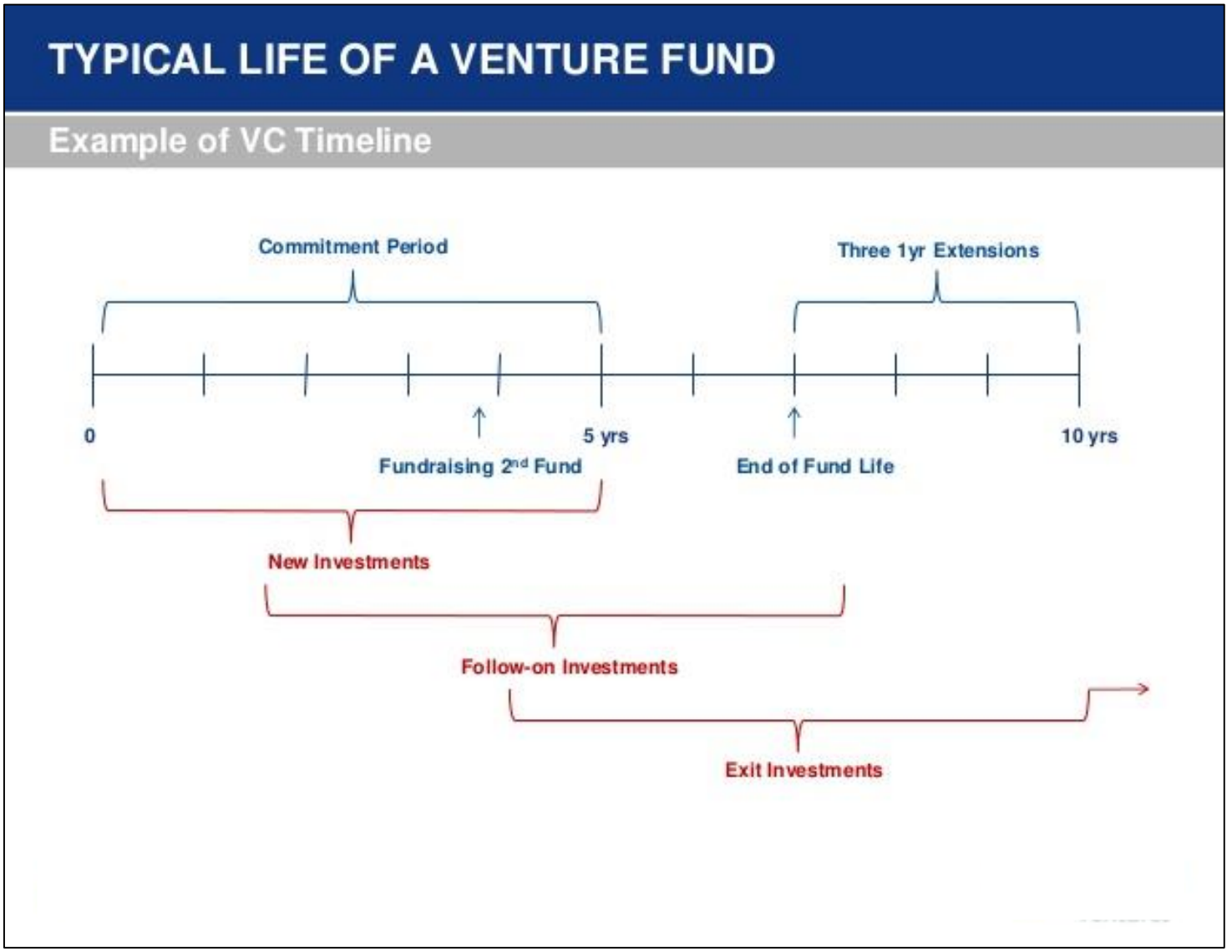
VC Interest – varies by geography

Industry Investing

Overall confidence in VC investing in the Biopharmaceuticals sector



Time horizon – VC fund



Government

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Processes to set-up, shut-down a company

Investing in Education

Investing in R&D

Supporting Entrepreneurship, Risk-taking

Supporting Risk Capital

Government

Time to Set Up a Company (Days)

Country	2003	2016
Argentina	66	25
Australia	3	3
Austria	25	21
Belarus	80	5
Belgium	56	4
Bolivia	59	45
Brazil	156	80
Bulgaria	39	23
Canada	4	2
Chile	42	6
China	48	29
Colombia	43	9
Costa Rica	90	23
Czech Republic	40	9
Denmark	7	3
Dominican Republic	79	15
Ecuador	92	49
Egypt, Arab Rep.	39	7
El Salvador	115	16
Estonia	72	4
Finland	31	14
France	41	4
Germany	45	11
Greece	38	13
Guatemala	39	20
Haiti	260	97
Honduras	61	13
Hong Kong SAR, China	11	2
Hungary	54	7
India	123	26
Ireland	18	5

Country	2003	2016
Israel	19	12
Italy	23	7
Jamaica	31	10
Japan	31	11
Malaysia	38	19
Mexico	32	8
Netherlands	9	4
New Zealand	12	1
Nicaragua	47	13
Norway	18	4
Panama	18	6
Paraguay	72	35
Peru	100	26
Poland	63	37
Puerto Rico	7	6
Russian Federation	43	10
Saudi Arabia	78	16
Singapore	8	3
South Africa	56	43
Spain	138	13
Sweden	16	7
Switzerland	20	10
Turkey	39	7
Ukraine	40	5
United Arab Emirates	19	8
United Kingdom	13	5
United States	6	6
Uruguay	45	7
Venezuela, RB	143	230
World	52	21

Summary / Closing thoughts

This is hard work.

It can/should be managed, there are processes.

And it requires a certain critical mass.

Estonia Knows the Challenges

Swedish National Incubator Initiative

ALMI FÖRETAGSPARTNER

- Data from 42 Incubators – over 7 years (2005-2011)
- Project/Idea Volume
  - 25k+ ideas submitted
  - 2419 projects accepted (9.5%)
- Average 27 months in Incubator
- 1031 companies still active in 2011 (42.6%)
  - Average # Employees = 3
  - Average Revenue = $294k/year
- Incomplete data on M&A, IPOs, other exits

Norwegian Perspective

"We have no raw materials,

and we have a 67% higher cost of people,

So the only way we will survive is through:

- Competence,
- People,
- And a way of working"

Sverre Narvesen - President

Knowledge ≠ Action

What are you going to do differently next week?

Thank you!

Aitäh!

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