

Capital Formation

Evolutionary

1. What

Capital

2. how

Property Law

3. why

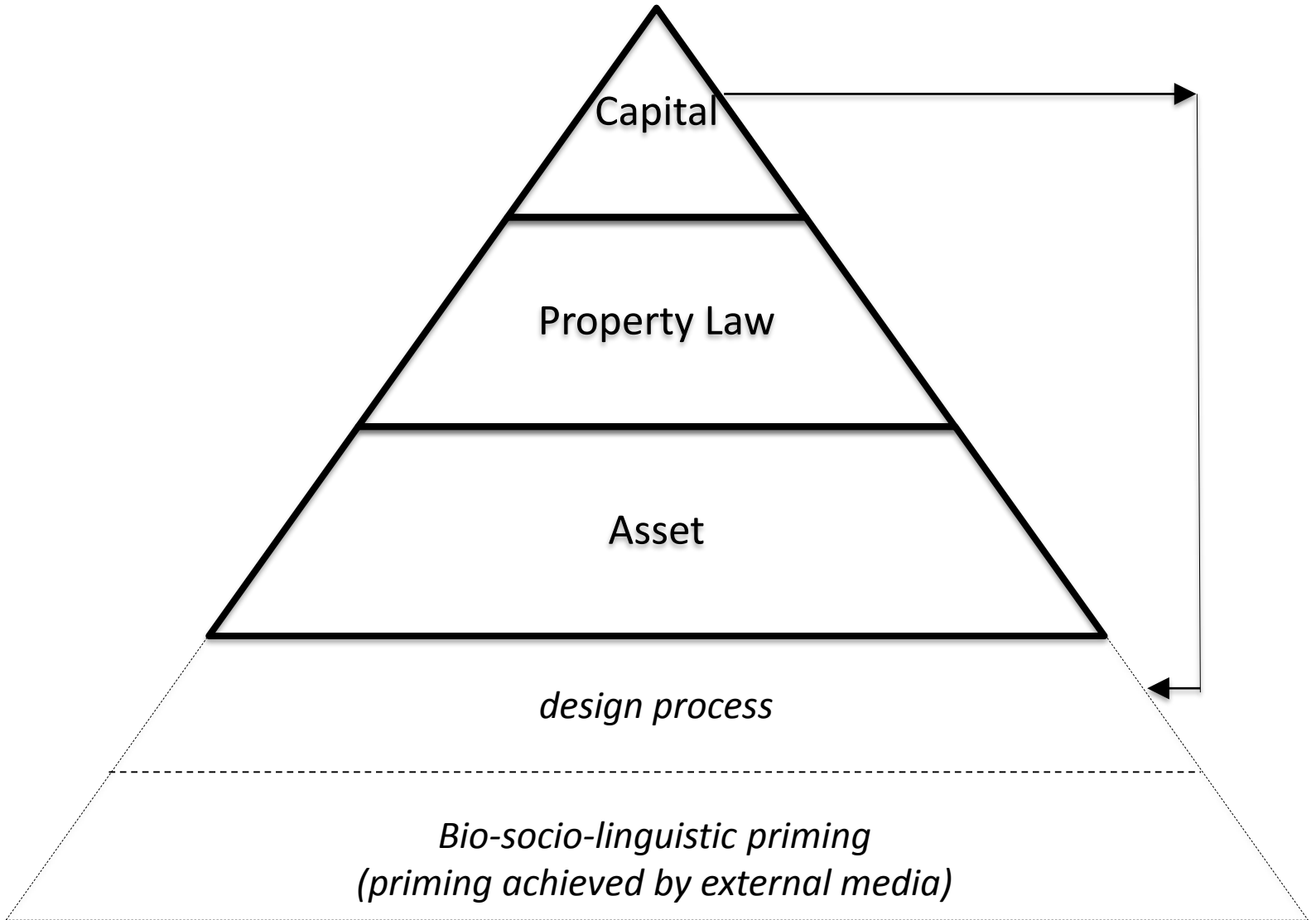
Asset

4. why

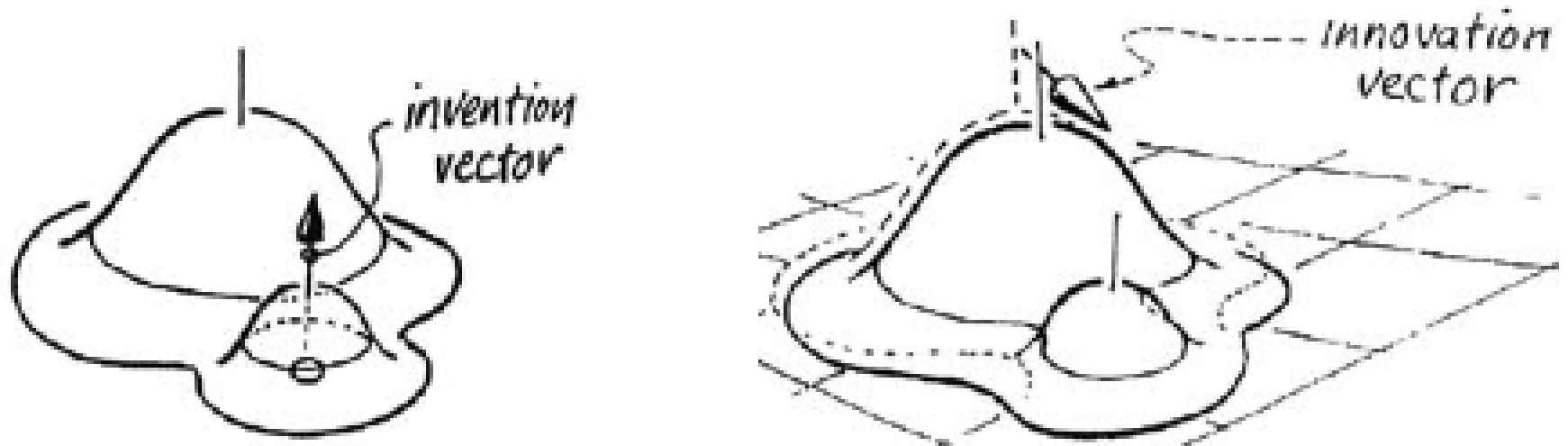
design process

5. why

*Bio-socio-linguistic priming
(priming achieved by external media)*



Innovation and Courage



The fundamental difference between invention and innovation is made clear in this model. Invention involves the conception and vertical growth of a new idea in the fringe of the idea distribution. Innovation is associated with the horizontal movement that occurs as these new ideas are incorporated into products, organizations, or systems on a broad scale. Both involve taking risks, and both are properly associated with creativity. At the same time they require different skills and abilities. Invention has more to do with personal courage, while innovation has more to do with organizational courage. (Rolf Faste)

Innovation Ecosystem

Ade Mabogunje

Poll

- Designers
- Engineers
- Scientists
- Artists
- Educators
- Investors
- Entrepreneurs
- Managers/Administrators
- Other professionals
- Eccentrics
- Visionaries

Caution – Work in Progress!

- Conversation about Design
 - A lot of Material to be covered
 - Seek coherence in understanding not rationality
- Design of Innovation Ecosystem
- Local focus
 - Stanford, Ideo, Xerox, Silicon Valley, US
 - Because design is context dependent
 - Silicon Valley
 - Semi-conductor Revolution (Hardware)
 - Internet Revolution (Software)
 - Knowledge Economy
- Silicon Valley is to the Information revolution what the first steam engine was to the industrial revolution

Sponsors (1987-2016)

1. NASA - Generation and Conservation of Design Knowledge
2. NSF - Digital libraries Initiative
3. George Kozmetsky Global Collaboratory at Stanford
(Co-founder Teledyne Inc., Dean UT Austin College of Bus. Admin.)
4. Fola and Hajira Adeola, Fate Foundation, Nigeria
(Co-Founder, GTB Bank)
5. Nimesh Kampani (JM Financial group of companies), Asit Koticha, Nemish Shah, R.K.Damani, and Ahmadabad University, India
6. Hasso Plattner Design Thinking Research Program, US/Germany
(Founder SAP)

Outline

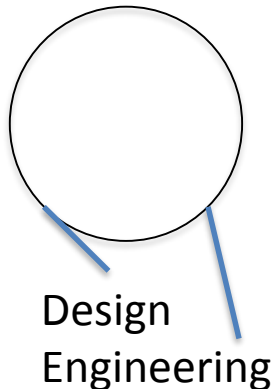
- **What is design?**
 - Design Thinking
 - Relationship between Engineering and Design
 - Why bother with design?
 - Can design be measured?
- **What is an innovation ecosystem?**
 - How does it work?
 - Can it be designed?
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Questions

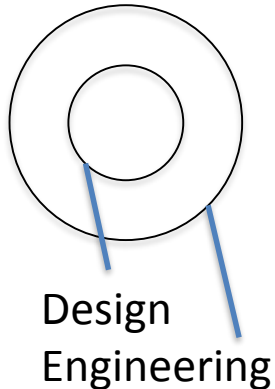
- What is design?
- What is its relationship to engineering?

What is the relationship between Design and Engineering? Please choose one.

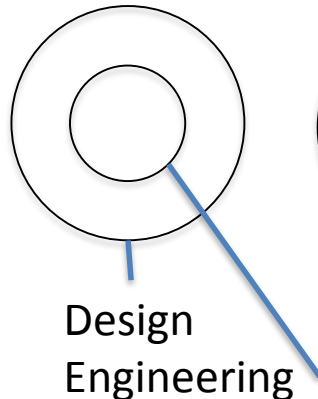
A



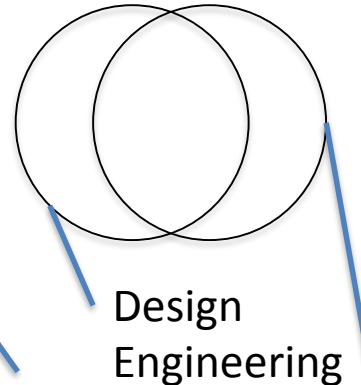
B



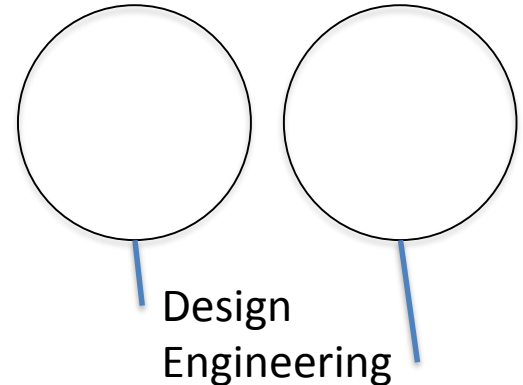
C



D



E



what is design?

Historically and traditionally, it has been the task of the science disciplines to teach about natural things: how they are and how they work. It has been the task of engineering schools to teach about artificial things: how to make artifacts that have desired properties and how to design.

Engineers are not the only professional designers. Everyone designs who devises courses of action aimed at changing existing situations into preferred ones. **The intellectual activity that produces material artifacts is no different fundamentally from the one that prescribes remedies for a sick patient or one that devises a new sales plan for a company or a social welfare policy for a state.** Design, so construed, is the core of all professional training; it is the principal mark that distinguishes the professions from the sciences.

- *Herbert. A Simon*
Nobel Prize, Economics

Design in Different Cultures

SPIDER WEB



ANT HILL

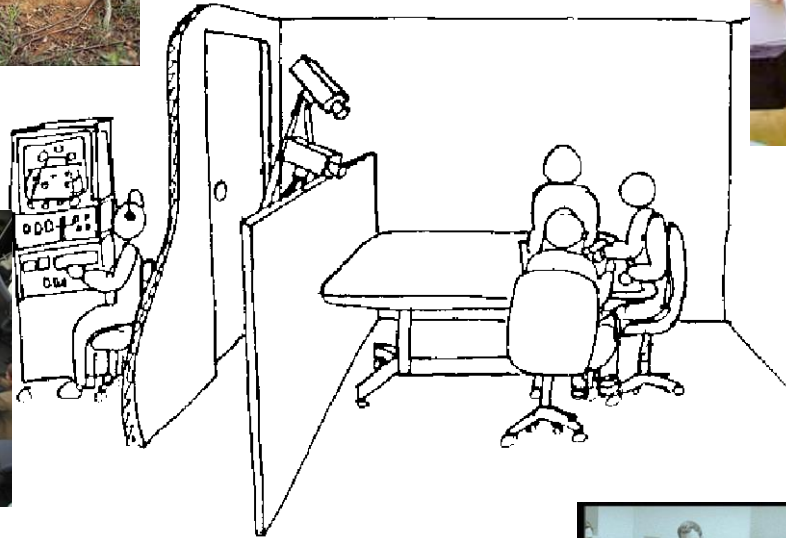


STANFORD



HPI

(Potsdam, Germany)

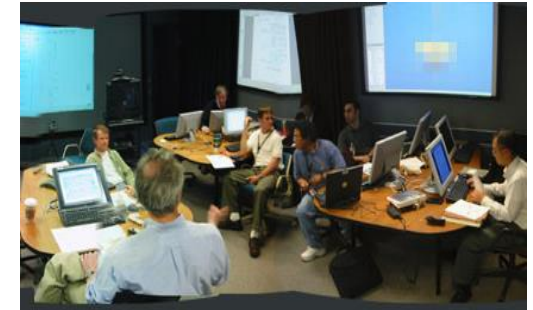


IDEO

(Palo Alto)

JALLIPATTI, INDIA

(Latchiyathin Kural)



NASA



SRI, 1968
Menlo Park

Outline

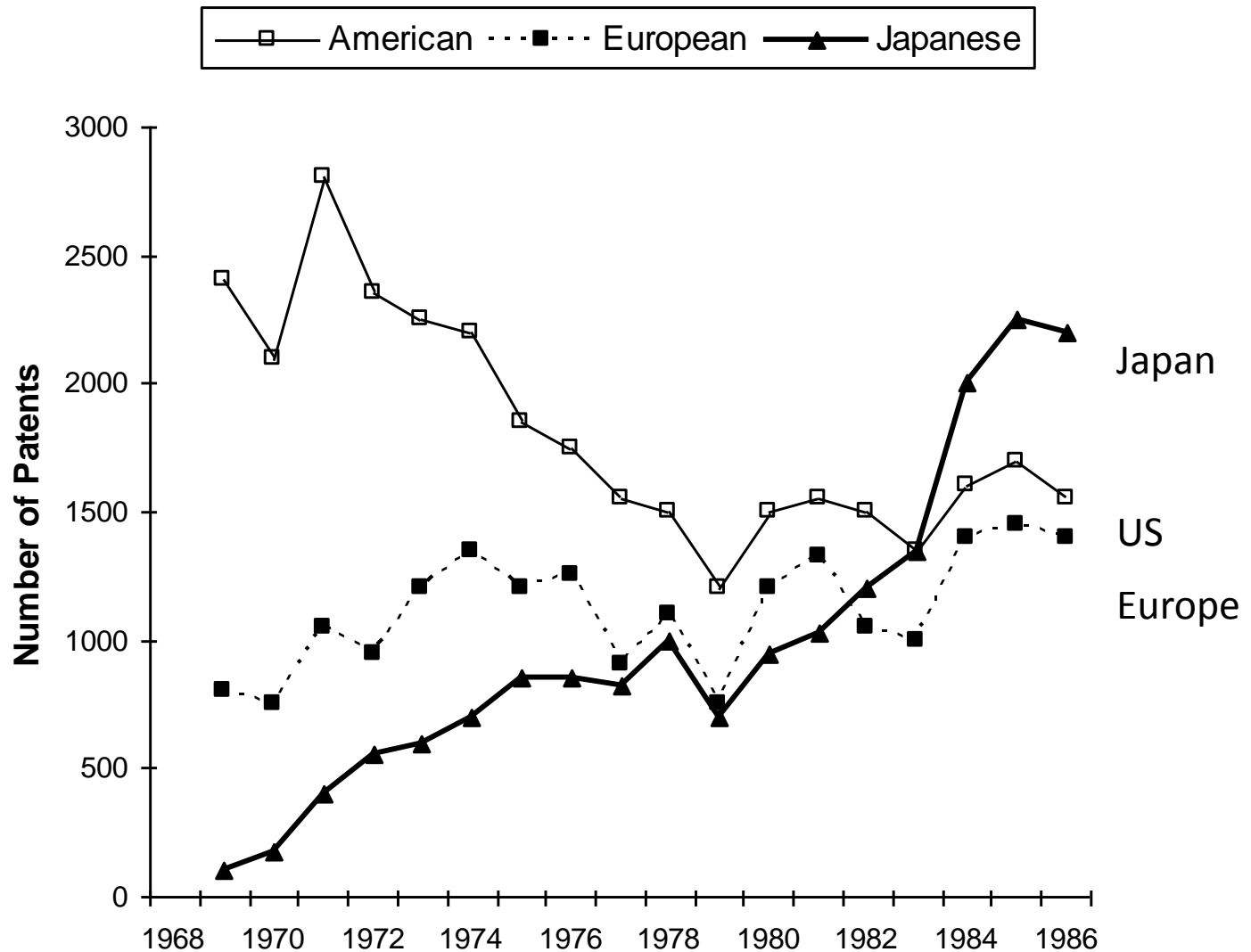
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Why?

Design → Innovation → Economic Growth

- Fostering innovation is key to economic growth (Solow, 1962)
- Understanding design is key to fostering innovation (Current understanding)

Rise of Japan in the Auto Industry



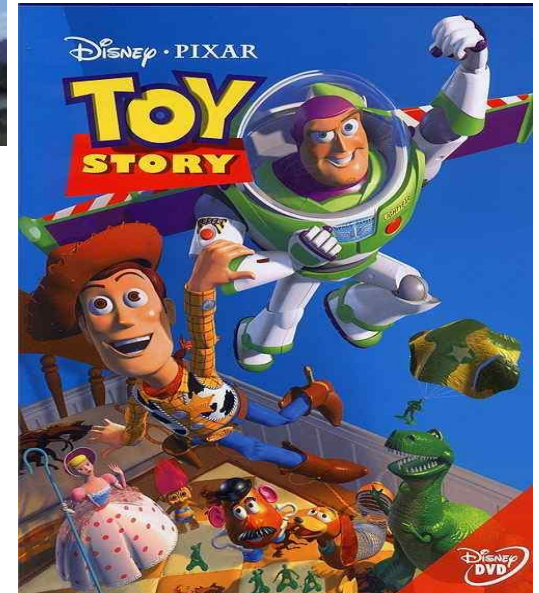
Ref: Womack, Jones, and Roos (1990)

Opportunities

Healthcare



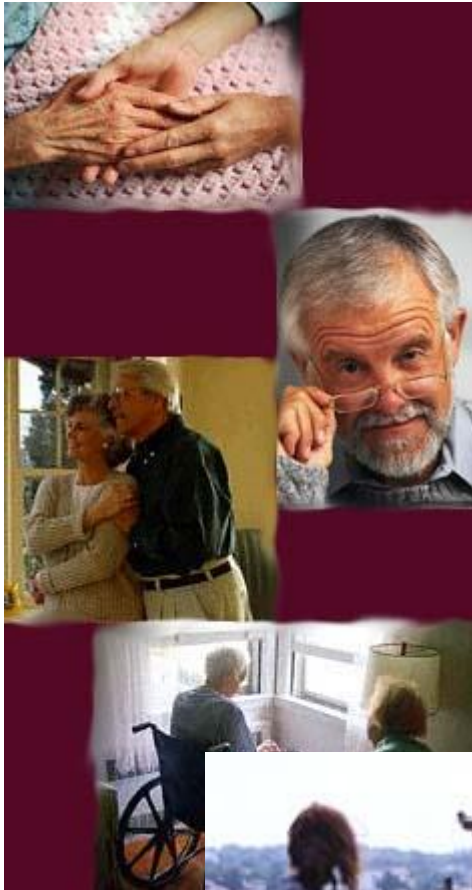
Defense (Security)



Media (Entertainment)

Challenges

Aging



Poverty



Disability



Artificial Disaster - War
(Orphans and Widows)

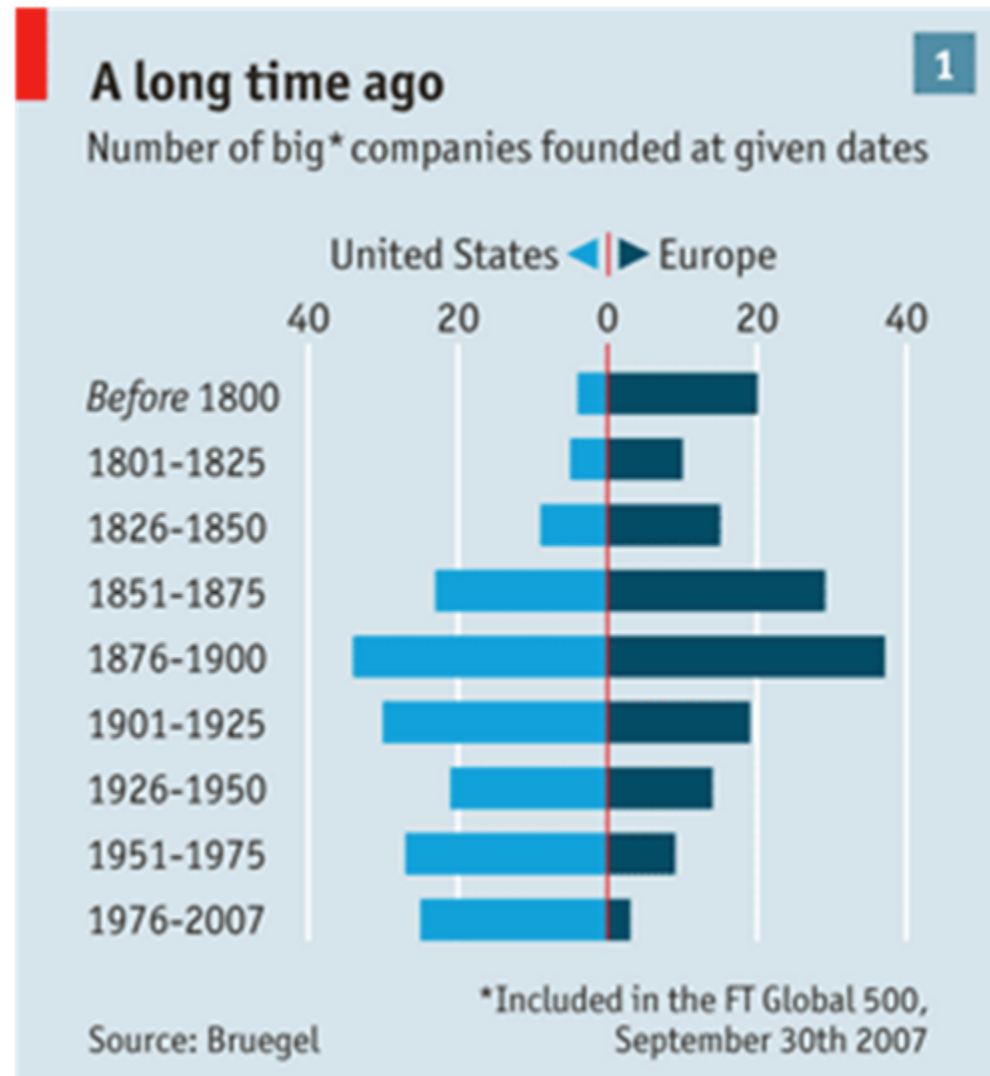


Natural Disaster

Question: Why has Europe only produced 12 FT 500 companies in the last 50 years while the US has produced 52?

Europe gave birth to just 12 new big companies between 1950 and 2007.

America produced 52 in the same period. Europe has only three big new listed firms founded between 1975 and 2007. Of those, two were started in Britain or Ireland, which are closer to America in their attitude to enterprise than continental Europe. Europe's big privately held firms, too, mostly date from before 1950, often a very long time before.



10 December 2014 Last updated at 00:07

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Top!

France plans elite top-10 mega-university: Paris-Saclay



President Hollande at a Paris science centre:
The French government wants to compete
with Silicon Valley



The university, south of Paris, is planned
as a hi-tech "knowledge hub" to drive the
French economy

"Yes, I found a flaw ... That is precisely the reason I was shocked because I'd been going for 40 years or more with very considerable evidence that it [my model of how the world works] was working exceptionally well."



Towards a Model of Intentional Disruption and Transformation

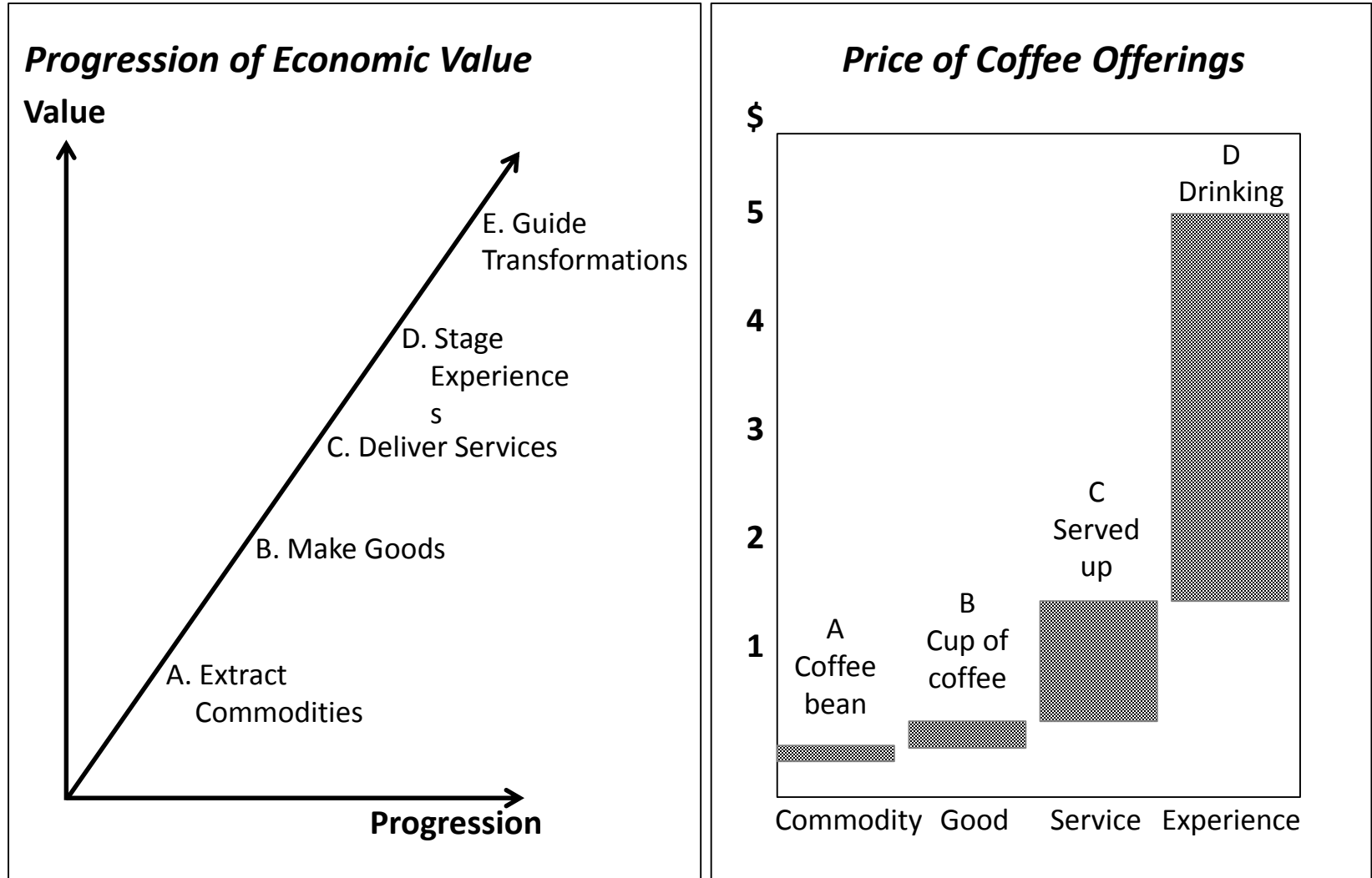


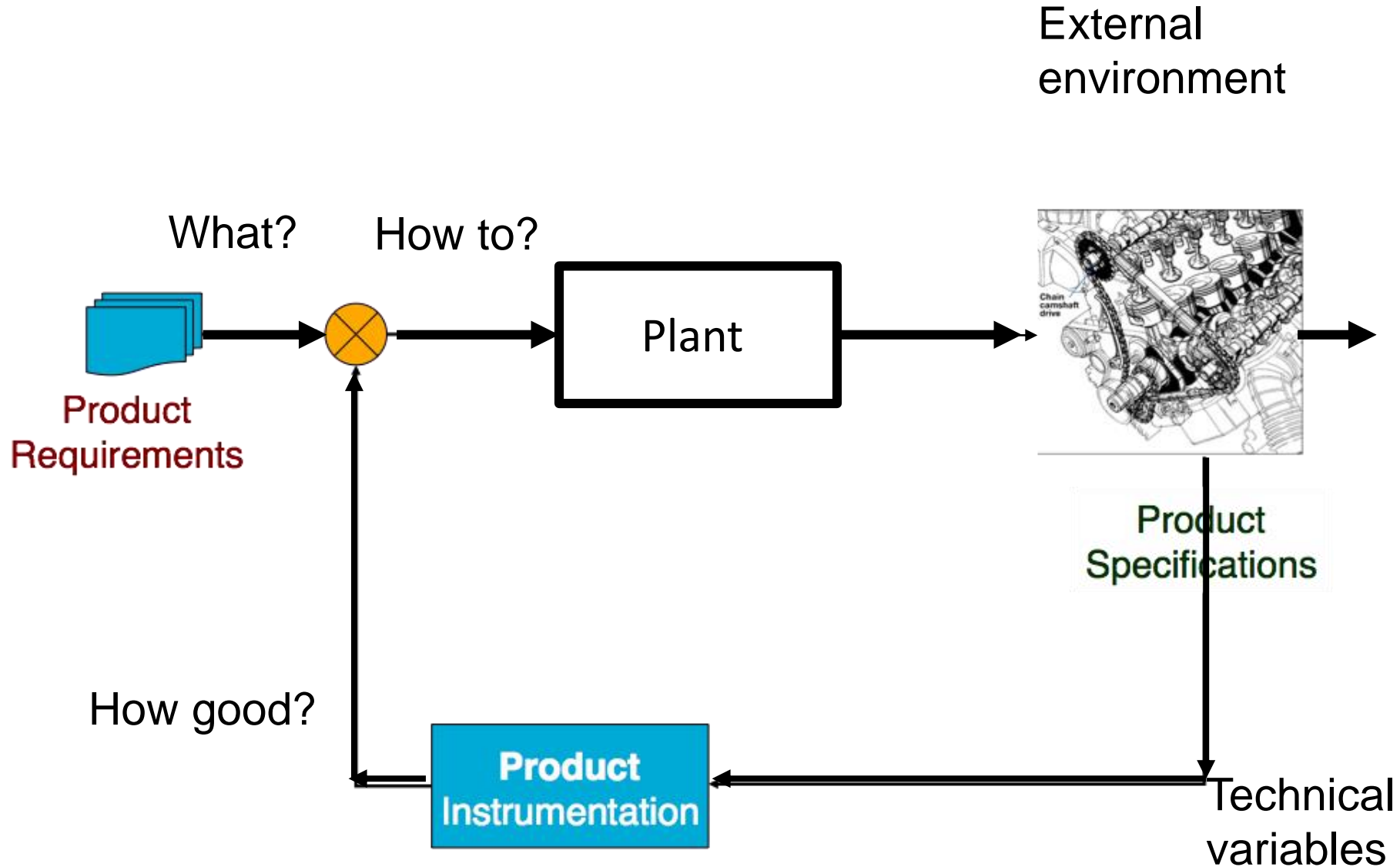
Diagram in Robertson (2001) from Pine & Gilmore's book *The Experience Economy* (1999).

Outline

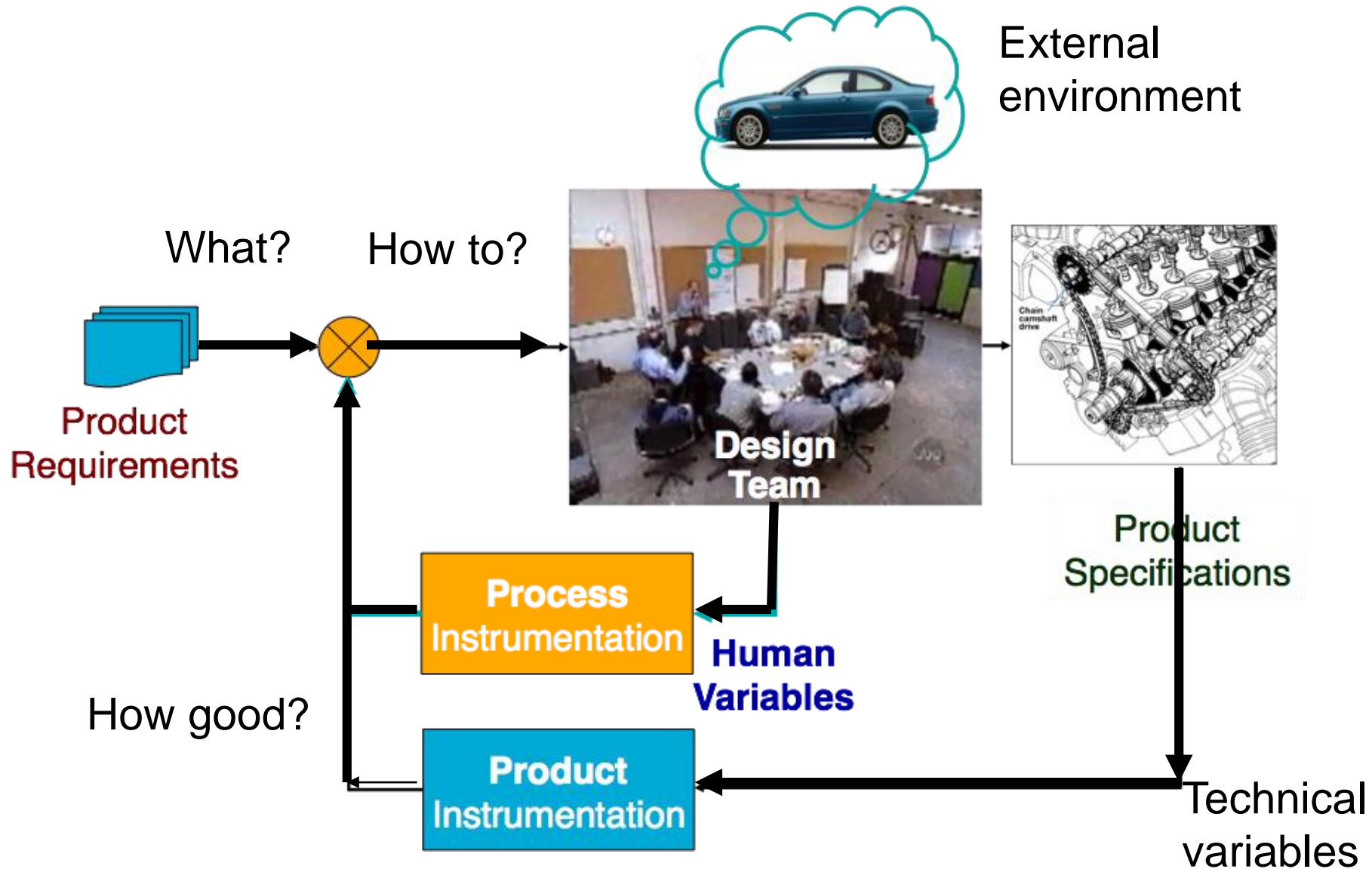
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Measurement Examples

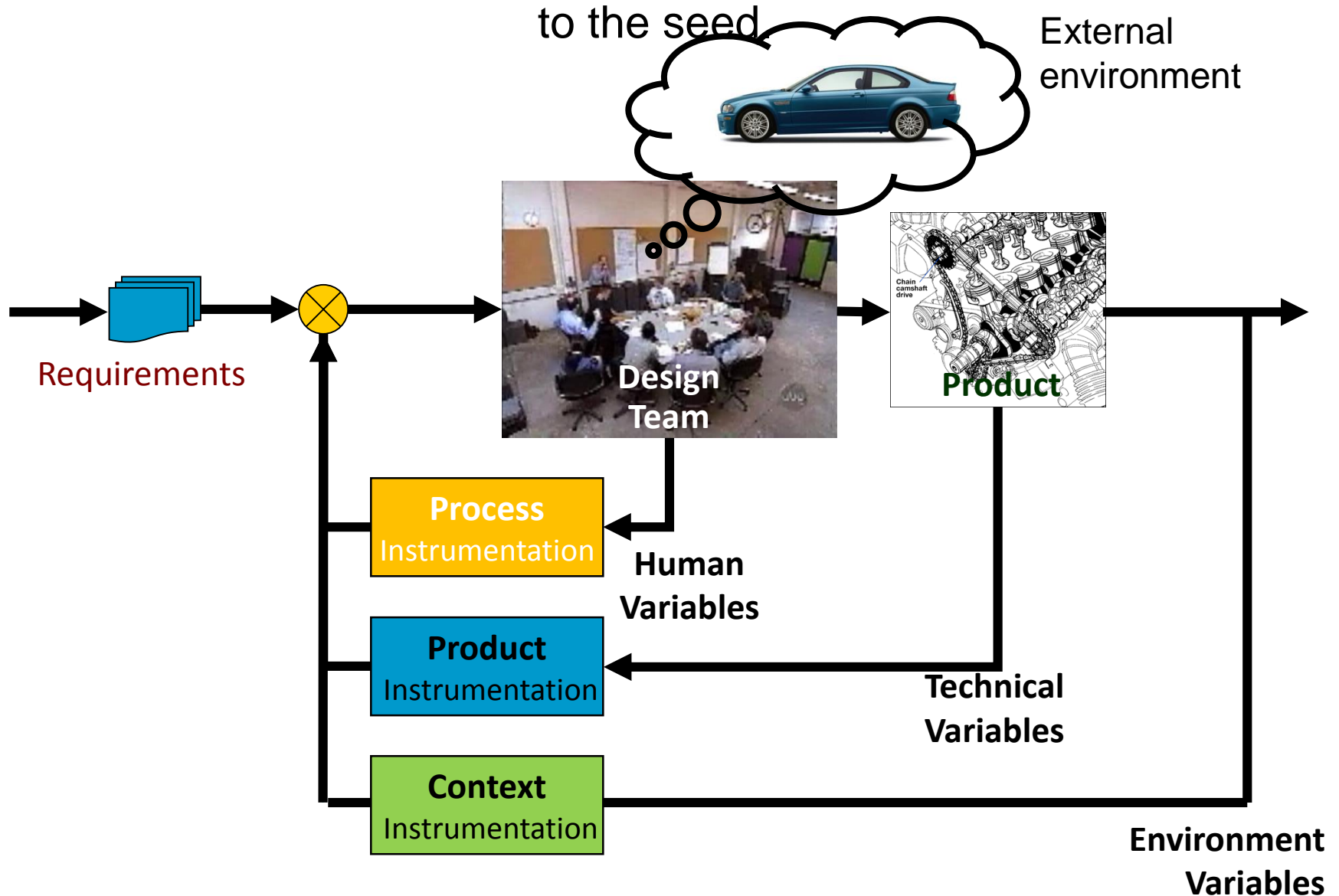
Engineers investigate a system's physical structure and the services it delivers to some external environment.



Our working hypothesis is that we can improve design process performance through a similar feedback process.



Design teams do not operate in a vacuum, they are like the seed in a soil and surrounding atmosphere, nurtured naturally or by a gardener/coach. Environmental variables capture the activities external to the seed



This is not a study of the product.

This is not a study of the consumer.

This is a study of the producer.

We are studying ourselves.

We are using our methods to improve ourselves.

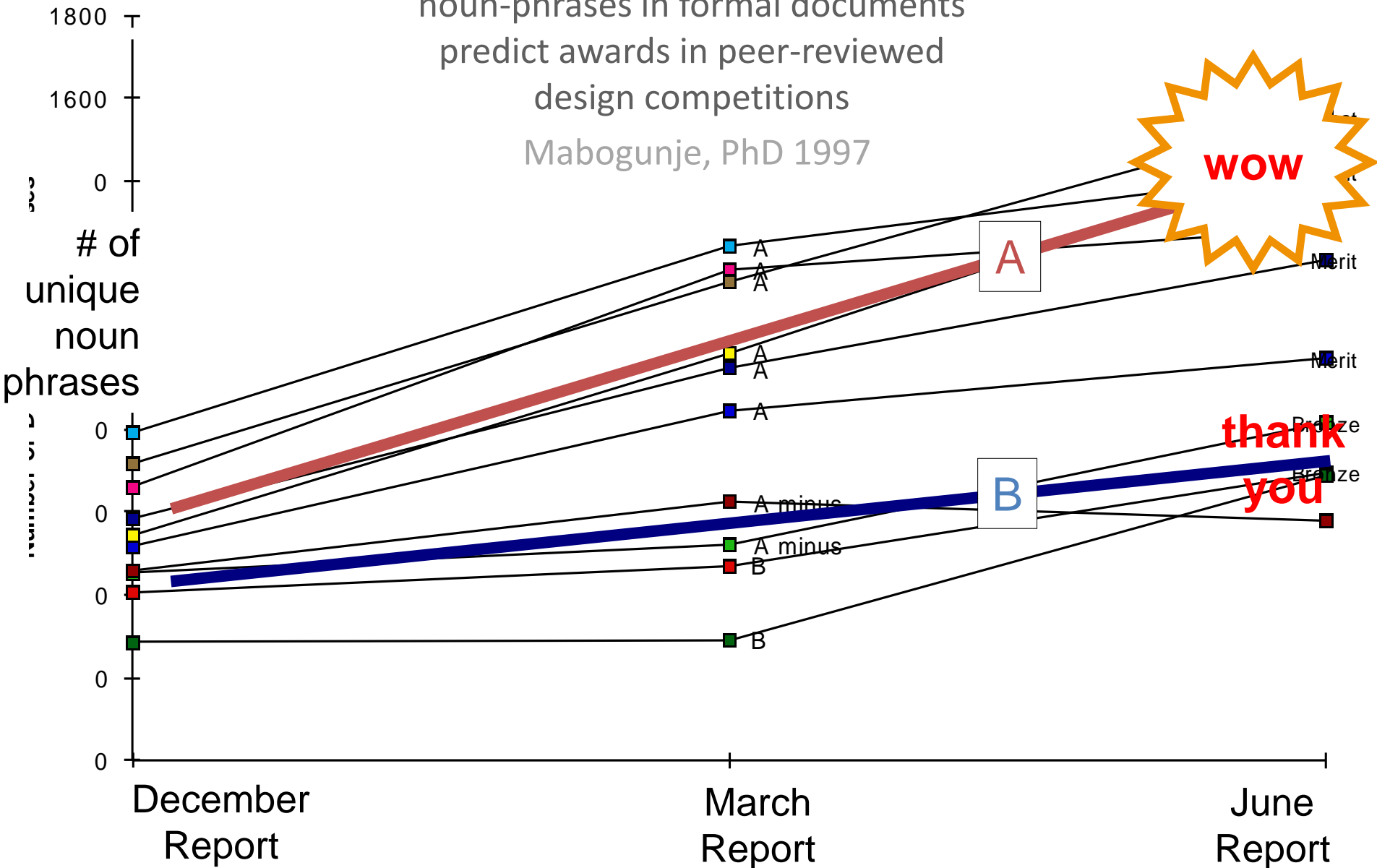
the importance of gestures

Tang PhD 1989

Function	Text Activity	Draw Activity	Gesture Activity	
Store Knowledge	40	19	1	27%
Express Ideas	2	63	33	43%
Mediate Interaction	0	21	46	30%
	19%	46%	35%	

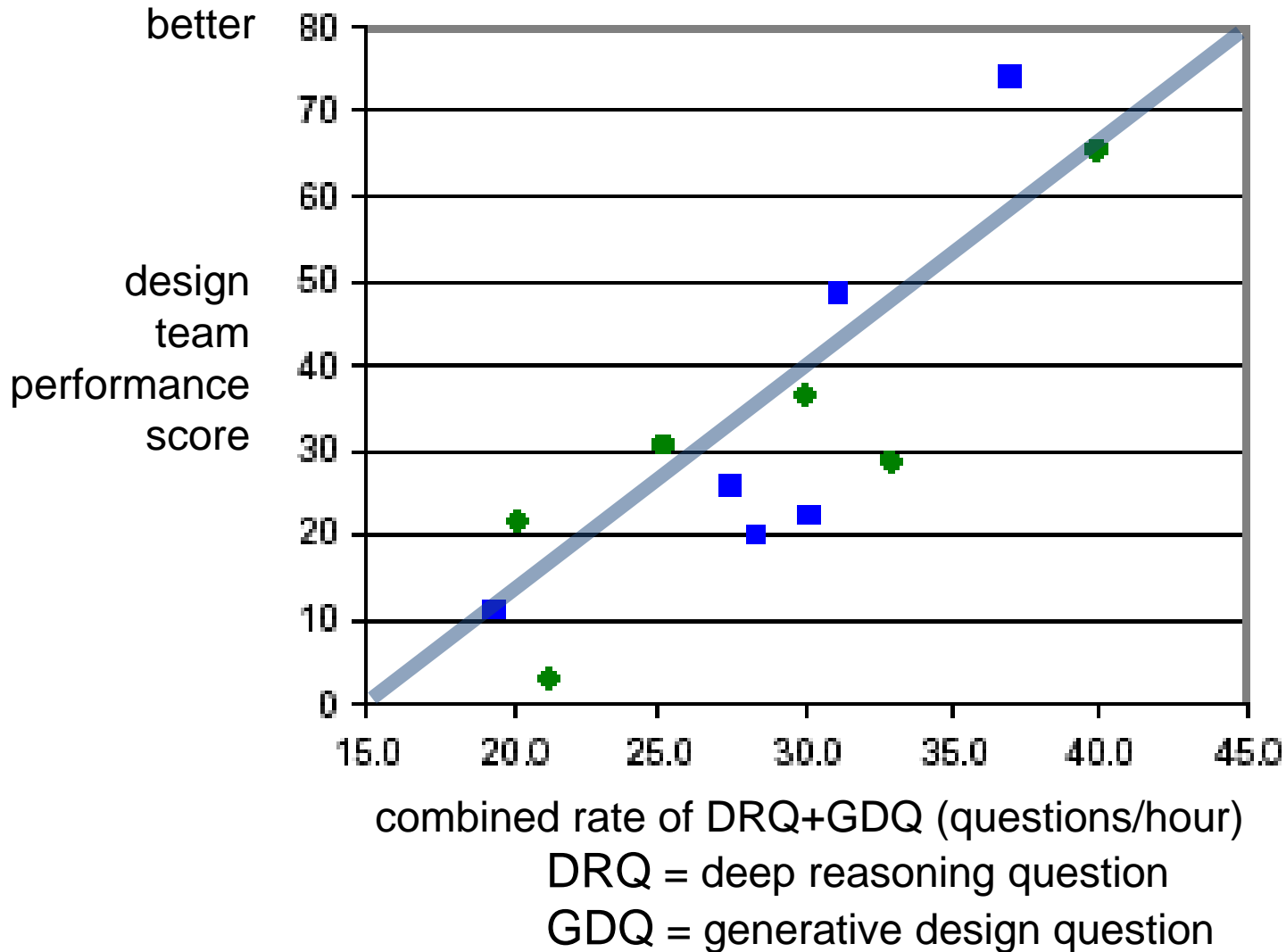
the importance of creative language

noun-phrases in formal documents
predict awards in peer-reviewed
design competitions
Mabogunje, PhD 1997



the importance of questioning

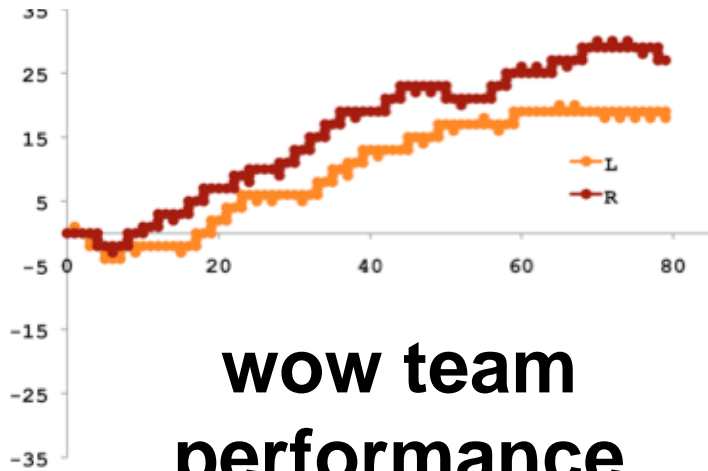
Eris PhD 2002



the power of hedonic balance

Malte Jung PhD 2011

wow team
performance

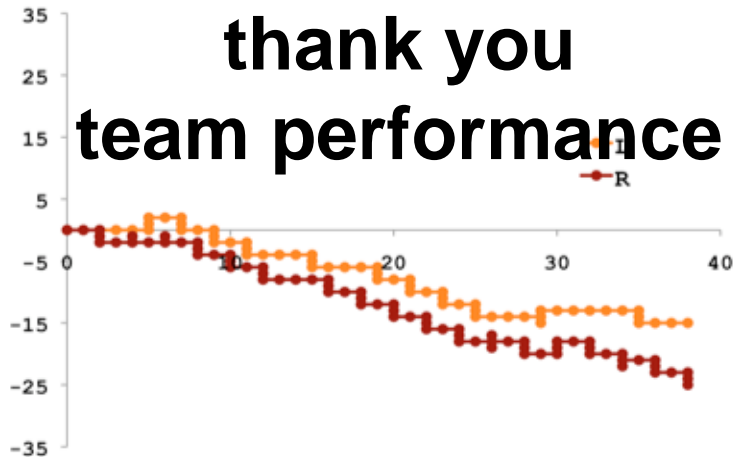


speaker
turns

regulated
(positive
hedonic balance)
N = 5

cum pos-neg
affect

thank you
team performance



speaker
turns

non-regulated
(negative
hedonic balance)
N = 11

Communication Variables

Gestures (Tang 1989)

Ambiguity Preservation (Minneman 1991)

Temporal Transitions (Baya, 1996)

Categorical Transitions (Brereton 1997)

Noun Phrase Generation (Mabogunje, 1997)

Generative Design Questions (Eris, 2003)

Disposition Variables

Team Emotional Balance (Jung, 2010)

Team Composition (Schar, 2012)

Team Diversity (Kress, 2012)

Institution Variables

Innovation and Economic Growth (Solow, 1962)*

Vision (Founding Narrative, ReVeL Handbook, 2005)

Rules (Regulation of Capital Formation, Hwang & Horowitz, 2011)*

Network Density (Zoller, 2010)*

Age differences (Park et al, 2002)*

* Work Not done in our lab

So many variables, so little impact

- We could analyze and describe design
- But we were not able to intervene in any meaningful way.
- As engineers, this was frustrating

How can we integrate all the variables?

Inspiration



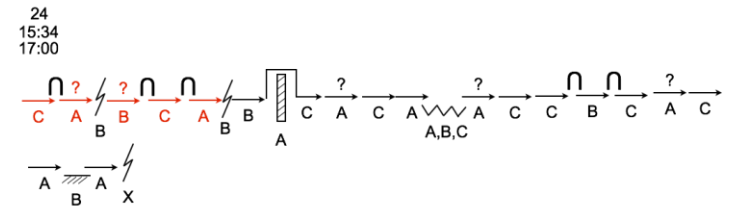
Ode To Joy

Staff 1: C G C C G

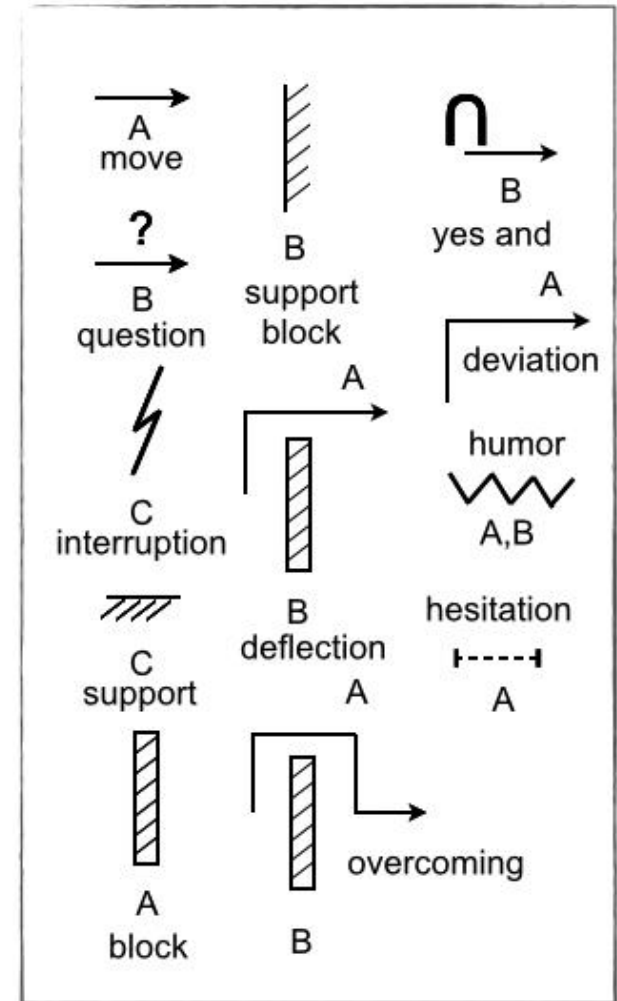
Staff 2: 5 C G C G C

Staff 3: 9 G C G C G C G

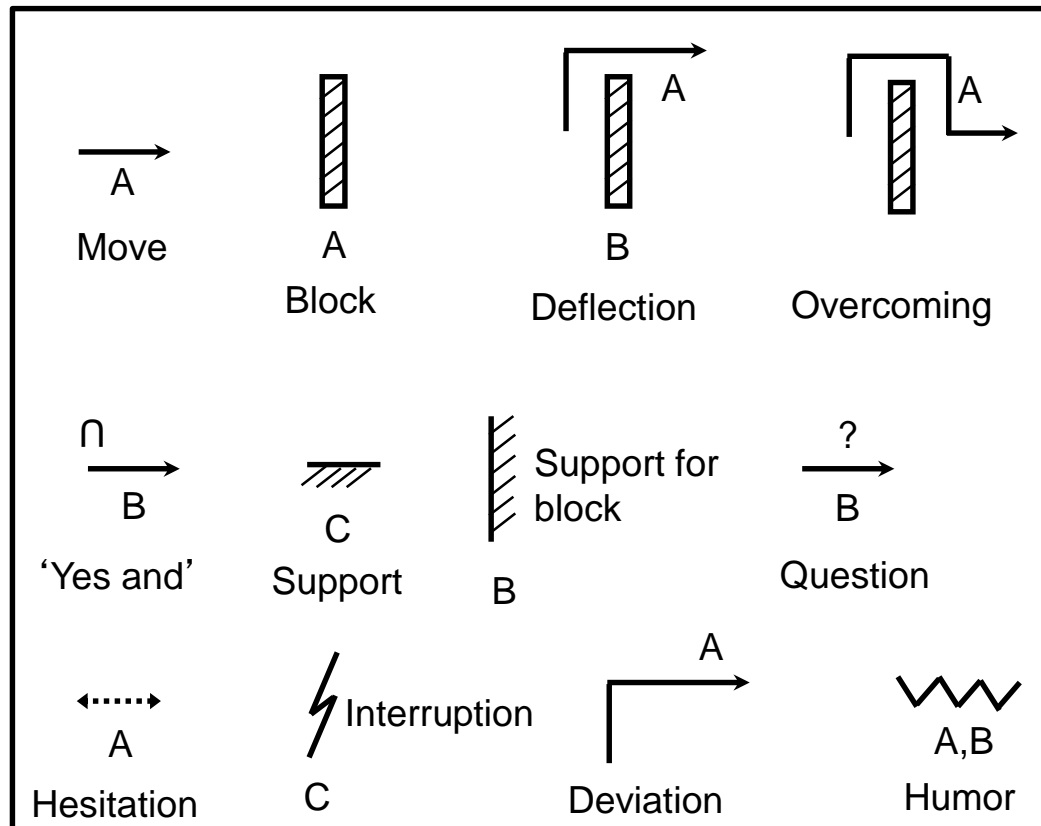
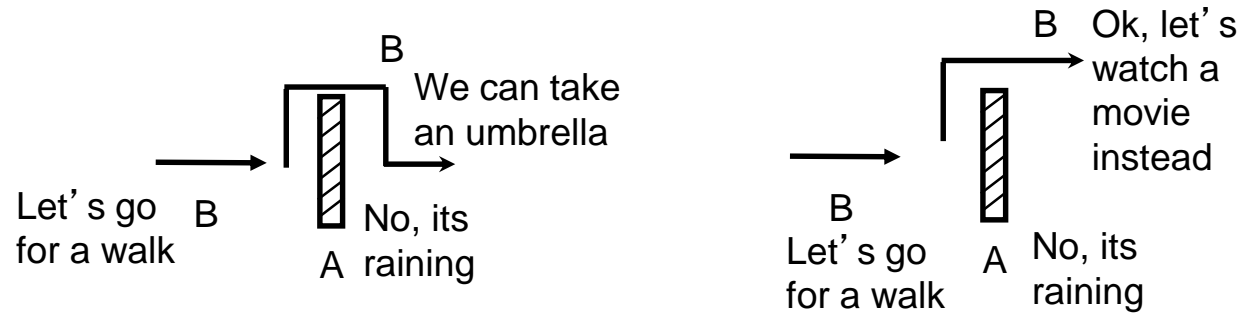
Staff 4: 13 C G C G



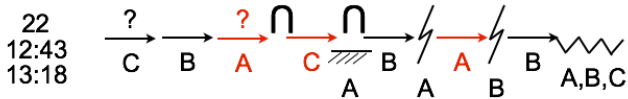
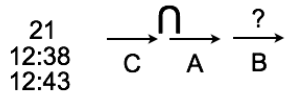
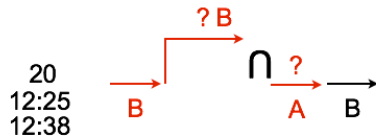
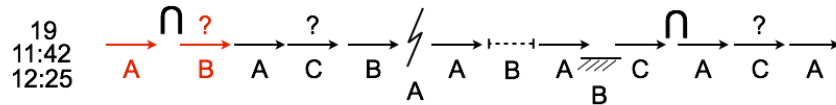
Design Activity



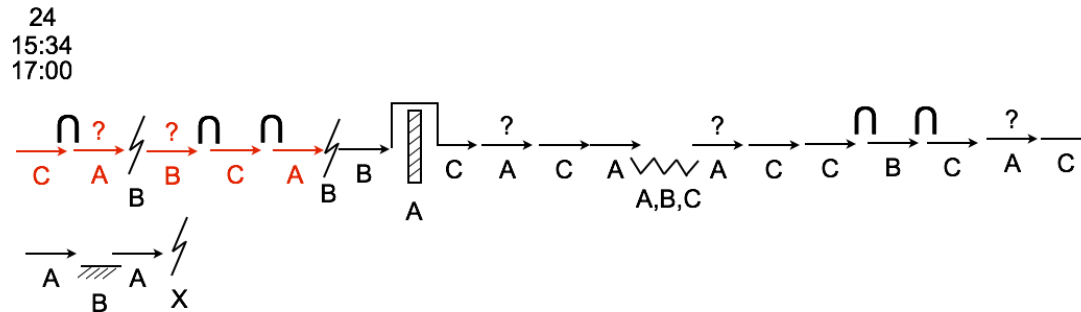
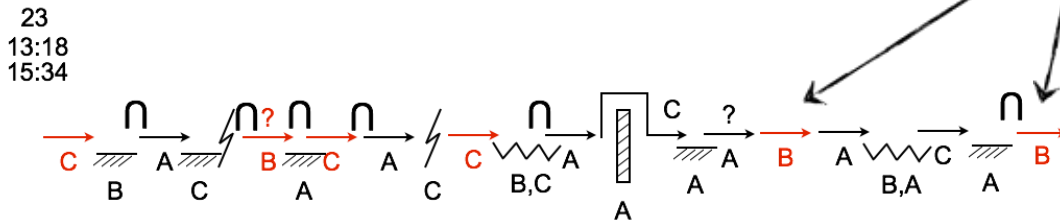
Interaction Dynamics Notation



Sample of interactions with ideas highlighted



Ideas in Red



Measuring Engineering Design Thinking

PHYSICS

$$\frac{\partial \vec{v}}{\partial t} + \vec{v} \cdot \nabla \vec{v} = -\frac{1}{\rho_0} \nabla p + \nu \nabla^2 \vec{v} + \frac{\rho}{\rho_0} \vec{g} - 2(\vec{\Omega} \times \vec{v}) + \frac{1}{c\rho_0} \vec{j} \times \vec{B}$$

The movement of fluid depends upon:

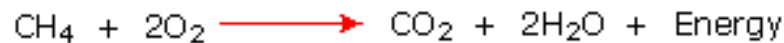
- pressure
- viscosity
- gravity
- rotation
- magnetic term (associated with the Lorentz Force)

GENETICS

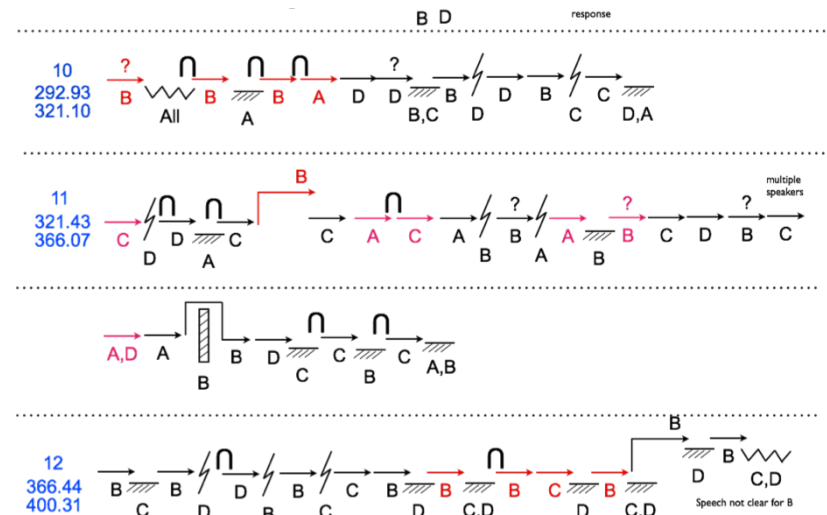
```

12854400 tcaaaagtaagttagataaacatgatcattcacagggtcagatgt
12854200 taggactaccagaattgagttacctagtacttctcaattctatt
12854000 taggaaaagttaatgtttacggcccaatcactttttttaacagc
12853800 attgtccactcaaaacgtgacaaatggaggtctaaagggagac
12853600 cttgtaaagtatttcacattttcattcccaagaaaaatagactg
12853400 aggtttagggtctcaatataaacacacaaaagcagatagaagaa
12853200 TCTTTTCTTCATCGTCTTTCCAACCTTCACGTTTTCCTCCACC
12853000 tcacttattgggtttctttcaattgtgaaacagAGTTTCAATT
12852800 ACATAGCCAACGCTGGAATCACTCATCTTTGGCTTCCTCCTCC
12852600 taccaatcttgttactcagcaatcttcattcctcagGTTACT
12852400 AATCGTTAATCAAAGCGTTGAATCAAAAAGGAATAAAAGCTTT
12852200 CTGTTATTTTCAAGGTGGGACTTCCGATGATCGTCTTGATTGG
12852000 ACCGGAGGAGATTTTGATGGAGCGCCCGACATCGACCACCTTA
12851800 GATTCCATGGTTGGAGATTTGATTATGTTTCGAGGTTATGCATC
12851600 aacagtattagatatataagaacaataggttgagataattattt
  
```

CHEMISTRY



DESIGN MECHANICS



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Vision for Stanford



- Universities are rapidly developing into more than mere places of learning. They are becoming major economic influences in the nation's industrial life, affecting the location of industry, population growth, and the character of **communities**. Universities are in brief a natural resource just as are raw materials, transportation, climate, etc.”
 - Frederick Terman
 - Provost at Stanford (1955 -1965)
 - Dean, School of Engineering (1945 – 1955)
 - Professor, Electrical Engineering (1925 – 1941)

Menlo Park Investors

Stanford University

Industry

Foothill-De Anza Community College

Note: Not all corporations shown here are affiliated with Stanford University. Map copyright by Google

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d.School Stanford

(USD ~30M)

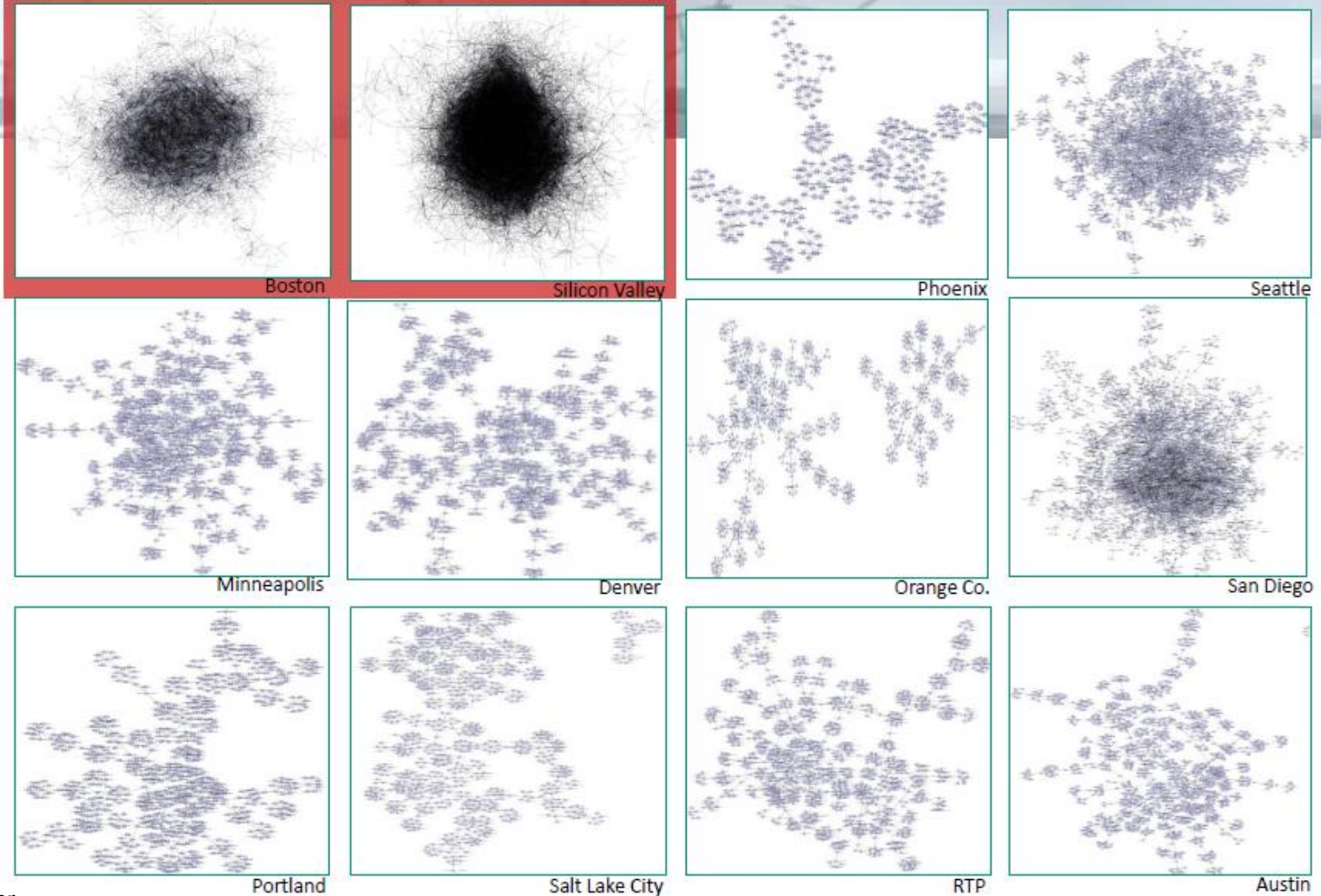


In FY 2008, the Stanford affiliated companies on the Silicon Valley's top 150 firms had a total market capitalization of \$402.5 billion (i.e. 47% of the \$849.9 billion total market capitalization of those firms).

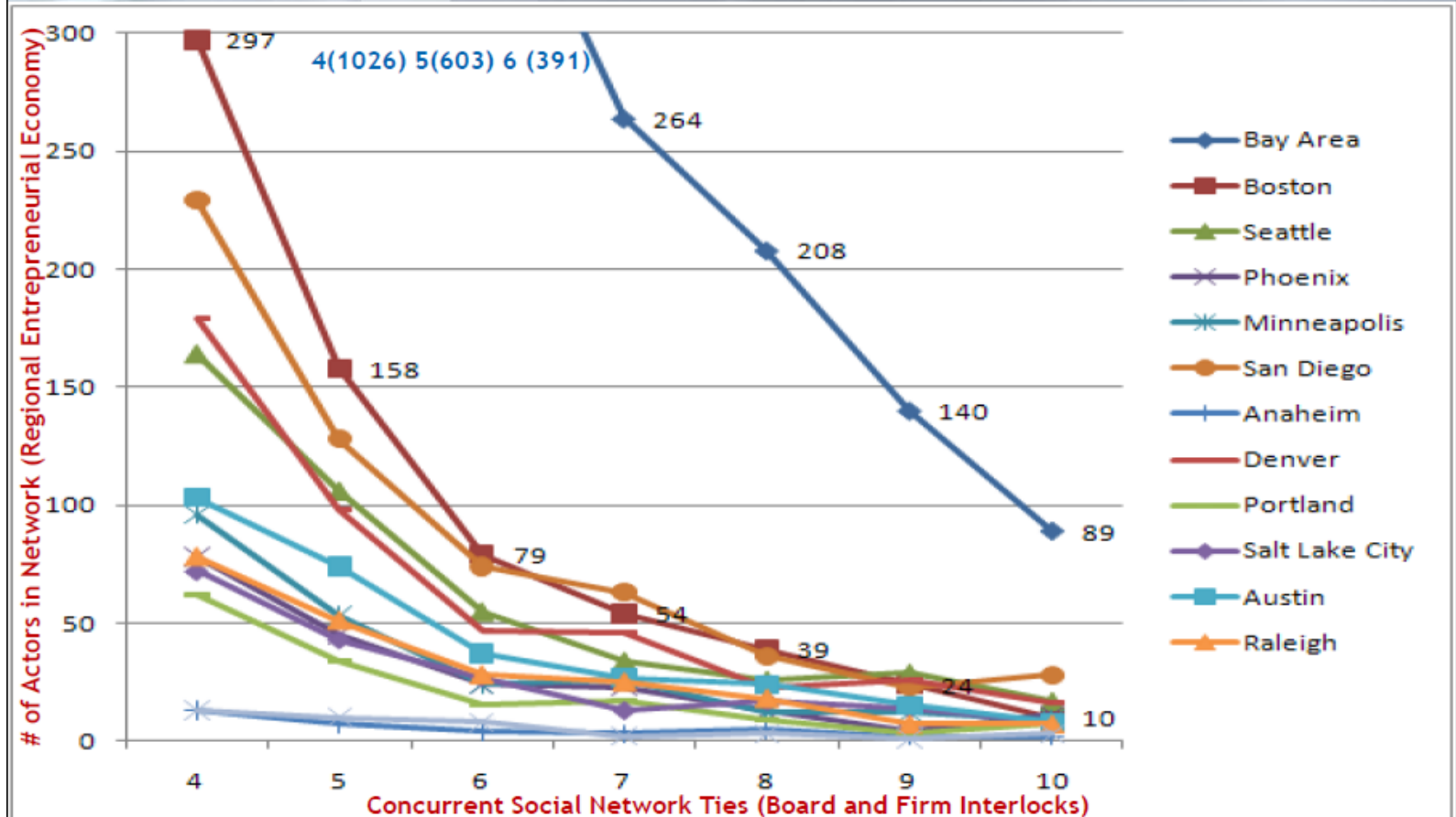
Company	2008 REVENUES (MILLIONS)	2008 NET INCOME (MILLIONS)	MARKET CAP (MILLIONS) on March 31, 2009
1 Hewlett-Packard	\$118,697	\$8,050	\$76,835
2 Cisco Systems	\$39,575	\$7,492	\$97,887
3 Google	\$21,796	\$4,227	\$109,741
4 Sun Microsystems	\$13,256	-\$1,832	\$5,451
5 eBay	\$8,541	\$1,780	\$16,114
6 Yahoo	\$7,209	\$424	\$17,860
7 Agilent	\$5,547	\$637	\$5,307
8 Electronic Arts	\$4,479	-\$1,140	\$5,854
9 NetApp	\$3,465	\$101	\$4,908
10 Nvidia	\$3,425	-\$30	\$5,349
11 Intuit	\$3,064	\$415	\$8,673
12 Varian Medical Systems	\$2,120	\$293	\$3,787
13 Maxim Integrated	\$1,901	\$156	\$4,018
14 VMware	\$1,881	\$290	\$9,227
15 Cypress Semiconductor	\$1,800	-\$430	\$934
16 Atmel	\$1,567	-\$27	\$1,630
17 SunPower	\$1,435	\$92	\$1,878
18 Altera	\$1,367	\$360	\$5,149
19 Netflix	\$1,365	\$83	\$2,519
20 Synopsys	\$1,361	\$196	\$2,944
21 Cadence Design	\$1,077	-\$1,822	\$1,111
22 Varian	\$983	\$62	\$688
23 Intuitive Surgical	\$875	\$204	\$3,737
24 Tibco Software	\$631	\$53	\$1,026

SOCIAL CONNECTIVITY LOOK

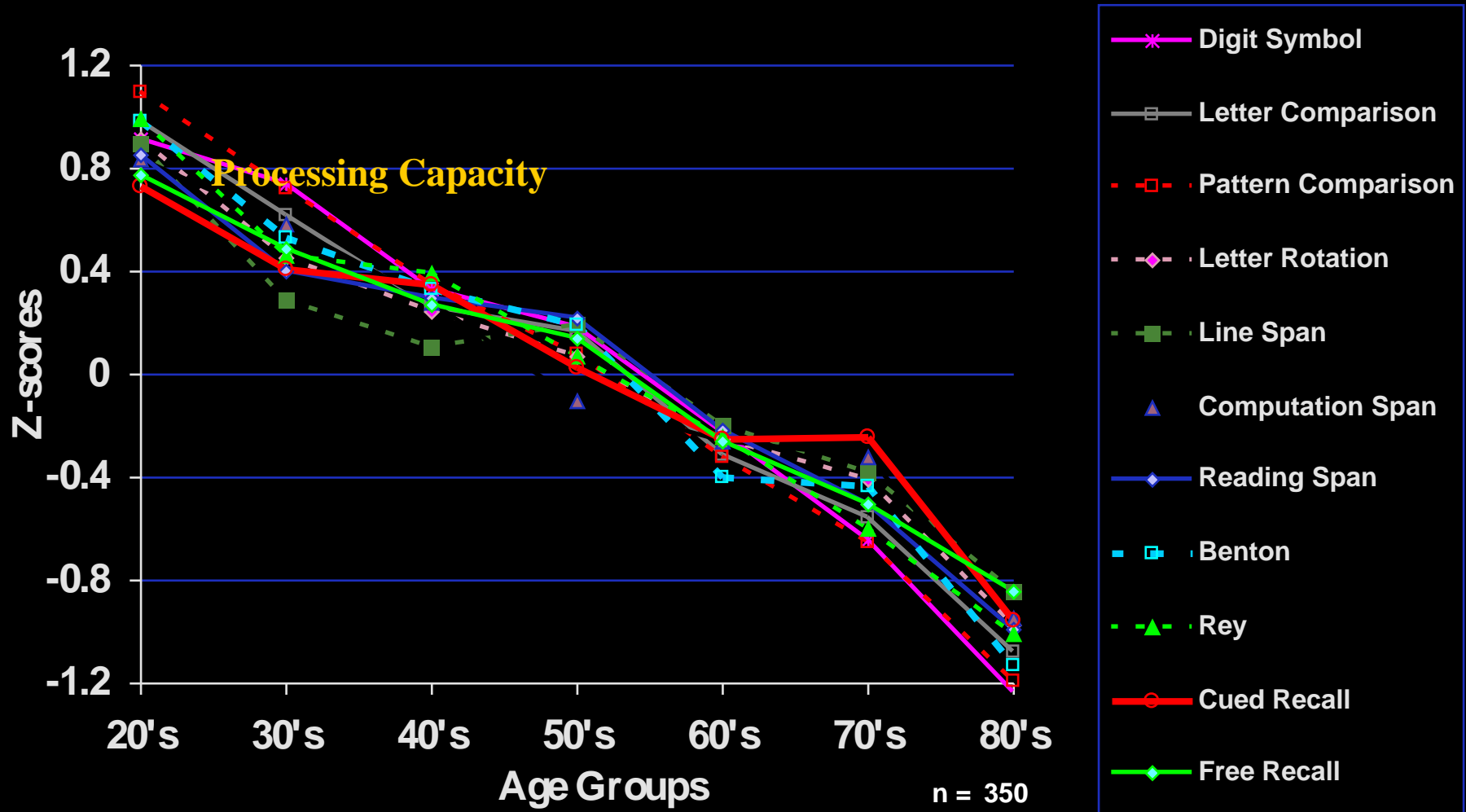
Total Associated Entrepreneurial Networks by Technopole, Sorted by Regional Population Size



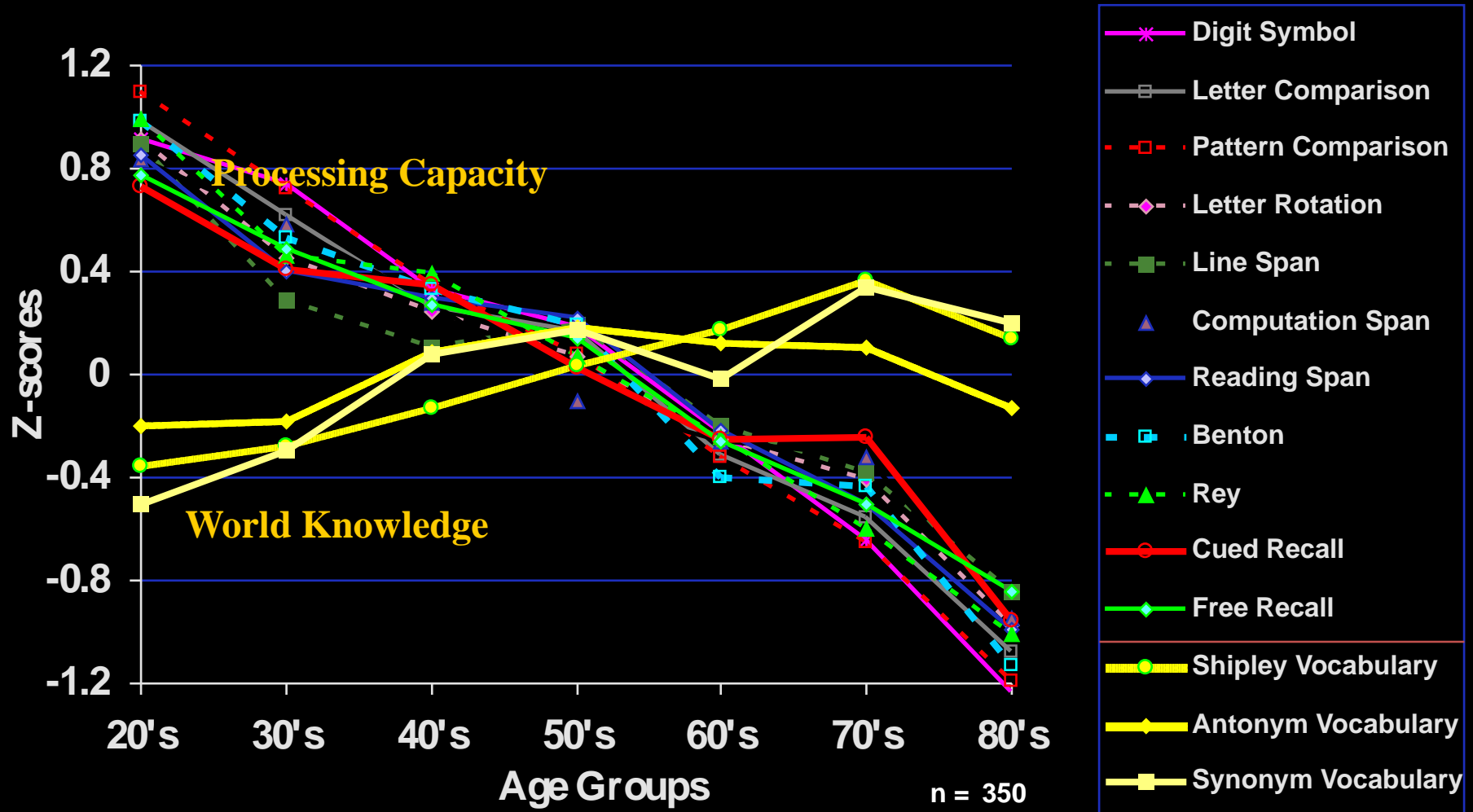
Dealmaker Concurrent Ties: All Technopoles



The Aging Mind



The Aging Mind



Park, Lautenschlager, Hedden, Davidson, Smith & Smith, (2002). Psychology and Aging

Change in Institutions and Governance Behaviors

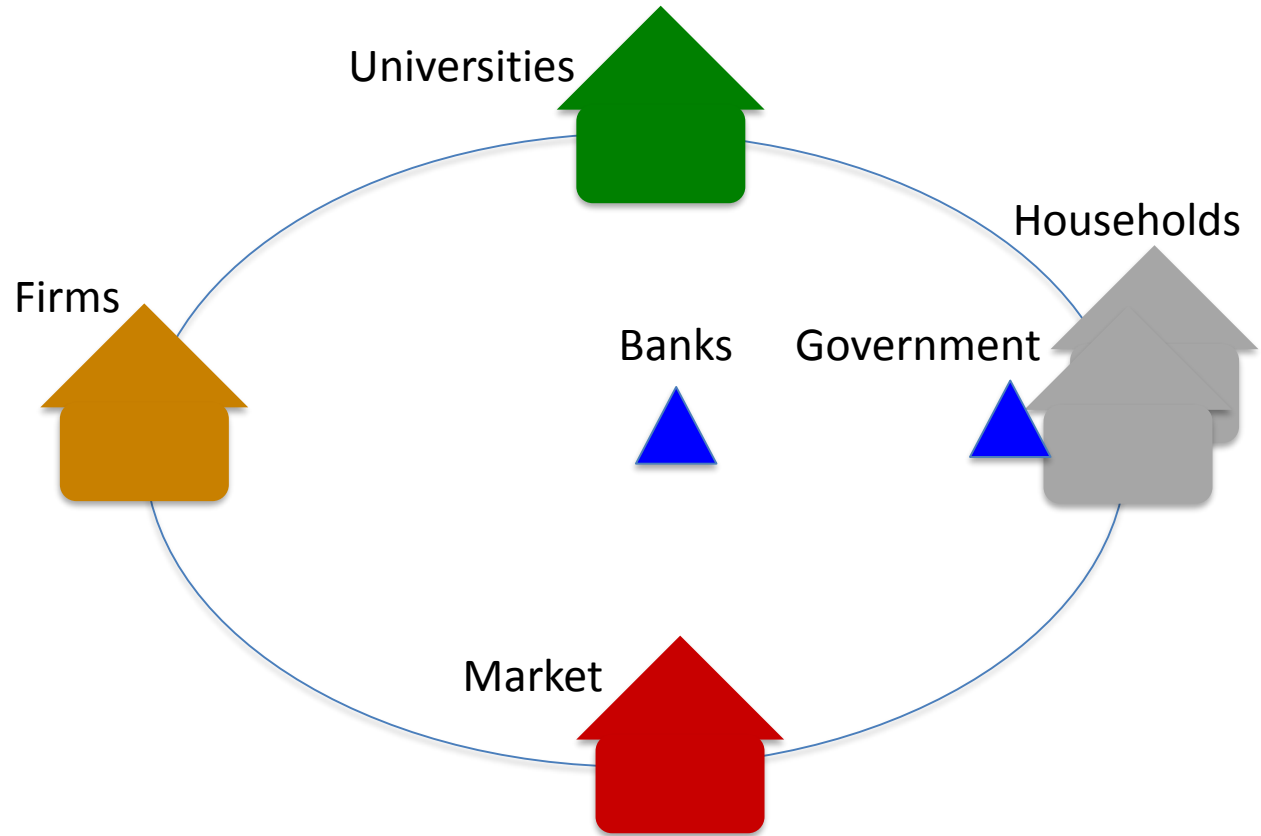
Rules of the Plantation *(for production)*

1. Excel at your job
2. Be loyal to your team
3. Work with those you can depend on
4. Seek a competitive edge
5. Do the job right the first time
6. Strive for perfection
7. Return favors

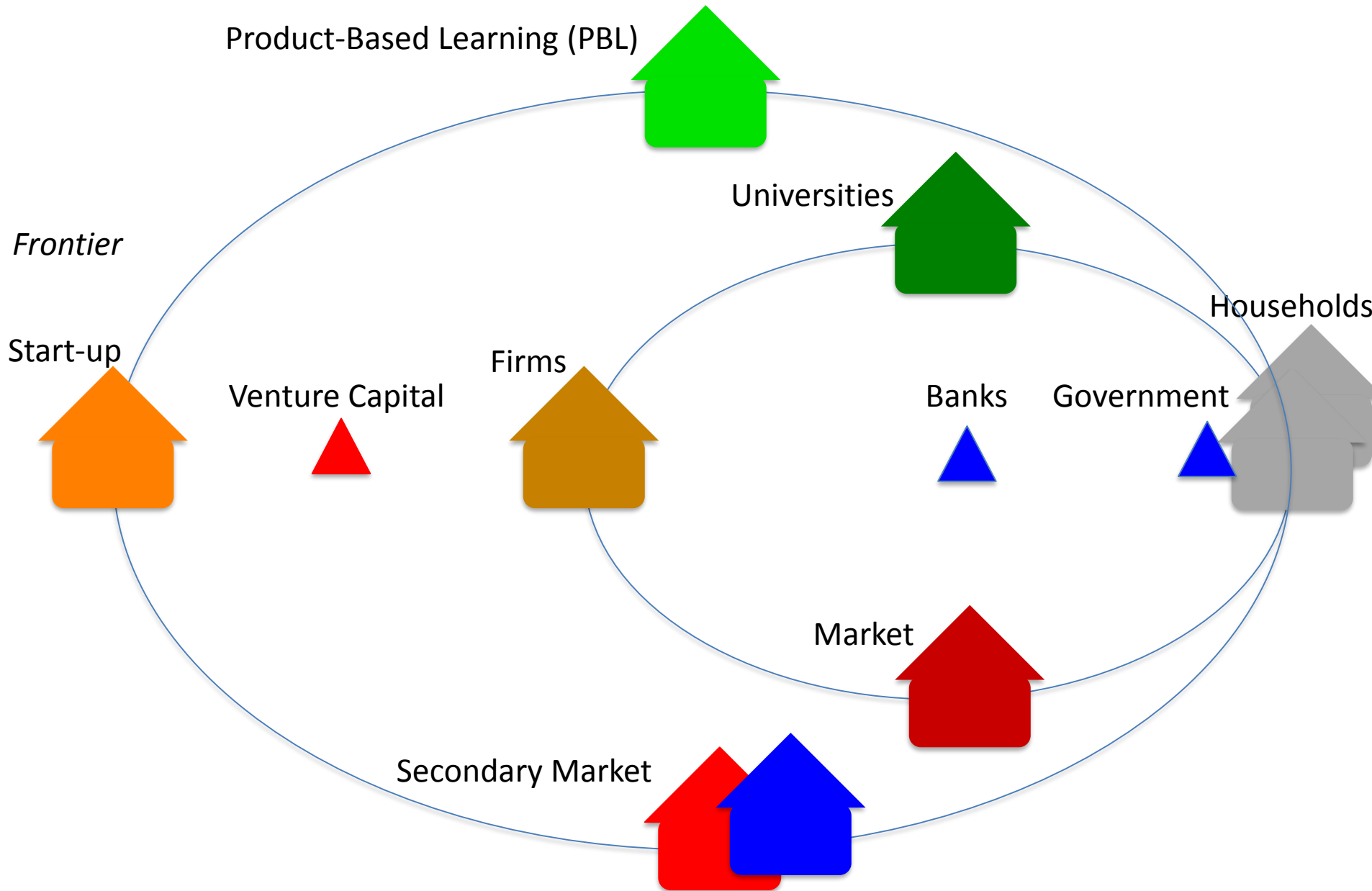
Rules of the Rainforest *(for innovation)*

1. Break rules and dream
2. Open doors and listen
3. Trust and be trusted
4. Seek fairness, not advantage
5. Experiment and iterate together
6. Err, fail, and persist
7. Pay it forward

An Integrative Model of Behavioral Prediction - Production



An Integrative Model of Behavioral Prediction – Innovation



Inst. for Venture Design – Nigeria

(USD ~2M)



Venture Studio – India

(USD ~2M)



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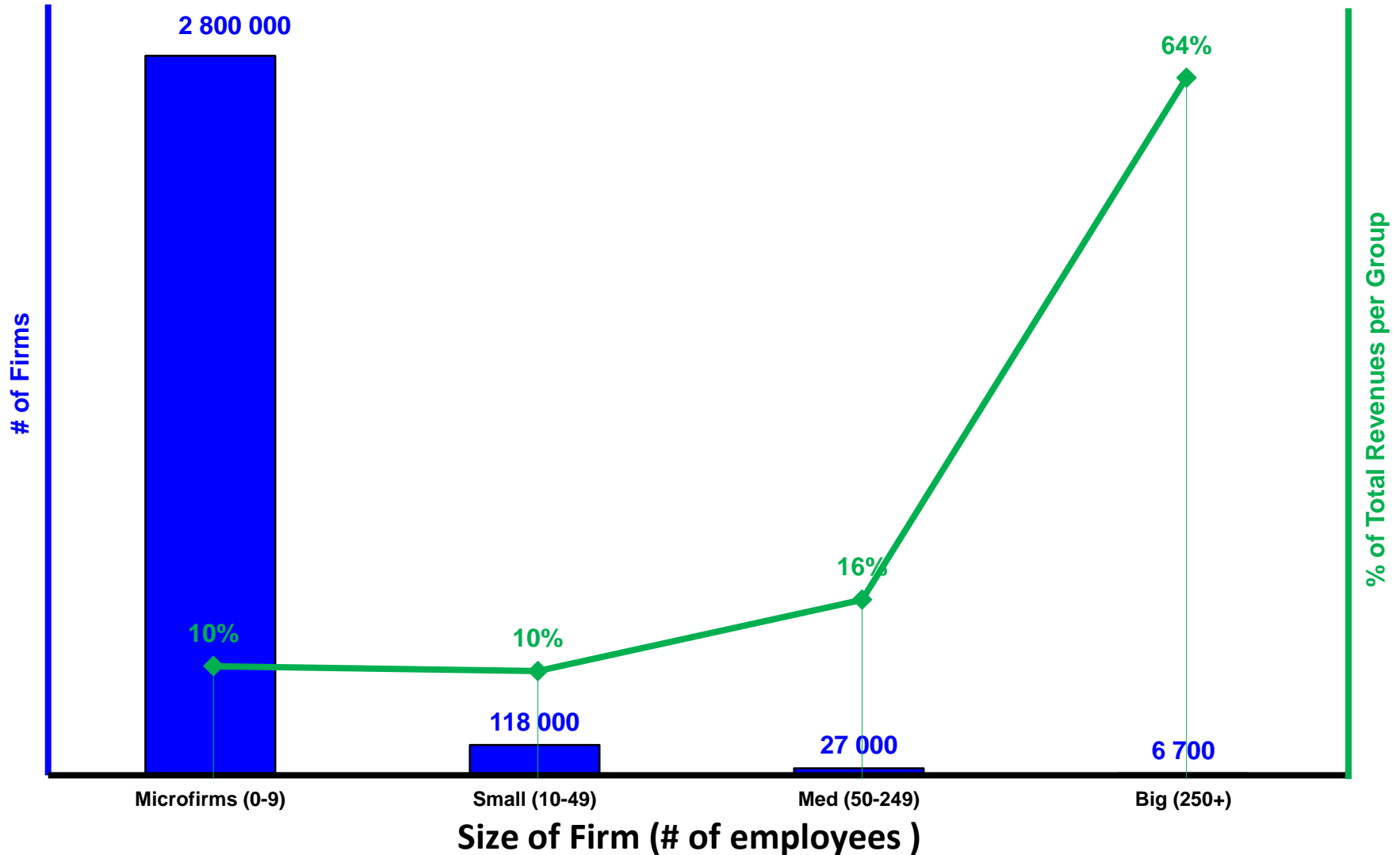
Building an Innovation Ecosystem Infrastructure Fund for Alesund, Norway

An aerial night photograph of Alesund, Norway, showing the city's lights reflecting on the water and the surrounding mountains. The city is built on a peninsula, with a large harbor area and a bridge visible in the background.

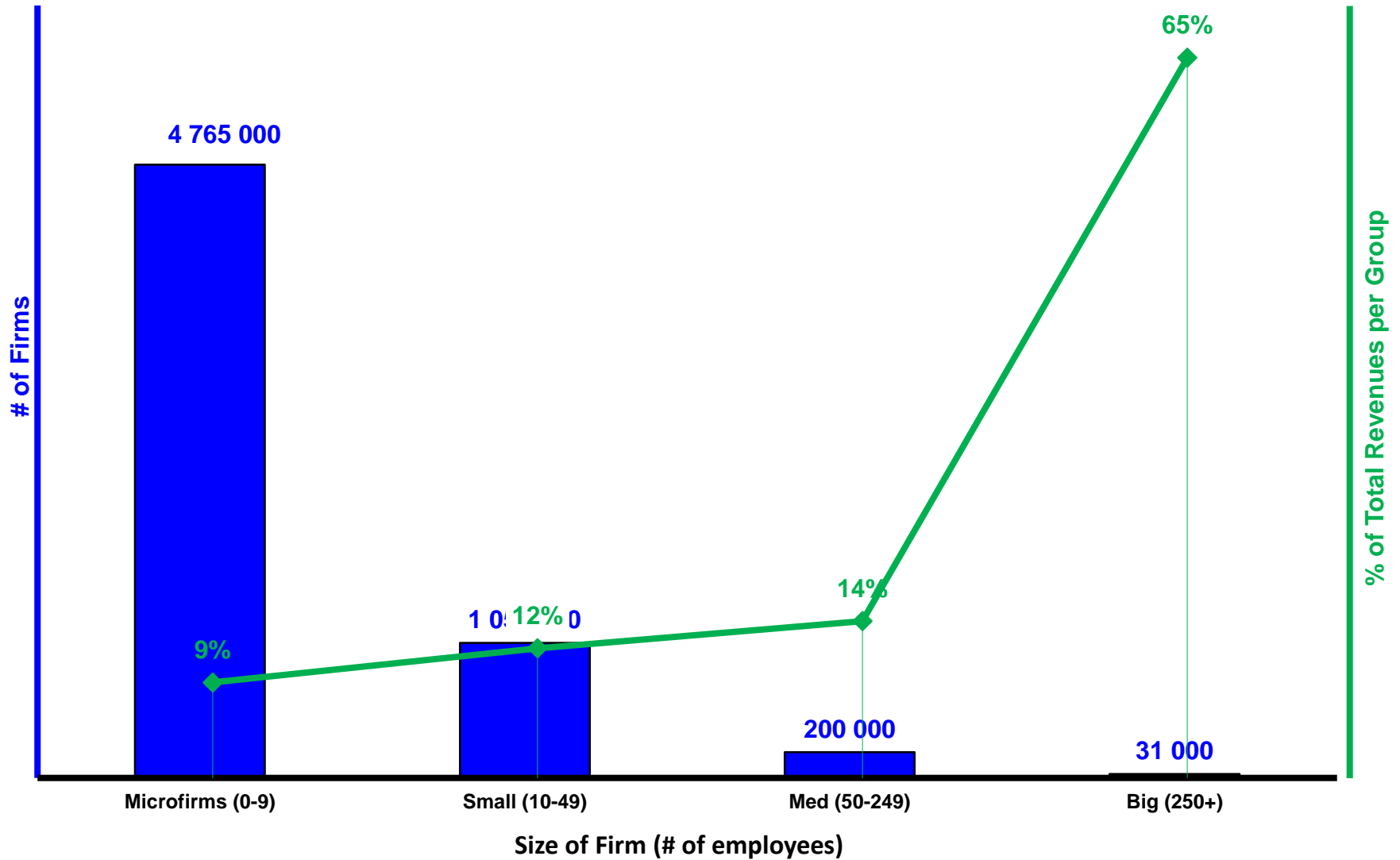
Center for Design Research
NTNU Aalesund

**Innovation has a direct and
measurable impact on
economic outcome**

Starting point: Firms and Revenues in Mexico.

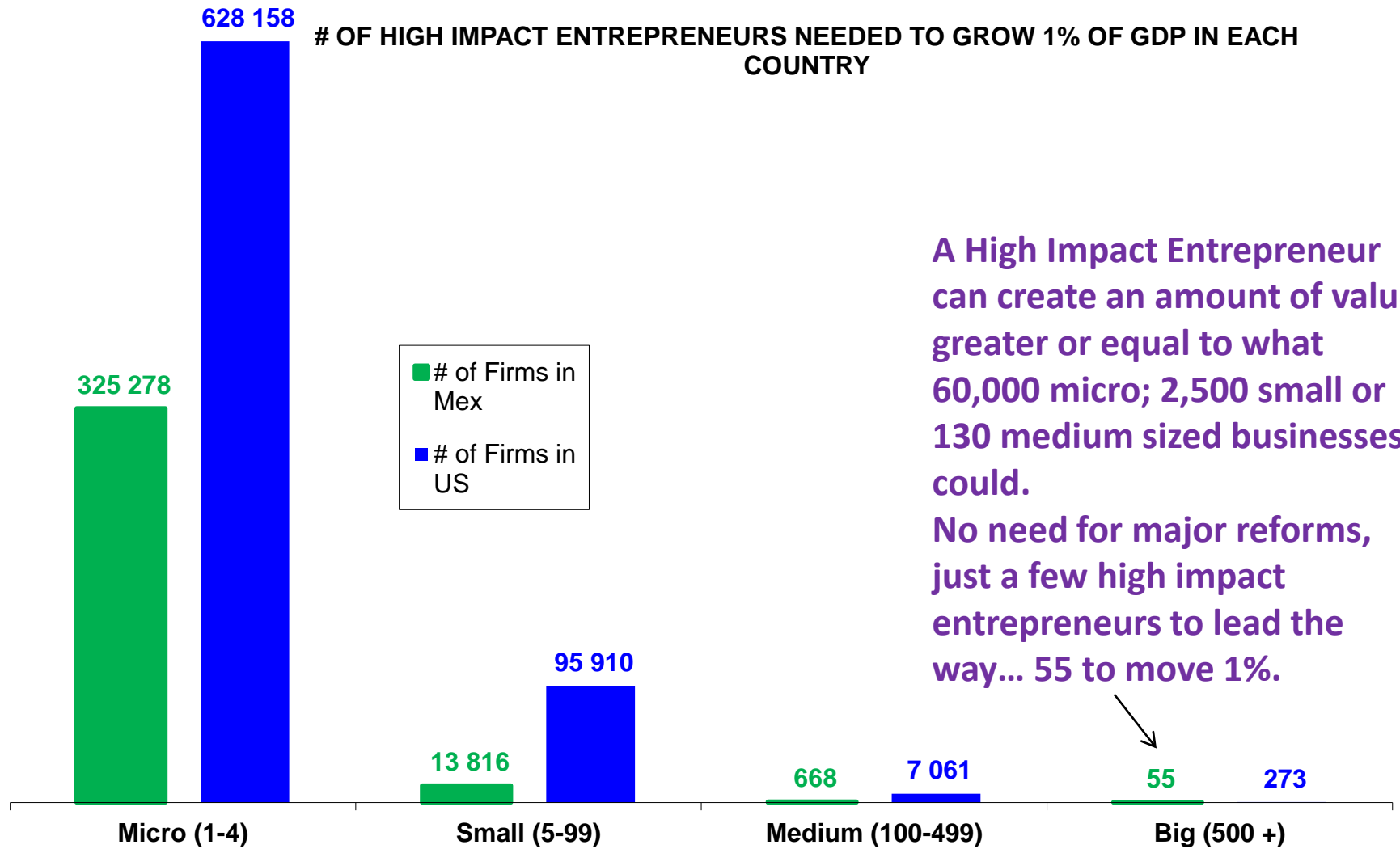


Compare to USA:



If we want to grow GDP by 1%:

Assuming $\text{Corr}(\text{Revenues}, \text{GDP}) \approx 1$



Can we increase the GDP of Mexico City by
1% annually through innovation?

GDP of Bogota: USD 408.88 Billion

http://www.lloyds.com/cityriskindex/locations/city/mexico_city

Innovation Impact Goal = 1% of GDP = 4 Billion

Mindset

Accelerating a region's capacity to innovate and prosper involves building innovation ecosystem infrastructure



Just as a city needs road infrastructure investment for economic growth



It also needs investment in behavioral infrastructure for innovation

Can we invest 10% of the expected annual GDP impact in creating a 15-year behavioral infrastructure fund to accelerate innovation?

Fund invests 30% in Soil (ecosystem development)
and 70% in Seed (ventures and innovation projects)



Total fund size: USD 400 M

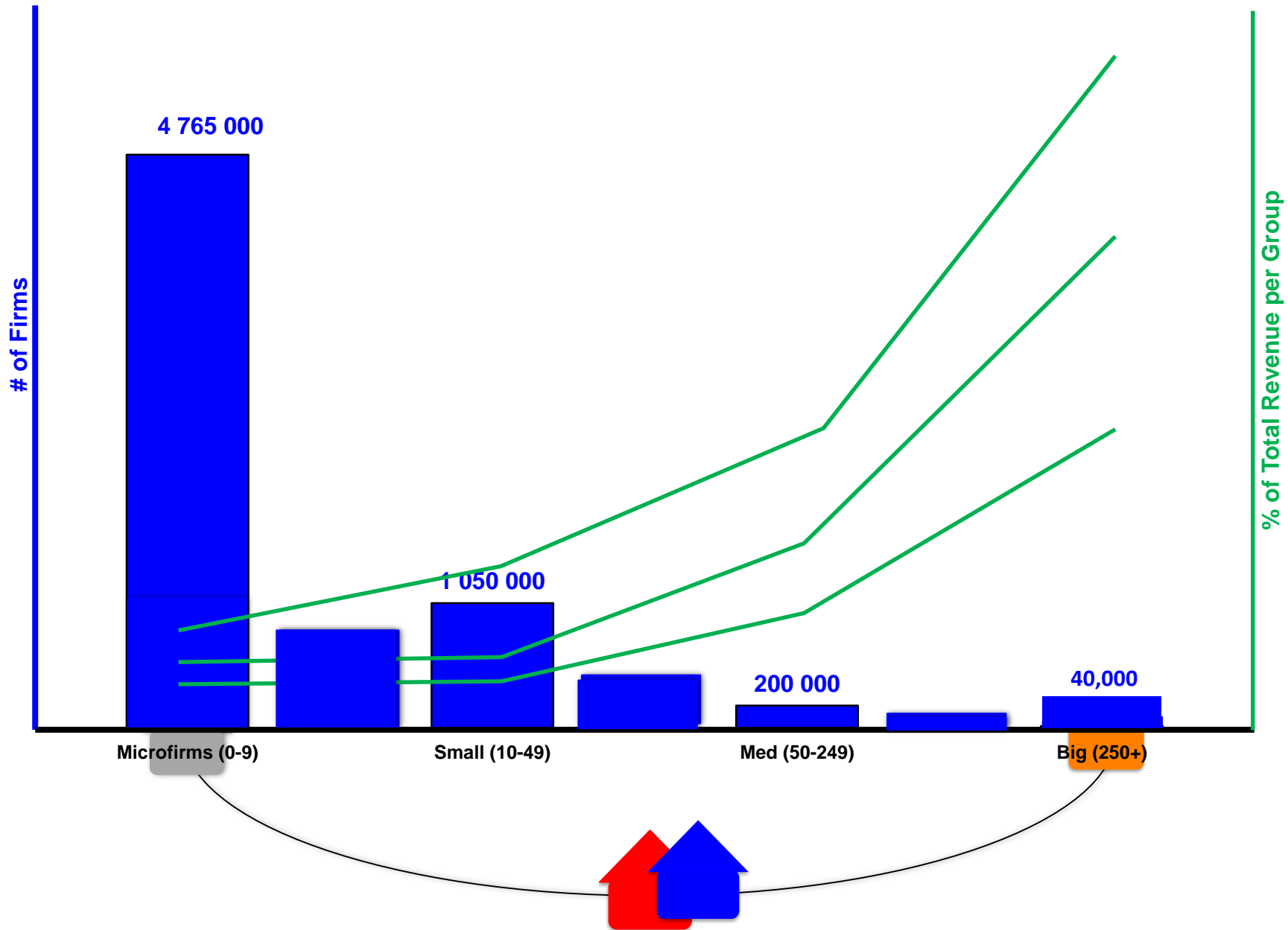
Fund investment period:

1 year setup + 8 year investing + 7 year development

Fund impact goal: Achieve 4 B of annual GDP growth
at city level from year 14 onwards

Targeted fund return to investors: $7X = 2.8 \text{ B}$ over 15 years

3% annual ecosystem development allocation+
fund/coaching team gets 10% of fund profits



Thank you

