

# "Formation of innovation eco-systems of the high-tech industries in U.S. and Japan"

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# Cluster and competitive advantage of companies

“Clusters are prominent in all successful and growing regional economies and play a crucial role in driving productivity, innovation and competitiveness.”

by Michael Porter “Creating Shared Value” 2011, Jan-Feb.HBR

“Far from being isolated from what lies outside them, firms are embedded in a social and institutional setting that shapes, and is shaped by, their strategies and structures.”

by Ann Lee Saxenian *Regional Advantage(1994)*

Clusters have the potential to affect competition by increasing the productivity of the companies in the cluster, by driving innovation in the field, and by stimulating new businesses in the field.



The Economist, 2012/10/27  
 Special report, "The geography of start-ups: Something in the air"

# Alfred Marshall

***“The mysteries of the trade become no mysteries; but are as it were in the air, and children learn many of them unconsciously.”***

- ***Principles of Economics***(Marshall 1890)

- knowledge spillovers
- common pool of the factors of production the local cluster uses
- more specialized input

# ”Local Industrial Systems” Saxenian (1994)

Three dimensions are closely interconnected.

Local Institutions and culture

Public or private organization that create and sustain regular patterns of social interaction in a region, shaping the local culture, the shared understandings, and practices that unify a community and define everything from labor market behavior to attitude toward risk taking .

Corporate Organizations

Degree of hierarchical or horizontal coordination, centralization or decentralization, and the allocation of responsibilities and specialization of tasks within the firm.

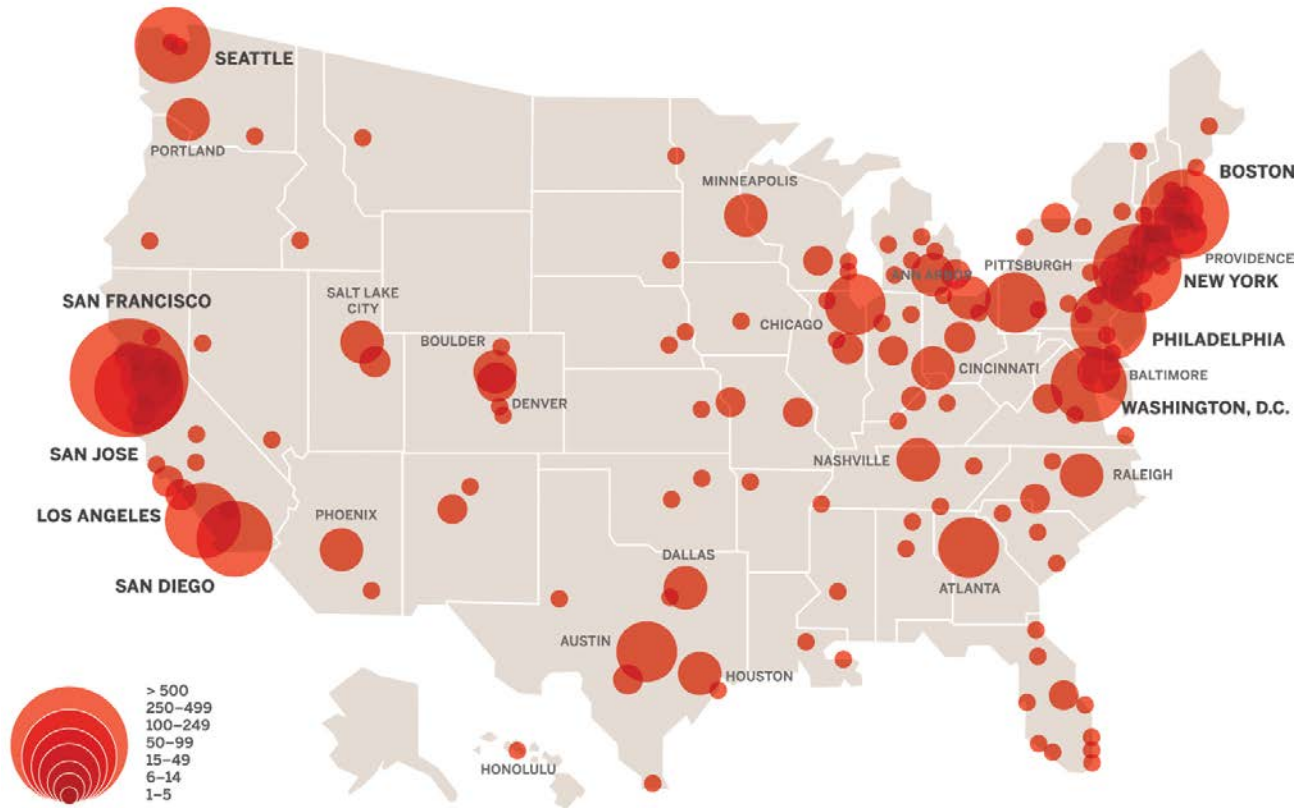
Industrial structure

Social division of labors, extend of nature of links between customers, suppliers, and competitors in a particular sector or complex of related sectors. (Stratified or horizontal ? )

# Results of Saxenian' research (1994): Comparison between Route 128 and Silicon Valley

	Boston Route 128	Silicon Valley
Main university	MIT	Stanford University
industry	military electronics ⇒ mini computer	military electronics ⇒ semiconductor
Division of labor	Independent large companies Vertical integration Self-sufficient	Distributed Network, Horizontal division of labor Specialized and connected
Supporting industry	Rich technology services VC coming from financial capital	Rich technology services VC from technology companies
culture	Frugality, diligent, conservative Loyal to organizations	Open and counterculture, Loyal to their functions (expertise) Open-minded attitude to failures
result	Adapt to stable mass productions market Innovation ecosystem resided in the company.	Adapt to high-tech and unstable market Core competences are shared. Innovation ecosystem was formed regional level.

# VC investment (2012)



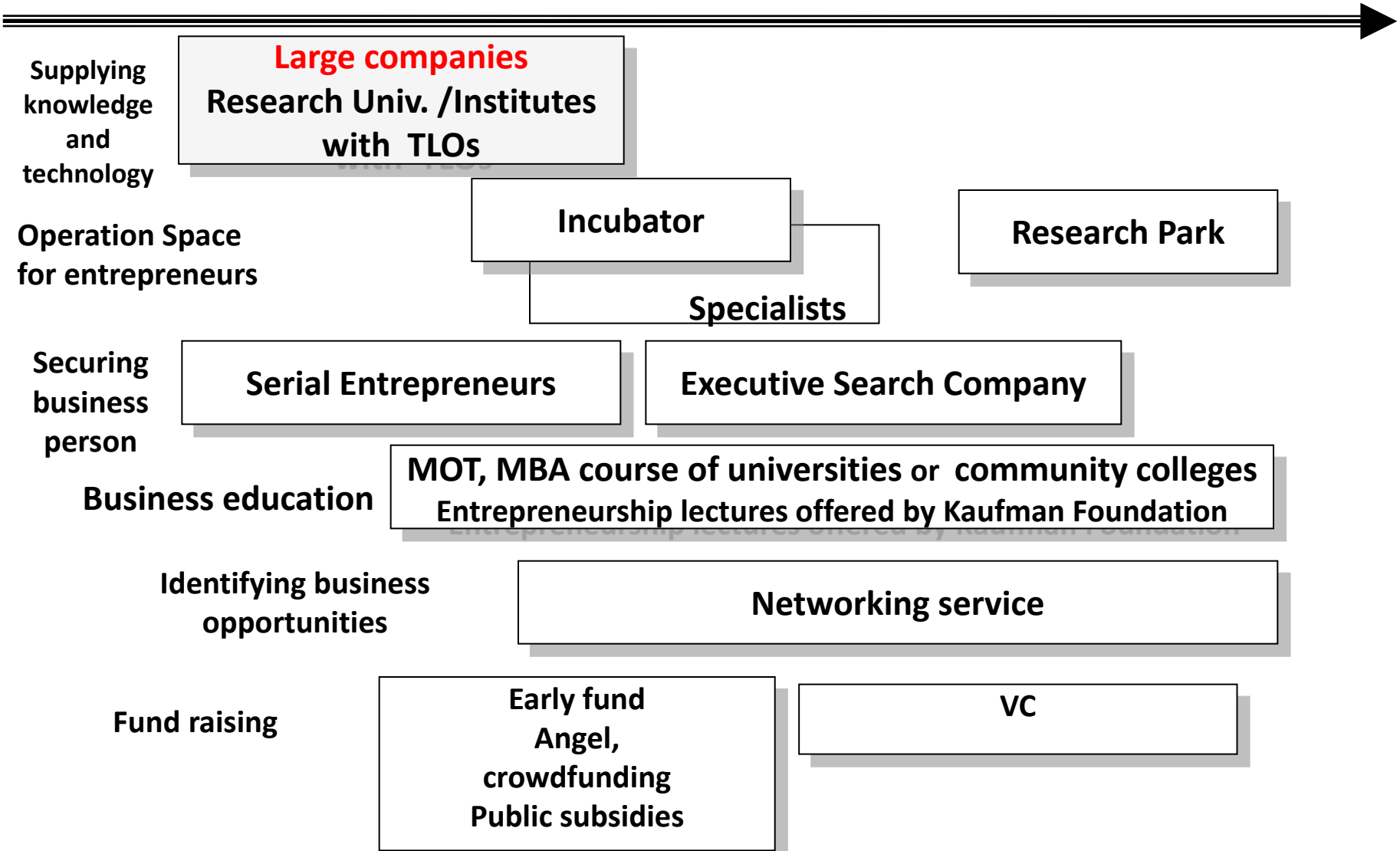
<http://www.theatlantic.com/magazine/archive/2013/10/the-boom-towns-and-ghost-towns-of-the-new-economy/309460/>

Relationship between large companies and startups  
in the U.S. and Japan



# Tools for creating high-tech cluster formation

Time



# The role of large companies in cluster formation (1)

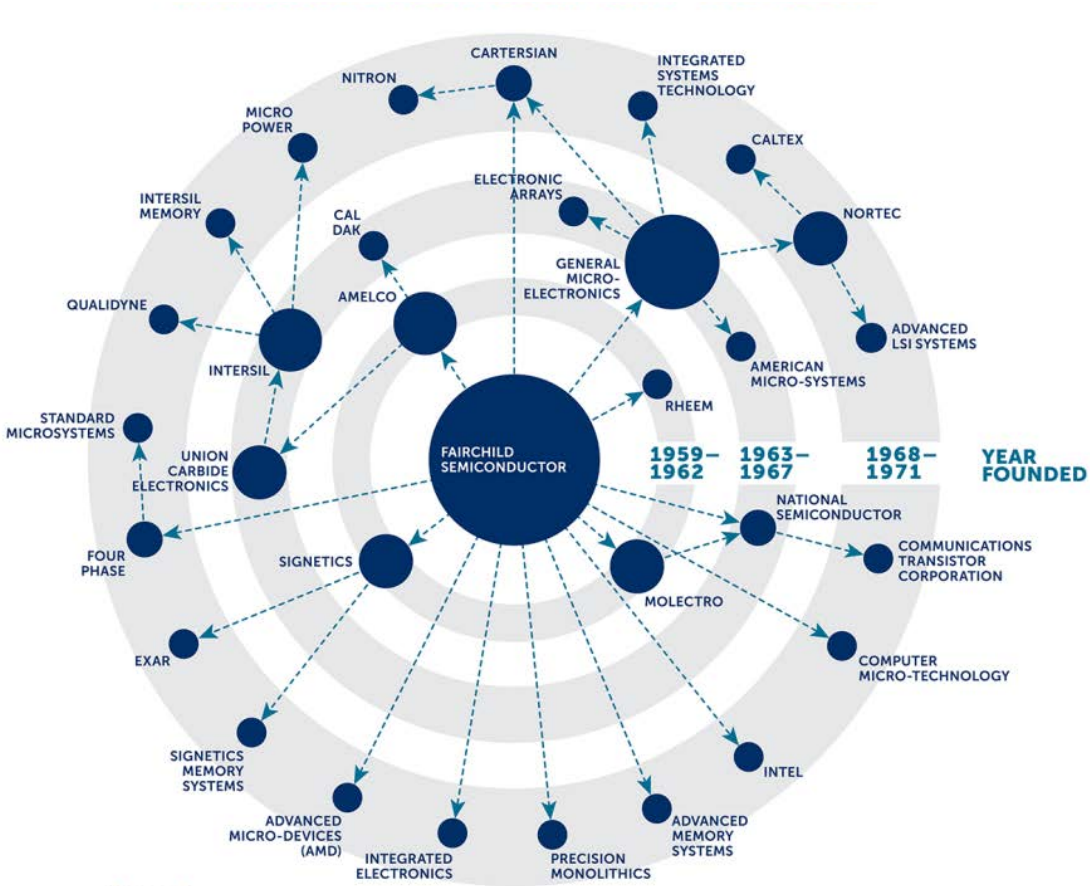
- Attracting excellent human resources
- Providing training and education to employees
- Providing opportunities for establishing human network
- Supporting intrapreneuers (entrepreneurs in the companies) through setting up supporting system, and giving money, things, information, etc...

“Generous large company”

# The role of large companies in cluster formation (2)

- In terms of cluster formation and growth, especially high-tech industries, spinoffs from large companies are regarded as one mechanism facilitating the process (Steffensen et al.2000; Neck et al. 2004; Garnsey & Heffernan2005; Boschma & Wengting 2007; Casper et al.2007).
  - Semiconductor industry in Silicon Valley (CA)
    - Spinoffs came from Fairchild Semiconductor
  - Bio cluster in San Diego (CA)
    - Hybritech produced large number of spinoffs.
  - IT cluster in Boulder (CO)
    - IBM, Storage Tek, and Ball aerospace produced spinoffs.
  - Software industry in Seattle (WA)
    - Microsoft produced many spinoffs, called “Baby Bill”.
  - Disc drive makers in North America
    - All founders of the desk drive makers in the U.S. came from the department of magnetic recordings of IBM.
  - Software industry in Austin (TX)
    - IBM, Tivoli systems and other large software companies (Trilogy) produced spinoffs.
- Spin-offs enjoy certain advantages over other types of newly created companies.
  - They can capitalize on their parent companies' routines and know-how (Agrawal et al., 2004)

# Spinoffs from Fairchild Semiconductor in Silicon Valley

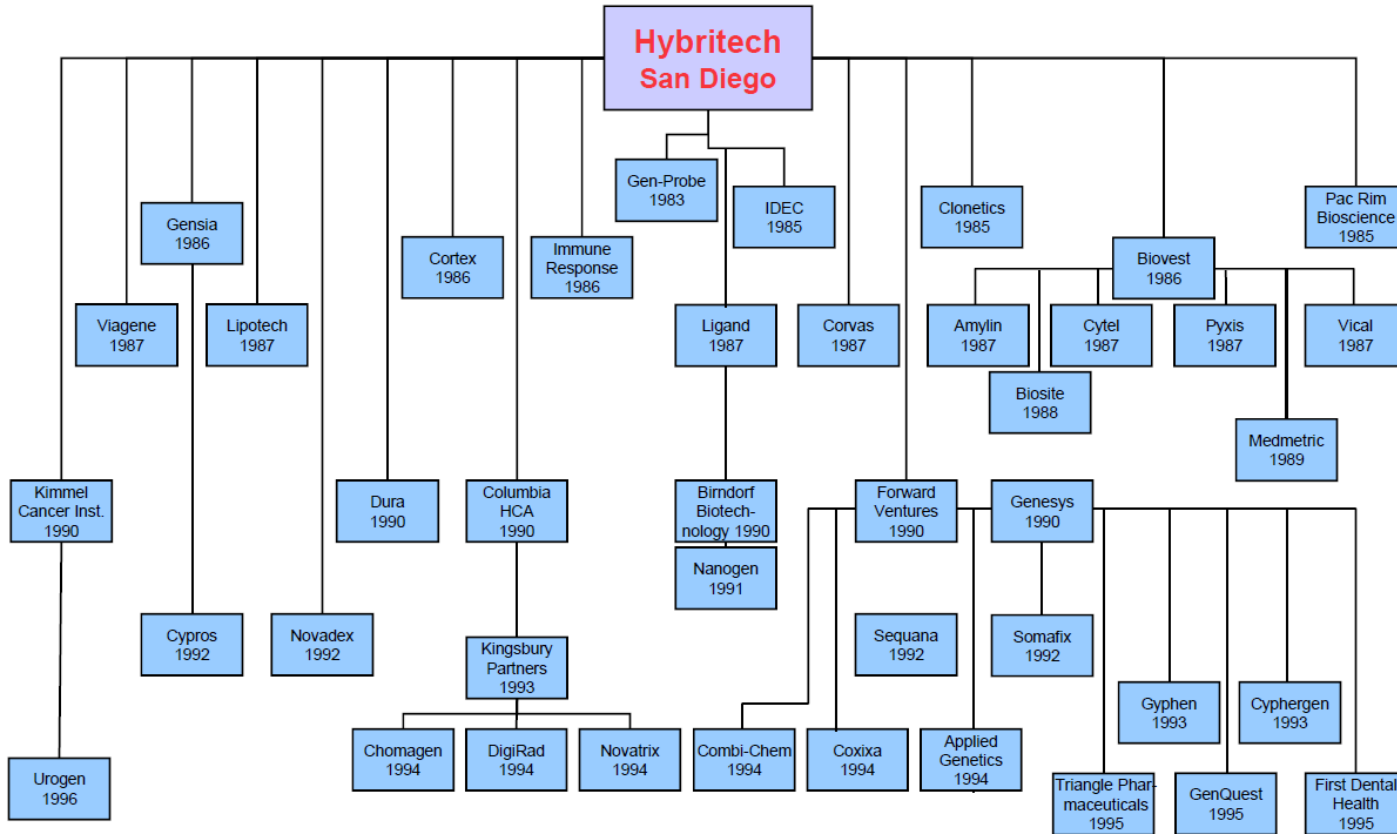


**Legend:**  
 Size of circle reflects the influence of the entrepreneurs at each company based on the number of spinoff firms.

-----> SPINOFFS

Source: Endeavor Insight.

# Spinoffs from Hybritech in San Diego



Source: CONNECT, University of California, San Diego

15

Hybritech's original founders and employees have gone on to found more than 175 of the several hundred life science companies now located in San Diego county

# 30th Hybritech reunion marks biotech's genesis in 2008



Hybritech Reunion,  
on September 14, 2008

- San Diego is the third largest biotech hub in the world.
- Hybritech was established by Dr. Ivor Royston and Howard Birndorf, then at the University of California San Diego in 1978. The venture-capital firm of Kleiner Perkins Caufield & Byers recognized that promise and provided funding.
- Eli Lilly and Company acquired Hybritech in 1986. Since then, exodus started.
- Hybritech aluminum are credited with founding more than 175 of San Diego County's life-science companies.
- Many of the entrepreneurs behind Hybritech didn't stick around after that, instead leaving with the cash and know-how to launch other biology firms.
- These Hybritech alumni rank among the earliest founders of San Diego's now vibrant biotech and life sciences 'technology cluster'.
- 275 persons are registered to LinkedIn of Hybritech Aluminum group as of 2015, September.

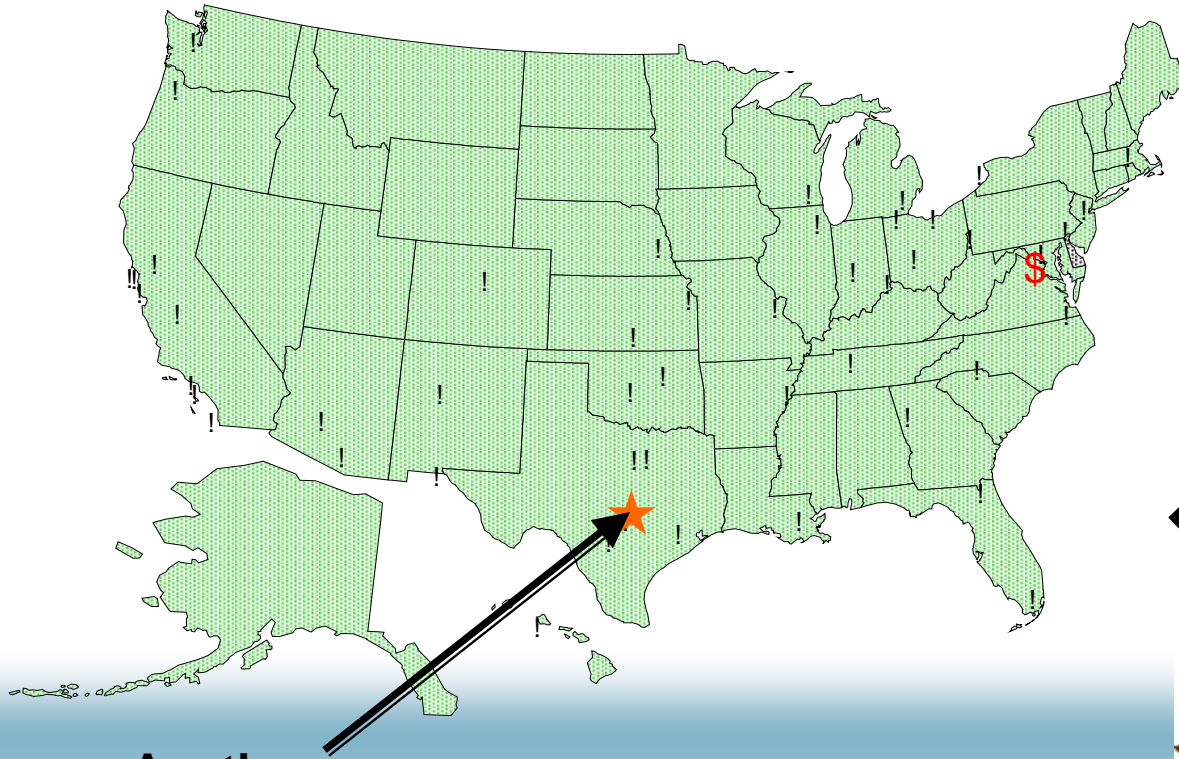
No. of spinoffs from large companies in Silicon Valley  
(cited from AngelList, June in 2015)

Name of company	No. of company that spinoff	No. of alumni who work for spinoffs	lifetime of the parent company (age)	No. of spinoffs they produced per year
IBM	1904	3867	104	18.3
Microsoft	2805	5027	40	70.1
Apple	1150	2488	39	29.4
Yahoo	797	1014	21	37.95
Google	2082	4926	11	189
Facebook	437	1345	17	25.7
Twitter	90	150	9	10

How do spinoffs take place?

How do spinoffs contribute to cluster formation?

# My research covers Austin, Texas



**Austin**

**Population : 842,592人  
(City of Austin, 2013)**

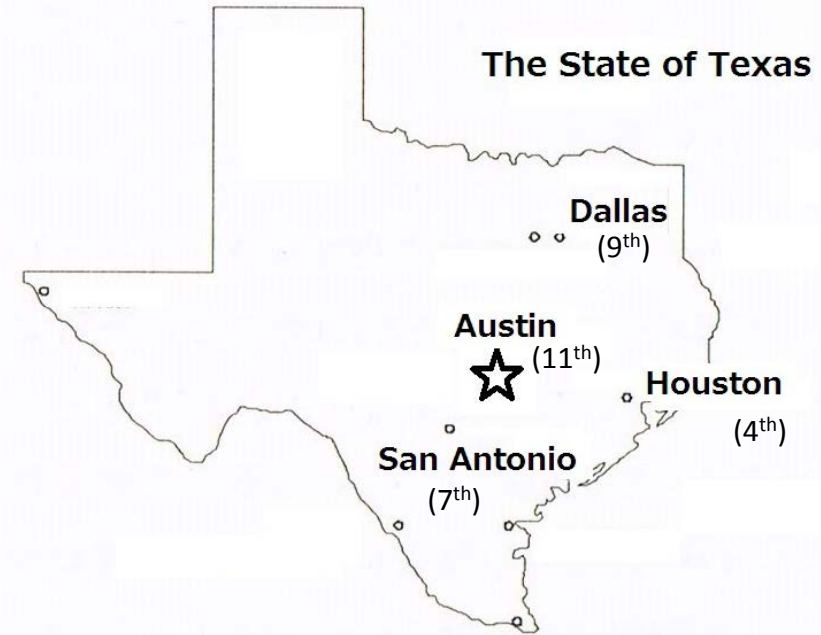


US Census Bureau and the City of Austin.



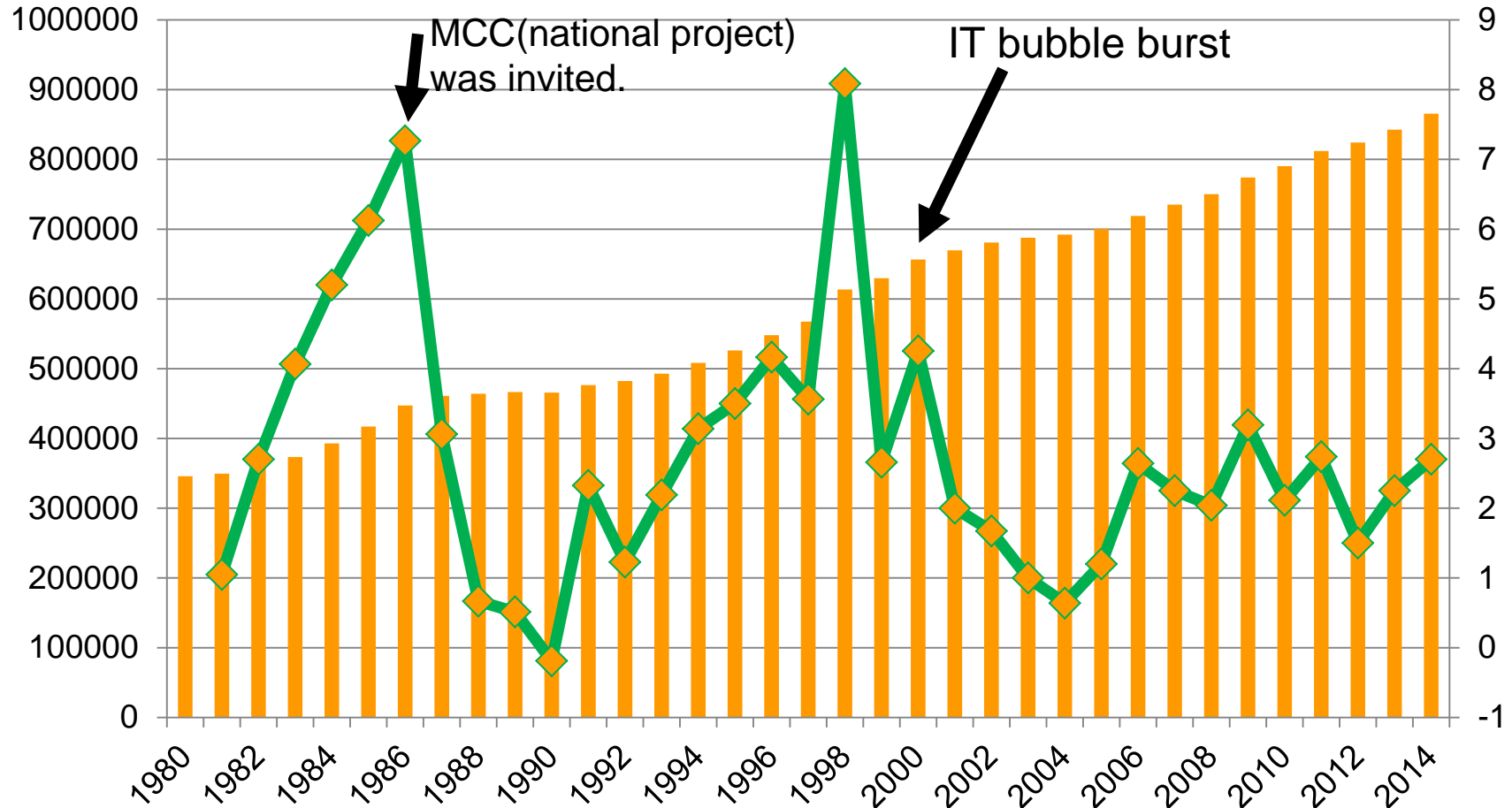
# Most populous cities in the US (2013 census)

	City	State	Population
1	New York	New York	8,405,837
2	Los Angeles	California	3,884,307
3	Chicago	Illinois	2,718,782
4	Houston	Texas	2,195,914
5	Philadelphia	Pennsylvania	1,553,165
6	Phoenix	Arizona	1,513,367
7	San Antonio	Texas	1,409,019
8	San Diego	California	1,355,896
9	Dallas	Texas	1,257,676
10	San Jose	California	998,537
11	Austin	Texas	885,400
12	Indianapolis	Indiana	843,393
13	Jacksonville	Florida	842,583
14	San Francisco	California	837,442
15	Columbus	Ohio	822,553
16	Charlotte	North Carolina	792,862
17	Fort Worth	Texas	792,727
18	Detroit	Michigan	688,701
19	El Paso	Texas	674,443
20	Memphis	Tennessee	646,889



# Population change (City of Austin)

增加率(%)



# Top ten cities in the U.S.

## Easy to live

1. San Francisco (California)
2. Seattle (Washington)
3. Washington D.C.
4. Boston (Massachusetts)
5. Portland (Oregon)
6. Denver (Colorado)
7. New York City (New York)
8. **Austin (Texas)**
9. San Diego (California)
10. St. Paul (Minnesota)

## Easiness of starting business

1. Atlanta (GA)
2. Raleigh (NC)
3. **Austin (TX)**
4. Tulsa (OK)
5. Oklahoma City (OK)
6. Tampa (FL)
7. Seattle (WA)
8. Minneapolis (MN)
9. Houston (TX)
10. Omaha (NE)

# Top Ten cities in the U.S.

## Rapid growing city

1. **Austin(TX)**
2. Raleigh(NC)
3. Phoenix(AZ)
4. Dallas(TX)
5. Salt Lake(UT)
6. Denver(CO)
7. Ogden(UT)
8. Charlotte(NC)
9. Orland(FL)
10. Houston(TX)

Forbes(2014)

## Best city for job searchers

1. **Austin(TX)**
2. Washington D.C.
3. Fort worth(TX)
4. Denver(CO)
5. Charlotte(NC)
6. Raleigh (NC)
7. Omaha(NB)
8. Minneapolis(MN)
9. Oklahoma City(OK)
10. San Antonio (TX)

Nerd Wallet rank (2014)

# Largest employers in Austin

1984	2000	2009
The University of Texas at Austin	The University of Texas at Austin	The University of Texas at Austin
City of Austin	<b>Dell Computer Corp.</b>	<b>Dell</b>
Bargstrom Air Force Base	<b>Motorola, Inc.</b>	<b>IBM</b>
Austin Independent School of District	City of Austin	<b>Freescale Semiconductor</b>
<b>IBM</b>	Austin Independent School of District	IRS/Austin Center
<b>Motorola, Inc.</b>	HEB Grocery Co.	<b>AT&amp;T</b>
Internal Revenue Service	Seton Healthcare	<b>Apple</b>
<b>Texas Instruments, Inc.</b>	<b>IBM</b>	<b>National Instrument</b>
Texas Department of Human Resources	IRS/Austin Center	<b>AMD</b>
Southwestern Bell Telephone Co.	<b>Advanced Micro Devices, Inc.</b>	<b>Flextronics</b> 21

# Key industries in Austin (early 2000s)

## ① Semiconductor

-AMD, Motorola, Samsung, Tokyo Electron,  
Applied Material, Cirrus Logic  
(Large companies + ventures)

## ② PC & peripherals

Dell

## ③ Software

IBM, Tivoli Systems, Trilogy

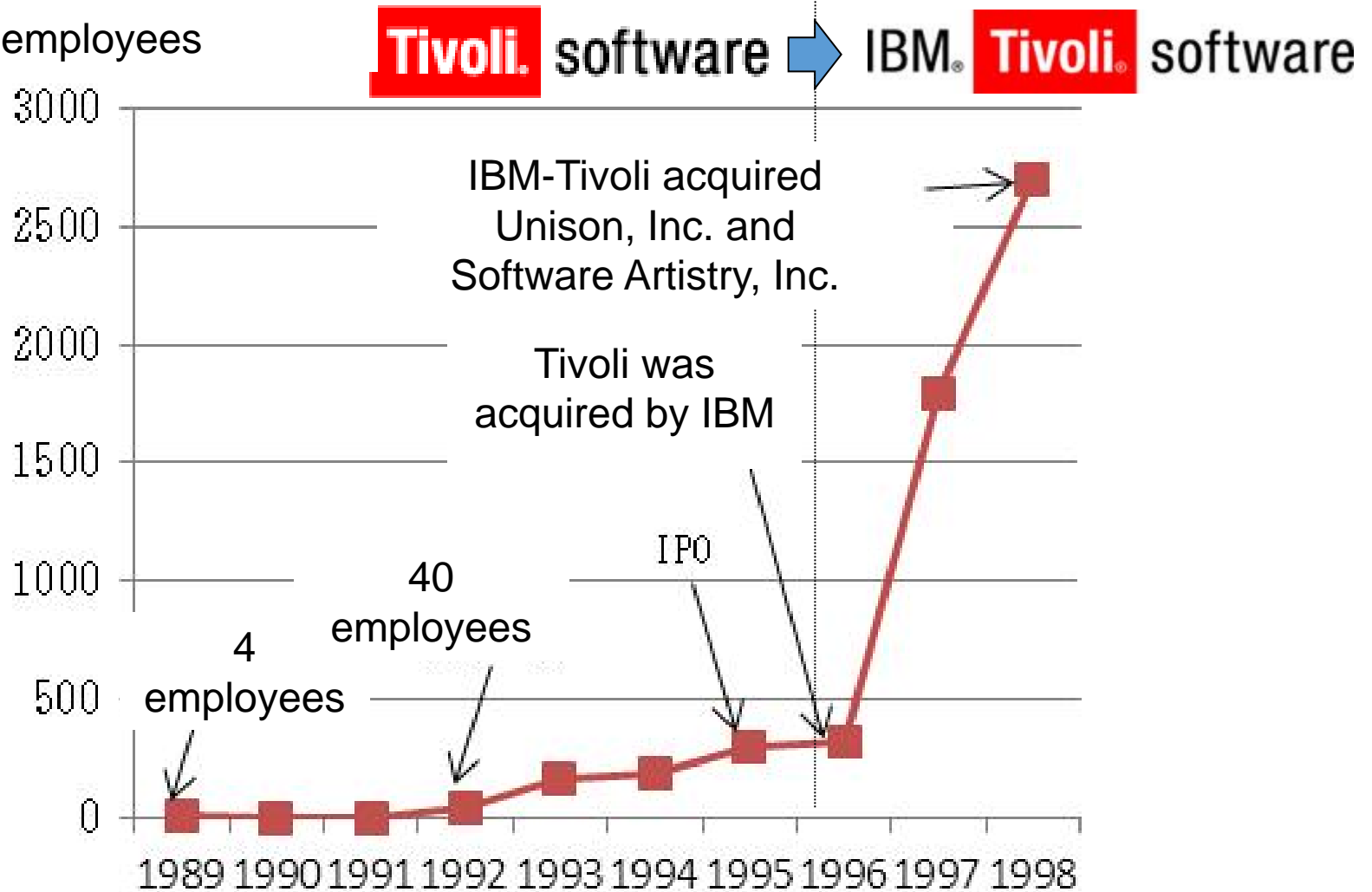
(About 500 companies; most of them were SMEs)

# About Tivoli Systems

- During the cluster development in Austin, the spin-off phenomenon was triggered by Tivoli Systems
- Tivoli was founded by four former employees of IBM-Austin in 1989.
- Tivoli was the first Austin-based company to receive top-notch venture capital in California, and it achieved remarkable success (IPO in 1995).
- In 1996, Tivoli was purchased by IBM for \$743 million
- The acquisition of Tivoli triggered an exodus of its employees

# Tivoli has grown rapidly after M&A.

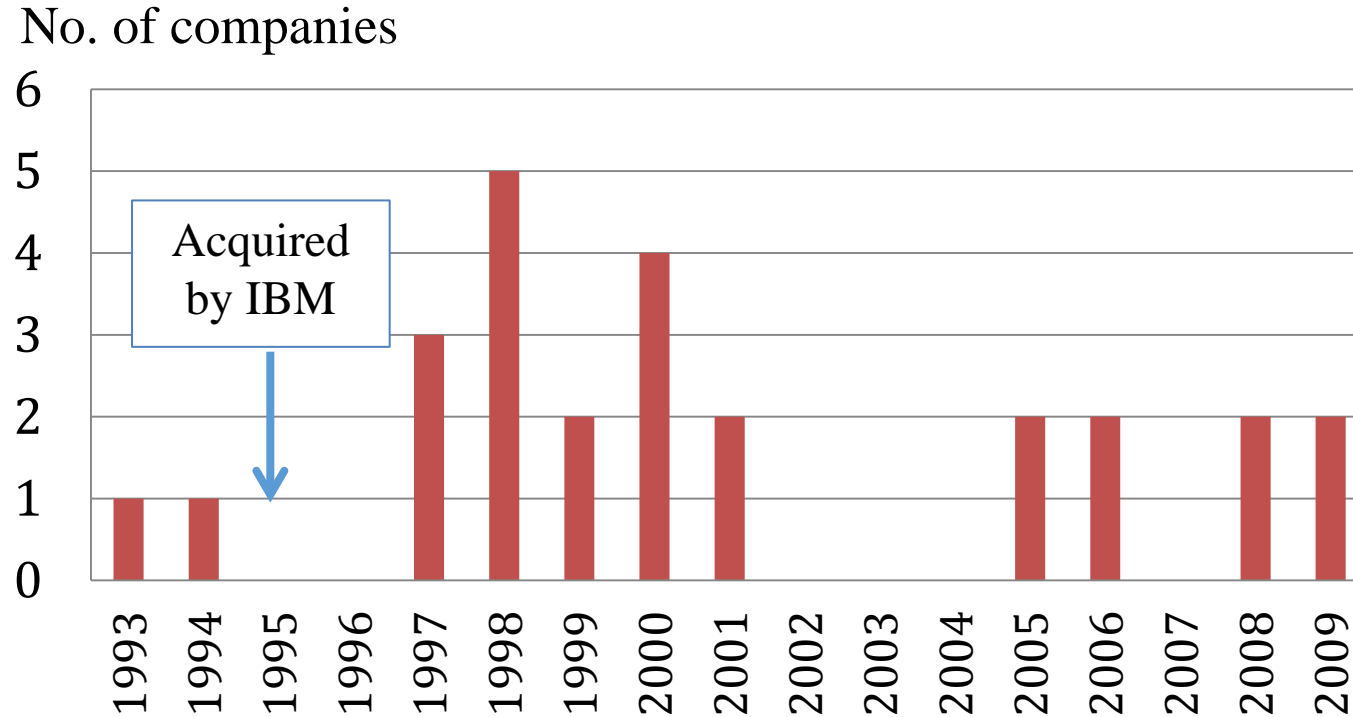
No. of employees



Source: Austin Business Journal, Book of Lists



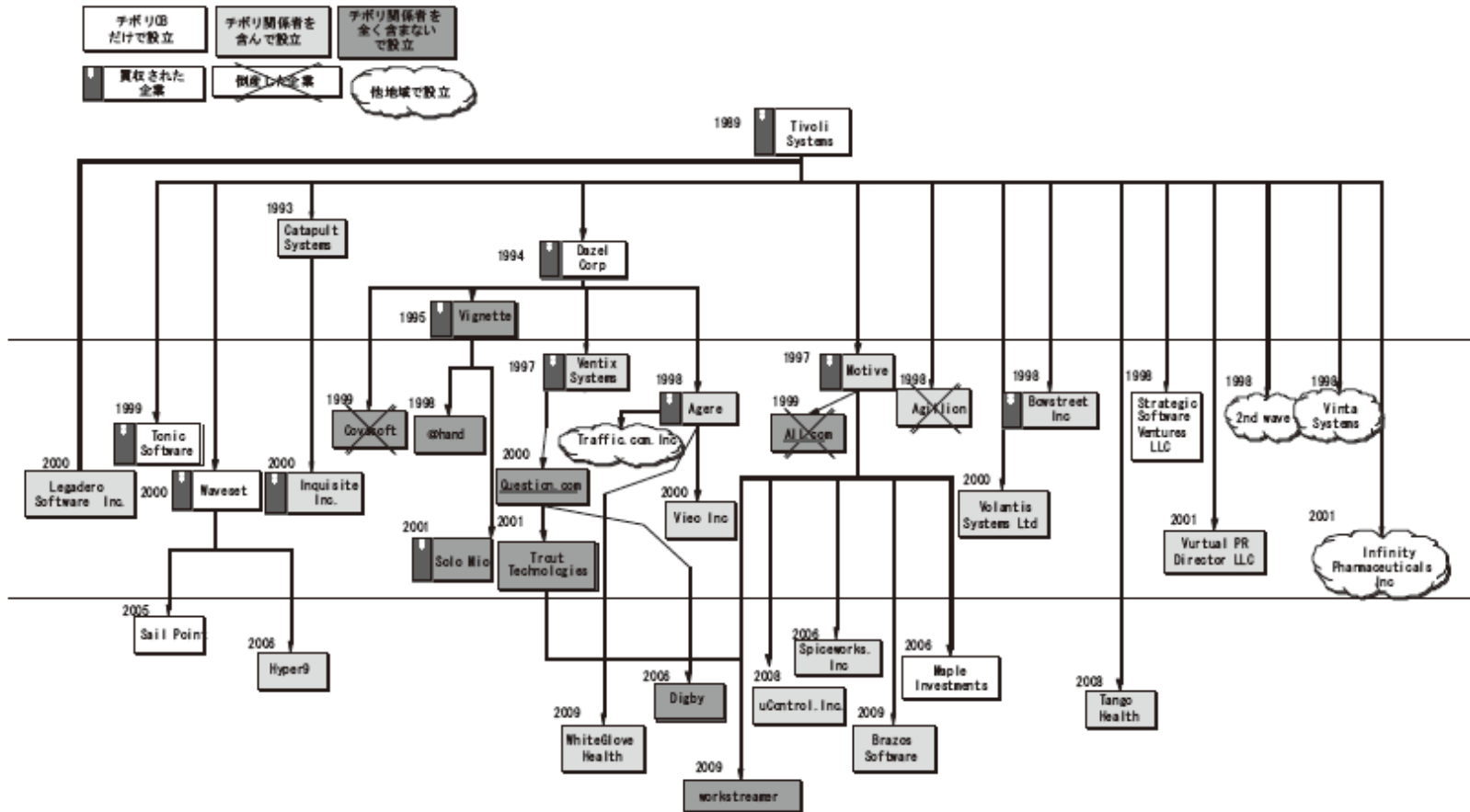
# Number of spinoffs from Tivoli Systems



Source: author-created

26 companies were spun off and 37 Tivoli retirees were involved in them

# Spinoffs from Tivoli Systems in Austin(1989-2009)



# Previous jobs of 37 founders who setup spinoffs from Tivoli Systems

- Experience of setting up companies . . . **4 persons**
- Experience of working large companies . . . **19**
  - IBM . . . **7**
  - Apollo computer . . . **3**
  - Apple . . . **3**
  - TI (Texas Instrument) . . . **2**
  - Lockheed Corporation . . . **2**
  - UniSQL . . . **2**

Their experiences at Tivoli might change their lives.

# Relation with Tivoli systems and spinoffs

- I think best thing to describe is the, **Tivoli doesn't support financially any of these (spinoffs)**. Not financially, not invest into any of these companies. I think it is fair to say the number of cases we have supported people that our running these companies. **By sharing experiences, know-how, and giving them a good advise**, none of them is good and for startup people, but not experience it comes to, you know, establishing smooth running lessons after they developed their products.

( interview from IBM-Tivoli, Advisor, Jahn Lindow )

- Exchanging and sharing ideas, not supporting money.
- Due to separations of businesses areas between IBM-Tivoli and startups, they were not in competitive relationship.
- There are some comments that the spinoffs could provide next job for IBM-Tivoli employees.

# Success rate of spinoffs (as of January 2013)

- **Number of spinoffs backed by VC**

- ▪ ▪ **20 spinoffs / 26 total (about 77%)**

- Six companies that were not backed by VCs, because
    - One was founded in a foreign country,
    - Two were VCs themselves.
    - Three were consulting firms.

- **Exit strategy**

- **M&As ▪ ▪ ▪ 10 spinoffs / 26 total (38.5%)**

- \*Before 2000 (in the middle of IT bubble):

- 12 spinoffs / 16 total (75%)

- **Failure ▪ ▪ ▪ 2 spinoffs / 26 total (7.6%)**

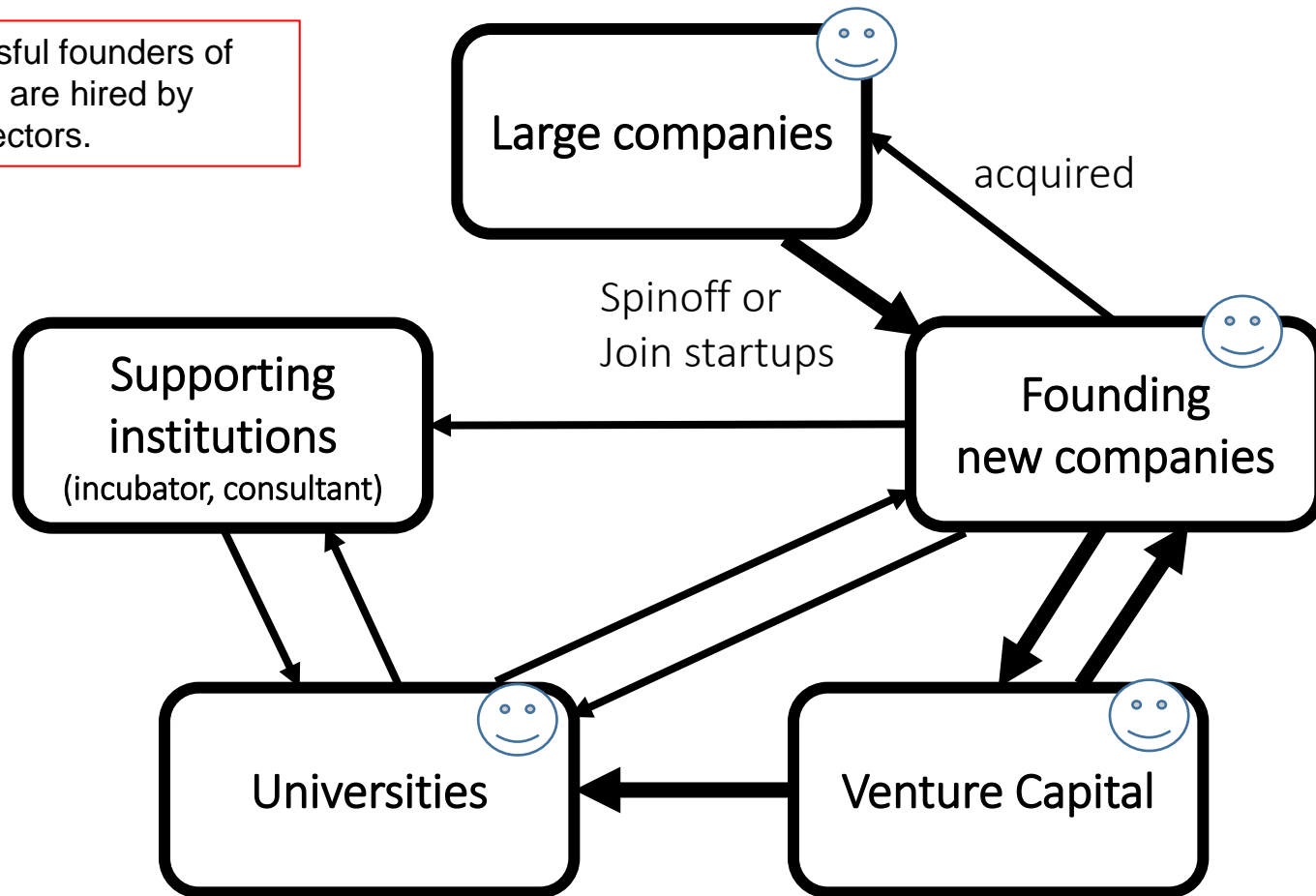
## Tivoli retirees who became VCs (as of 2009)

Name of retiree	VC attended
David Lee	Emergent Technologies Fund IV Sentient Ventures, Murphree Venture Partners
Eric Ruthfus	TL Ventures, Guggenheim VC
Frank Moss	Strategic Software Ventures LLC
Mark McClain	Austin Ventures
Martin Neath	Adams Capital Management, Inc.
Mike Maples	Maples Investment
Mike Turner	AV Lab
Robert Fabbio	TL Ventures (Austin Branch), Austin Ventures
Scott Harmon	Austin Ventures
Ford Tammer	Khosla Venture
William Bock	CenterPoint Ventures

Source: author-created

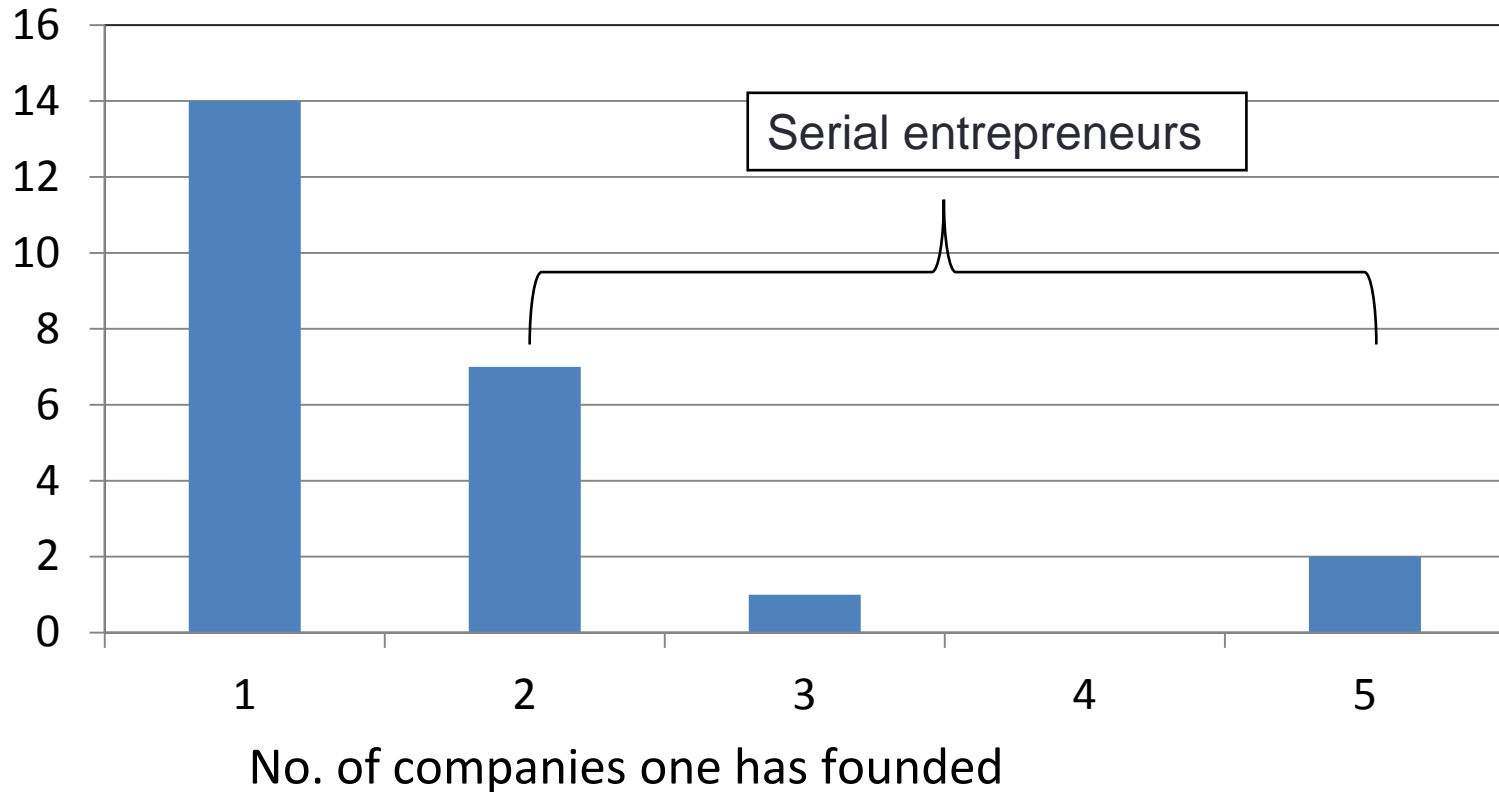
# Career Circulation of spinoffs' founders

Successful founders of spinoffs are hired by other sectors.



# Number of spinoffs founded by former Tivoli employees

No. of persons



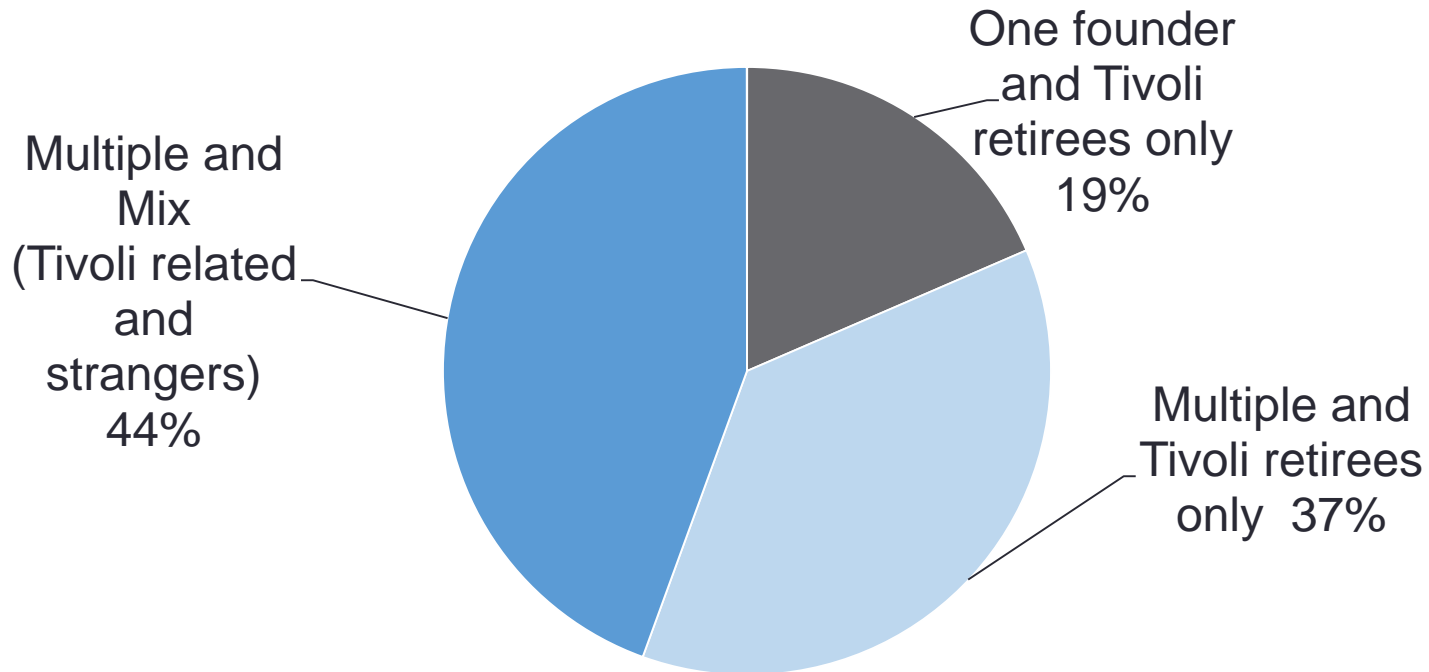
Source: author-created

10 serial entrepreneurs are identified

\*13 former employees of Tivoli founded a company and involved in the second company as a board member, not a founder.



# Composition of spinoff founders



Source) author-created

- (1) 81% co-founded their companies rather than opting for sole proprietorship
- (2) 44% chose to co-found with strangers or novice entrepreneurs

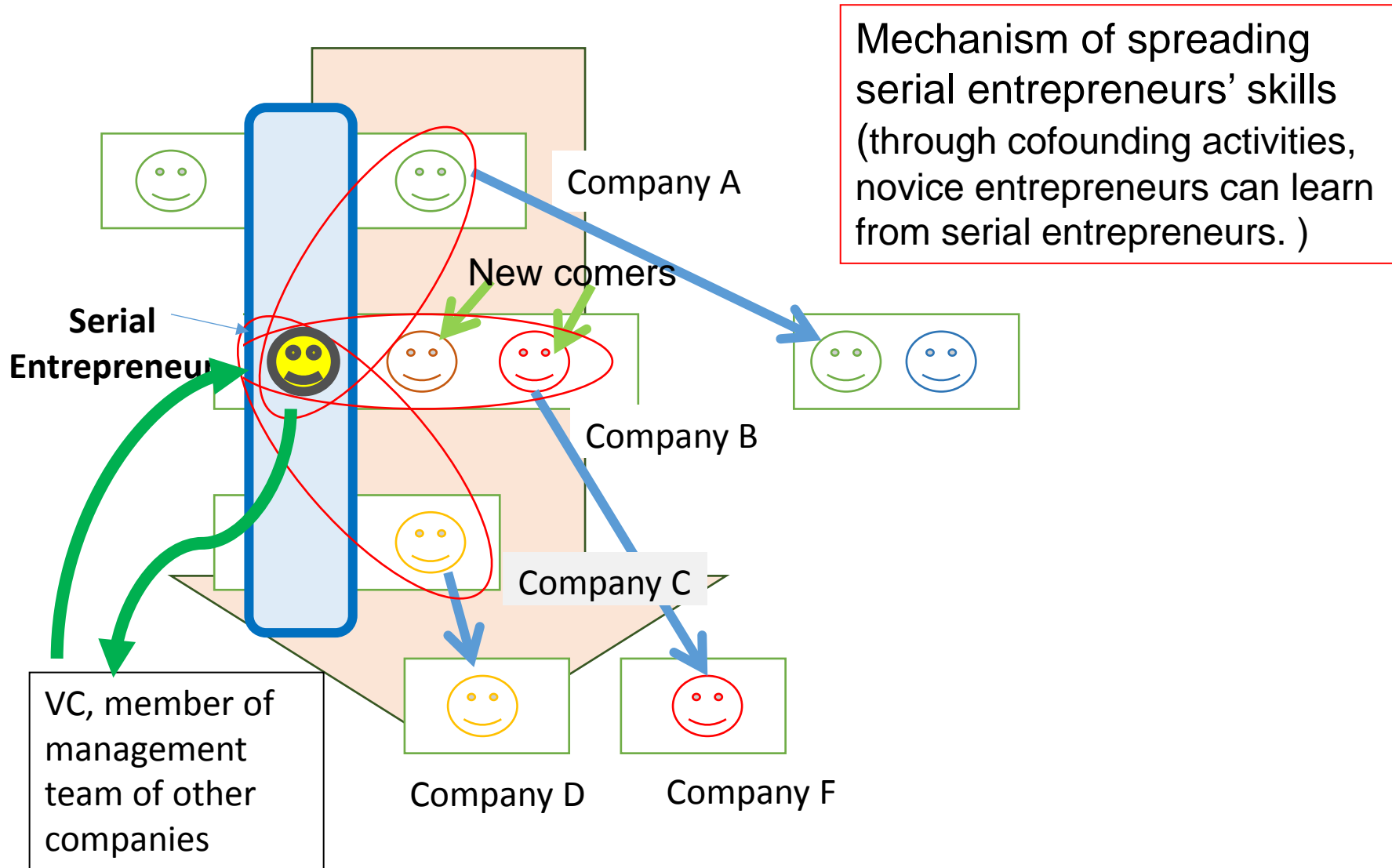
# Performance of spinoffs with serial entrepreneurs

The success (M&As, IPOs) rate of spinoffs that included serial entrepreneurs in the founding team is higher than those not including serial entrepreneurs

Spinoffs with serial entrepreneurs --- 46.7 %

Spinoffs without serial entrepreneurs --- 27.0%

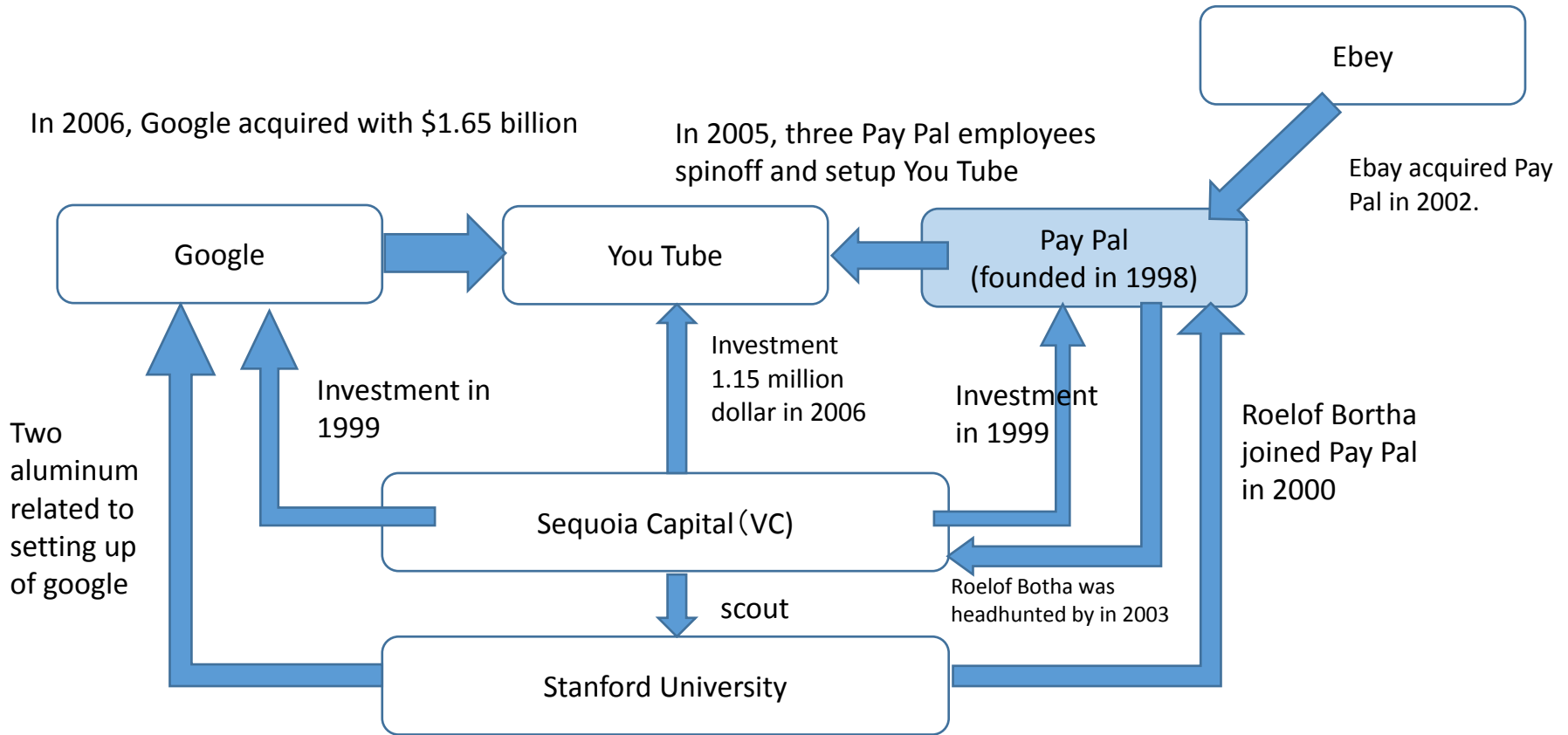
# Ring-toss model of knowledge sharing



# Key mechanism for creating high-tech cluster (lessons learned from Tivoli's case)

- **Spinoff from large company** is an efficient way to form clusters.
  - Spinoffs can take advantage of their parent companies' routines and knowledge (Agrawal et al. 2004).
  - Spinoffs can enjoy networks that established in their parents' companies and trust that parent companies hold.
- **Career Circulation of entrepreneurs** do good for spinoffs.
  - Entrepreneurs can acquire a variety of perspective with a gamut of experience, which would contribute to set up new spinoffs.
  - Asymmetry of information is partly mitigated.
  - Entrepreneurs can establish support networks for their future careers.
- Role of serial entrepreneurs is important; especially sharing experiences with novice entrepreneurs through **co-founding** is effective for success.
  - Co-founding activities between serial entrepreneurs and novices would facilitate inheritance of know-how and network.
  - The mutual learning on the part of entrepreneurs facilitates the creation of spinoffs and their success, in turn facilitating cluster growth

# How does human network work in Silicon Valley





# Japanese high-tech cluster formation

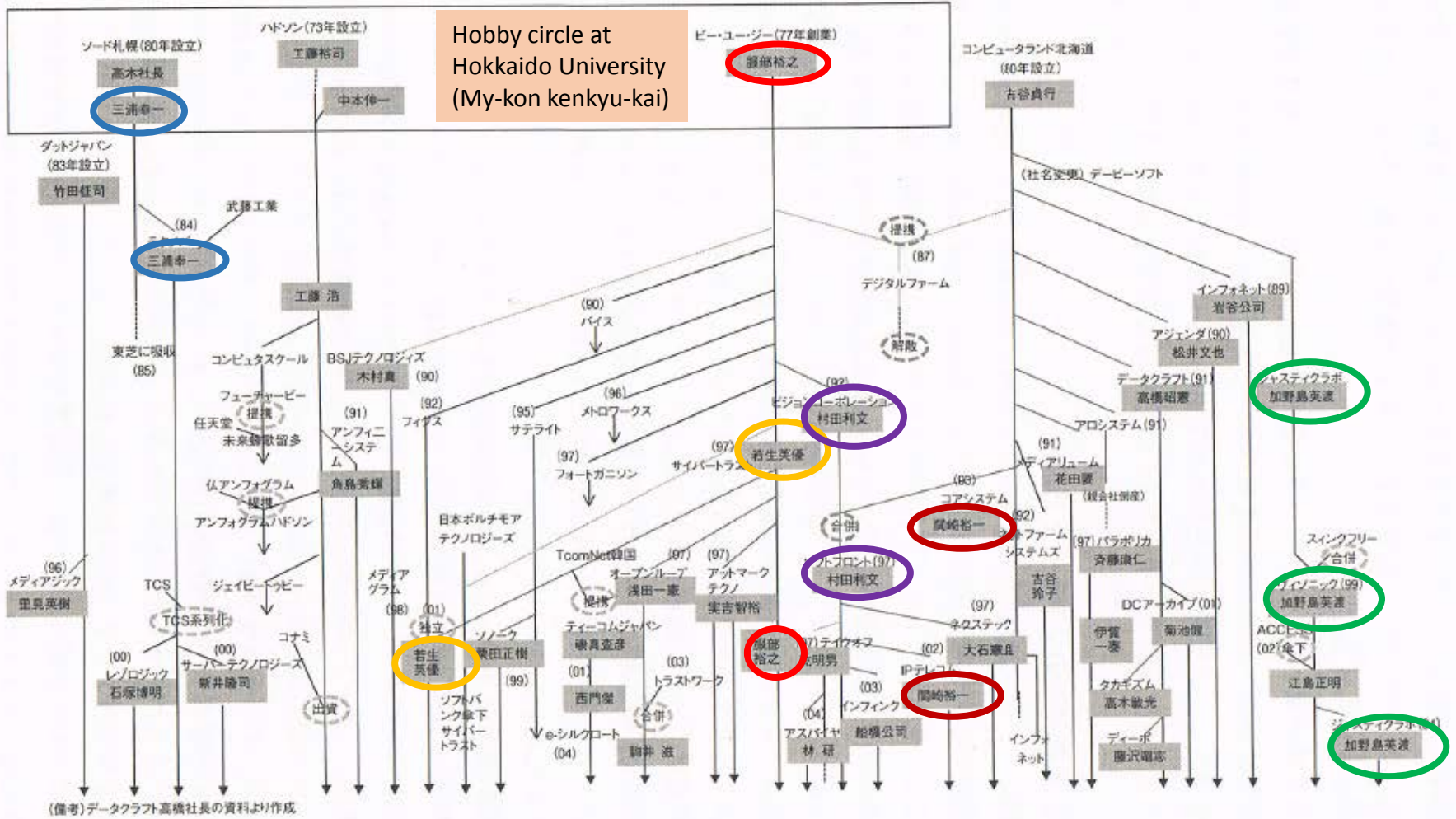
# Japanese high-tech cluster formation

- Existing & traditional (Keiretsu based) industries' transformation
  - Synthetic fiber industry ⇒ automobile industry
  - Metal houseware industry ⇒ titanium processing industry (e.x. medical devices, golf club shaft)
  - Textile industry ⇒ chemical or new material industry
  - Automobile industry ⇒ aerospace industry etc...
- Government initiated cluster formation
  - Knowledge cluster initiative (by MEXT)
  - Industrial cluster project (by METI)
- Voluntarily started cluster formation through spinoffs
  - Hamamatsu cluster (Nagayama, 2012)
    - Spinoffs from Yamaha Motor (motor bike ⇒ software)
    - Spinoffs from Hamamatsu photonics (photonics industry related)
  - Sapporo IT cluster (Kanai, 2005)
    - Spinoffs from BUG (or Hokkaido University) (software)



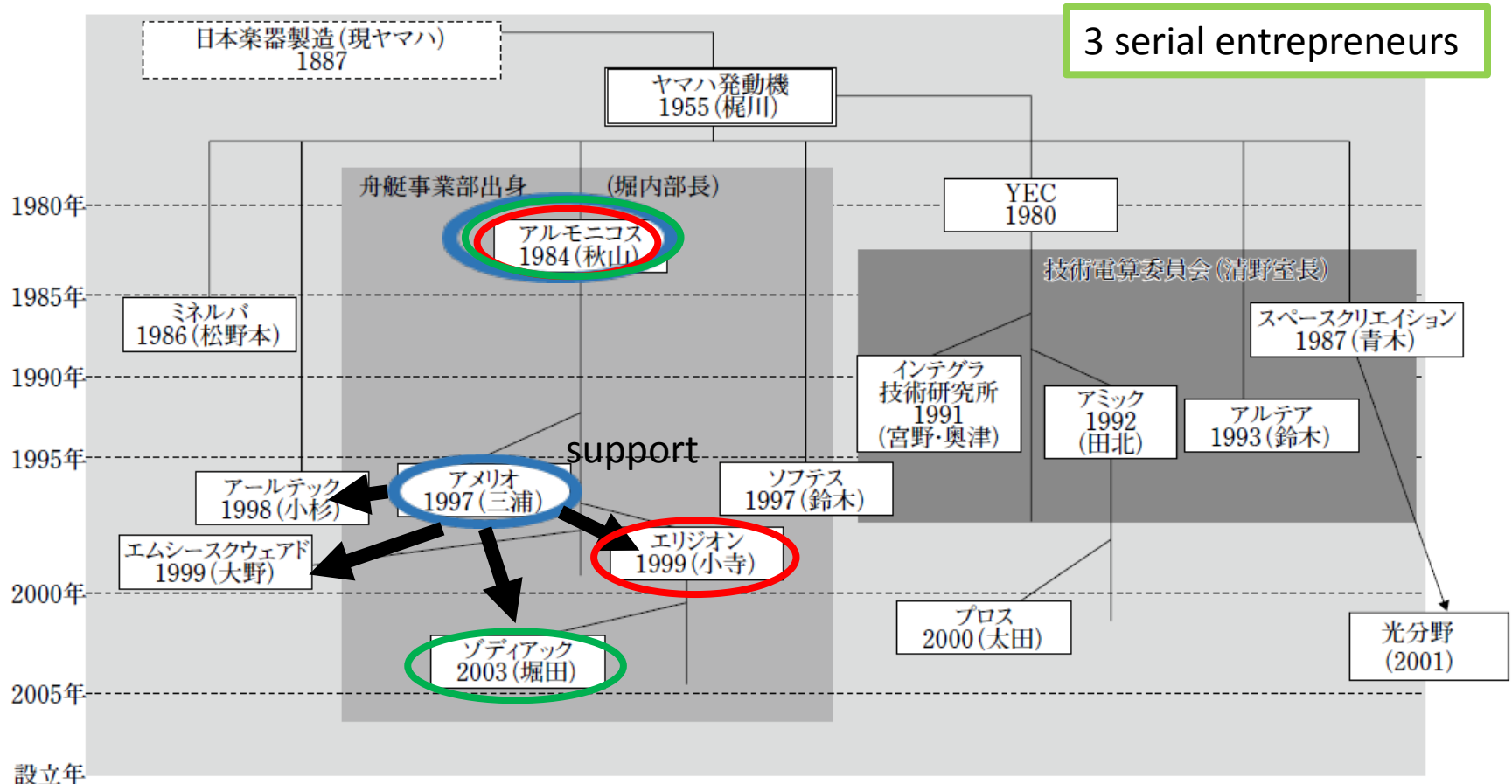
# Sapporo IT cluster

6 serial entrepreneurs



Source) Nagayama (2012) p.138 (original data comes from Datacraft Co.)

# Yamaha Motor Co. spinoff tree (the 3D image processing software industry)



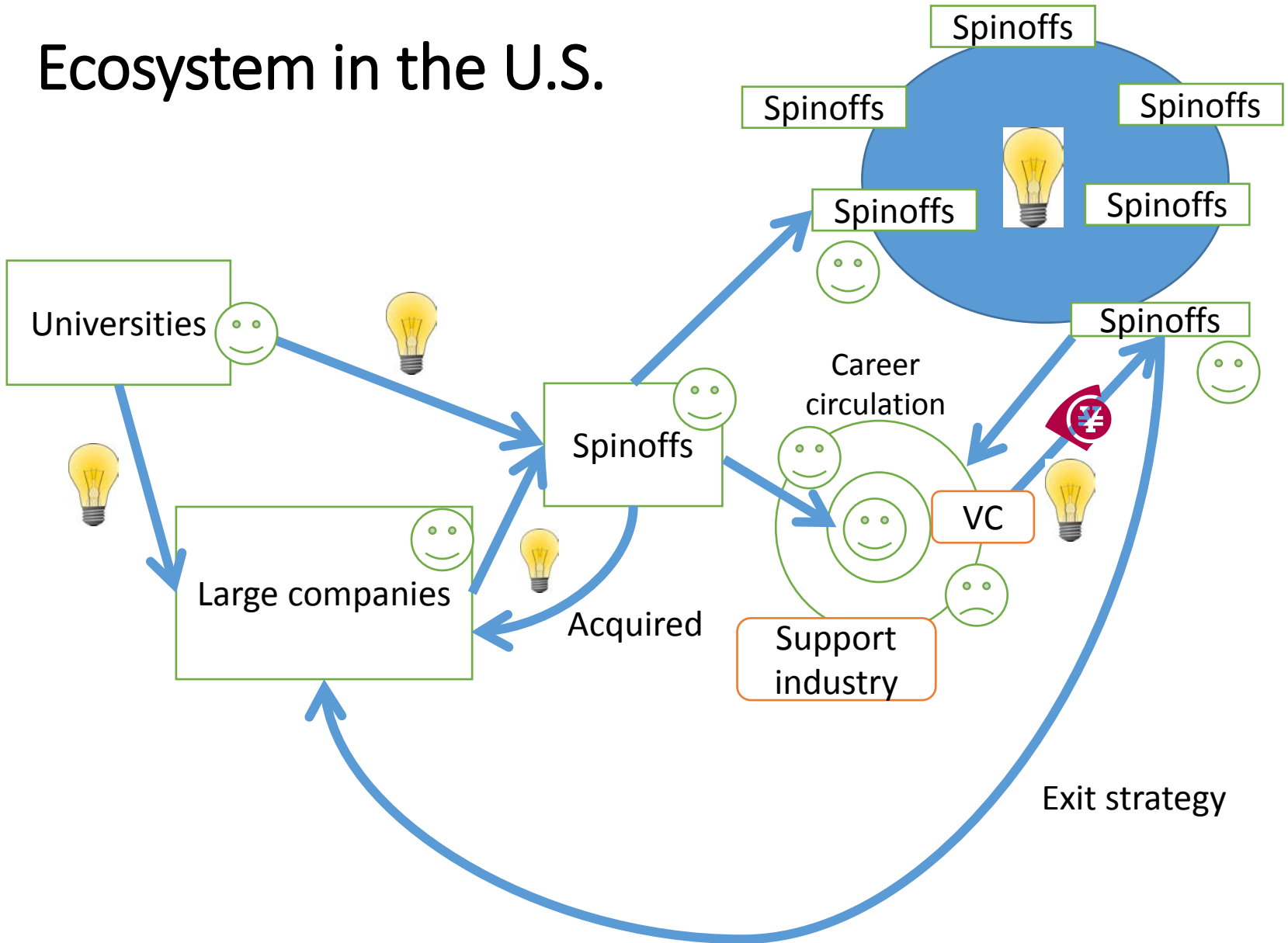
(注) ( ) は社長名、敬称略  
(備考) 各社に対するヒアリングより作成

source) Nagayama (2007) p.16

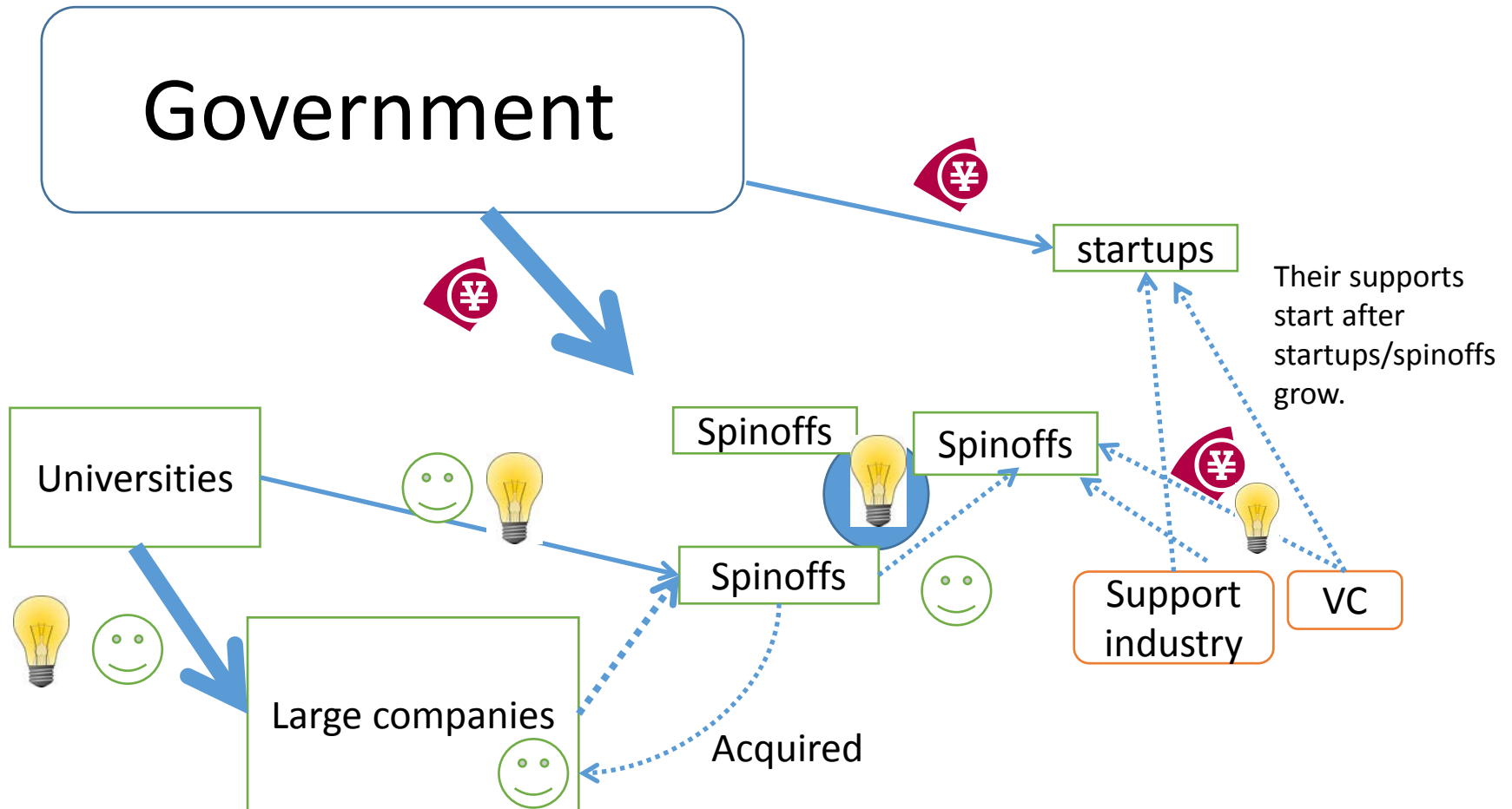
# Comparison

	Sapporo	Hamamatsu
year of start	Around 1973	Around 1980
Parent organization	Hobby Circle at Hokkaido University	Yamaha Motor Co.
Serial entrepreneurs and their role	6 Some serial entrepreneurs hold study groups and business meetups for meeting other entrepreneurs (such as Biz Café, Cool village, NCF).	3 One serial entrepreneur (Mr.Miura) become a supporter for novice entrepreneurs.
Relationship among entrepreneurs	Community of practices are open at community level.	Community of practice is limited to persons related Yamaha Motor. (apprentice system)
Exit strategies	3 IPO, 1 M&A, 1 Merger	—
Entrepreneurs' career change (experiences in other area)	No	No
Relations with Large companies	customers and partners	customers
Other supporting entities	Local government and MEXT	unseen

# Ecosystem in the U.S.



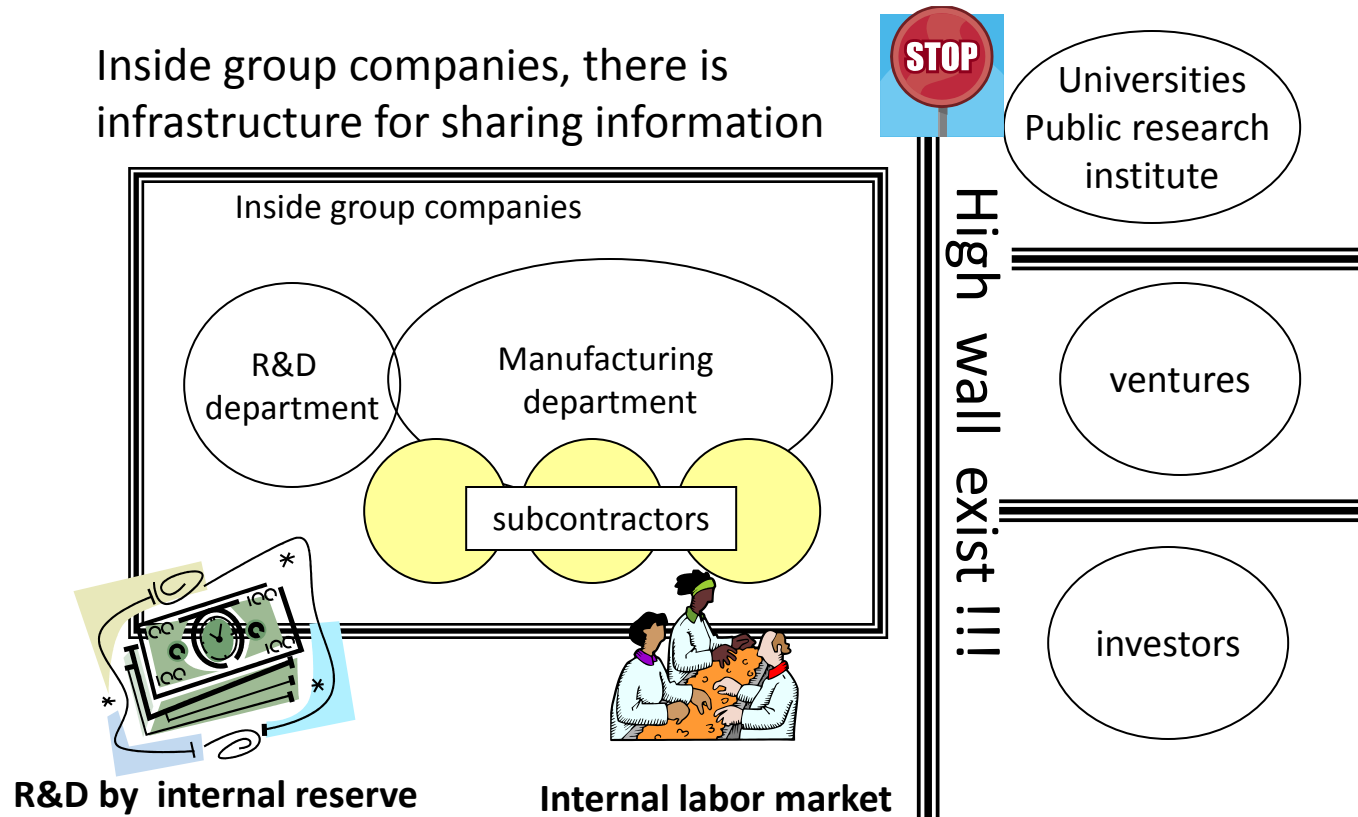
# Ecosystem in Japan



Relation between large companies and startups  
in transition

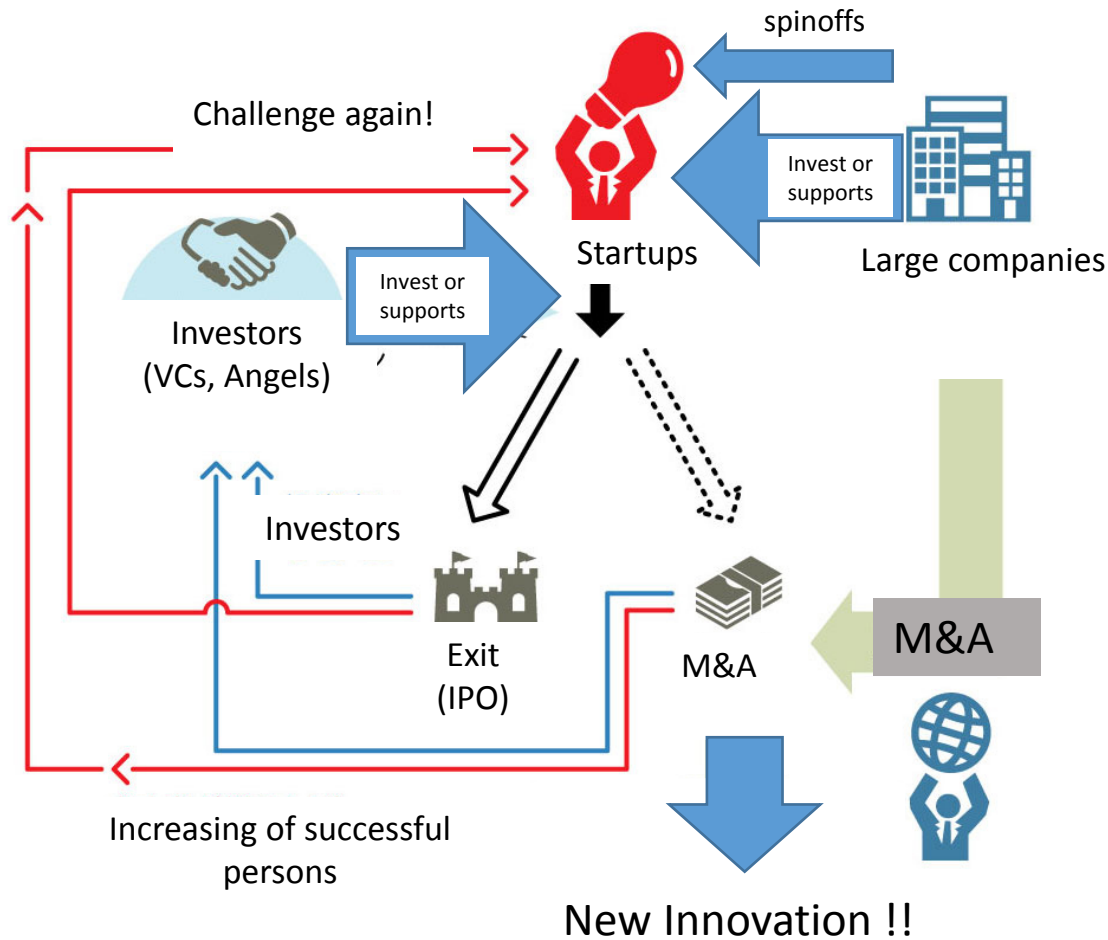
# Japanese closed innovation system

Inside group companies, there is infrastructure for sharing information



Source) Motohashi (2005)

# How to make a positive growth cycle?





# Large companies try to get closer to startups providing fund and mentor service to startups.

Name of company	founding year	Million yen	service
GMO internet	2005	280	GMO venture partners
Cyberagent	2006	800	Cyberagent ventures
GREE	2011	200	Gree ventures
KDDI	2011 2012	500	Collaboration space with mentor (KDDI∞Labo), KDDI Innovation Fund
Yahoo!	2012	100	YJ capital,
NTT docomo	2013	1000	Collaboration space (Domoco Innovation Village), domoco innovation fund
Fuji broadcasting	2013	150	Fuji startup ventures, Fuji startup fund
Recruit	2014	4500	RGIP LLC. (fund) *invest internationally

# KDDI ∞ (mugen) Labo

- KDDI provides a three-month business incubation program, which was started in 2011.
- Every three months, five candidates are selected with 3 months of hands-on support.
- KDDI provides a creative working space, weekly presentation with experienced advisers and mentors, profession experts of legal& accounting, hands on support, internal survey, open meeting, and demo-day.
- Other 13 large companies joined this program and they provide mentor service to the candidates.
- 35 companies have graduated (as of 2015, Jan).

# KDDI∞Labo graduates' projects (7<sup>th</sup>)

Name of service	Concept of service	Mentor company
Dr. JOY	Closed Medical SNS connecting doctor, patients and their family, and Pharmaceutical companies.	MitsuiBussan KDDI
Possam Gossam (meleap)	Vertical reality game using smartphone, wearable devices	TV Asahi KDDI
BooksOnDemand	Platform service for publishing books.	Kokuyo KDDI
Fem (AddQuality)	Platform service synchronizing service, Using imaging analysis and AI	Seven & I holdings KDDI
Sakaseru	EC platform for flower business	Plus KDDI

<http://itpro.nikkeibp.co.jp/atcl/news/14/092401046/>

# Morning Pitch

- Tohatsu Venture support and Nomura Securities Co., hold business matching event, "Morning Pitch".
- It started in 2013, Jan.
- Morning Pitch is held every Thursday, a.m.7:00-9:00 at Shinjuku.
- Tohatsu selects five promising startups under a specific theme as presenters.
- Five companies make pitches and had Q&A times in Morning Pitch. After each meeting, a small morning meeting is held for matching.
- Total 350 startups have been on the stage and more than 3000 companies attended as audiences(as of 2015 March).
- The distribution of audiences is as follows;
  - **Private companies (large) 61%**
  - **Media 19%**
  - **Financial institute (bank, VC)17%**
  - **Government 3%**
- About 50 matches were established per year (as of 2015, March).



# What we need ?

- Utilize serial entrepreneurs' skill effectively.
  - Be aware that entrepreneurship is limited & precious resource in Japan.
  - Try to increase the number of entrepreneurs.
  - Establish "Community of practice" for entrepreneurs
- Facilitate career transitions between various sectors such as;
  - Startups and large companies
  - Universities, companies, financial institutions, government...
  - Natural Science and Social Science
- Mentality change
  - Respect local initiative (Don't depend on subsidy)
  - Remove allergy to startups and outside resources (in large companies)
- Stop excessive compliance
  - Too much red tape kill real entrepreneurs, losing trust and time.

# “Trust your crazy idea!”

New Orleans show “transformation from victimized city to the city of entrepreneurs” for 10 years.

