Understanding Silicon Valley and Startup Ecosystems: New Research and Academic Classics You Should Know

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SSVNJ Project Components

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2. Research and Publication

3. Policy Analysis and Implementation

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RELEVANT RECENT RESEARCH PAPERS

THEME: SILICON VALLEY


  - Introduction - Silicon Valley Ecosystem Report
  - The Silicon Valley Ecosystem
  - Where is Silicon Valley

Silicon Valley Ecosystem Essential Reading list
Essential Reading List – Synthesis

*Understanding Silicon Valley: Anatomy of an Entrepreneurial Region*

*Public Universities and Regional Growth: Insights from the University of California*

*Inventing the Entrepreneurial University: Stanford and the Co-Evolution of Silicon Valley* (アントレプレナーの地域:スタンフォード大学とシリコンバレーの共生と進化)." By Timothy Lenoir, 2004

*Regional Advantage: Culture and Competition in Silicon Valley and Route 128*

Essential Reading List - Synthesis


“30 Years after Bayh-Dole: Reassessing Academic Entrepreneurship” by Rosa Grimaldi, Martin Kenney, Donald S. Siegel, and Mike Wright. Research Policy, 2011.

The Rise and Fall of Urban Economies: Lessons from San Francisco and Los Angeles. By Michael Storper, Thomas Kemeny, Naji Makarem, Taner Osman

## Key Characteristics of the Silicon Valley Ecosystem

<table>
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<tr>
<th>Characteristic</th>
<th>Description</th>
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<tr>
<td>Dual ecosystem of large firms and small, fast-growth startups</td>
<td>Top class universities</td>
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<td>Highly competitive industries, balancing between “open innovation” and secret protection</td>
<td>Extensive government role in shaping technological trajectories and basic science</td>
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<td>High financial returns for successful entrepreneurs and startups’ early employees</td>
<td>Business infrastructure (law firms, accounting firms, mentors, etc.)</td>
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<td>Finance and governance of startups by venture capital</td>
<td>Acceptance of failures (effective evaluation and monitoring)</td>
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<td>High level and diverse human resources for all stages of startups</td>
<td>Legal platform</td>
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<td>High labor mobility (at all levels)</td>
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History (matters)

How Silicon Valley Came To Be by Timothy Sturgeon

Silicon Valley is nearly one hundred years old. It grew out of a historically and geographically specific context that cannot be re-created.

Silicon Valley’s development is intimately entwined with the long history of industrialization and innovation in the larger San Francisco Bay Area.

The characteristics of early Bay Area electronics companies closely match the structure of industrial organization so widely hailed in Silicon Valley today, albeit on a much smaller scale.

- A leading role for local venture capital;
- a close relationship between local industry and the major research universities of the area;
- a product mix with a focus on electronic components, production equipment, advanced communications, instrumentation, and military electronics;
- an unusually high level of interfirm cooperation;
- a tolerance for spinoffs; a
- nd a keen awareness of the region as existing largely outside the purview of the large ponderous, bureaucratic electronics firms and financial institutions of the East Coast
- all of these well-known characteristics of Silicon Valley were as much in evidence from 1910 through 1940 as they have been from the 1960s onward.
Historical Role of Military

The Biggest “Angel” of Them All: The Military and the Making of Silicon Valley
by Stuart Leslie

Silicon Valley owes its present configuration to patterns of federal spending, corporate strategies, industry-university relationships, and technological innovation shaped by the assumptions and priorities of Cold War defense policy.

• It may not be too much exaggeration to say that the Department of Defense was the original “angel” of Silicon Valley.
  • At a time when six-figure venture capital investments were still considered risky by West Coast standards, a start-up company such as Varian Associates could routinely attract million-dollar-plus contracts from the U.S. Air Force or Navy.
  • Even better, from a corporate point of view, defense contracts generally meant a production contract along with an R&D contract, and so a guaranteed market. Add in the additional incentive of cost-plus contracts, virtually eliminating risk, and it is not hard to understand why so few start-ups saw the need to pursue traditional venture capital or public stock offerings, at least in the beginning.
Business Infrastructure

Dealmakers and Counselors: Law Firms as Intermediaries in the Development of Silicon Valley by Mark Suchman

Silicon Valley’s business lawyers play several important roles in the developing organizational community. At the most general level, local law firms use their distinctive structural positions to mediate crucial flows of operational resources and constitutive information within Silicon Valley’s larger interorganizational network.

(a) Dealmaker
   › link their clients to potential transaction partners (and other pools of operational resources), facilitating the survival and growth of individual companies and structuring patterns of access, symbiosis, and competition within the community as a whole.

(b) Counselors:
   • link their clients to potential role models (and other pools of constitutive information),

(c) Gatekeepers:
   • withhold community resources from inappropriately constituted deviants.

(d) Proselytizers:
   • promote community transactions among uninitiated novices.

(e) Matchmakers:
   • sort and steer transaction-seekers according to community typologies
Venture Capital – the Lynchpin

Venture Capital in Silicon Valley: Fueling New Firm Formation
by Martin Kenney and Richard Florida

- Venture capital in Silicon Valley grew by a process of combination, division, and incessant networking. Successful enterprises gave rise to wealthy entrepreneurs who would become venture capitalists, and existing venture capital funds gave rise to new venture funds in a virtuous cycle of investment, growth, and capital accumulation. In this sense, venture capital in Silicon Valley developed far more organically than did a similar community in Boston, where financial institutions and the strategic efforts of key elites played an important formative role.

- Silicon Valley venture capitalists adapted and perfected what is arguably the single most important organizational innovation of the modern venture capital system—the limited partnership model. Silicon Valley venture capitalists use the limited partnership as a vehicle to mobilize funds from institutional investors, while providing the opportunity for the venture capitalists to benefit handsomely from their successes through the carried interest provision.

- The limited partnership and increased pension fund investment forced an increasing professionalization of the venture capital industry.

- Venture capital played a critical role in incubating entrepreneurial activity, attracting entrepreneurs, accelerating rates of new business formation, and stimulating regional growth and development.

- The capital and wealth generated permitted the local informal investors to self-organize into a self-conscious venture capital industry. As they became an institution, they also reorganized their environment.
Silicon Valley: the most important geographic region not shown on a map

Originally "Silicon Valley"

Stanford University

UCSF Medical Center

Broader Silicon Valley Ecosystem

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Income Disparity
Labor Mobility – Porous Corporate Boundaries

High-Technology Agglomeration and the Labor Market: The Case of Silicon Valley by David Angel

Silicon Valley firms meet the majority of their labor requirements swiftly and at low cost by hiring skilled and experienced workers from the local labor market. Fluid employment relations and efficiencies in search and mobility within the local labor market provide Silicon Valley firms remarkable flexibility in meeting their labor demands and help to ensure a rapid circulation of knowledge and information within the production complex.

Regional Advantage: Culture and Competition in Silicon Valley and Route 128

The New Argonauts: Regional Advantage in a Global Economy
“Flexible Recycling” of People and Resources

Flexible Recycling in an High-Technology Entrepreneurship
by Homa Bahrami and Stuart Evans

• Once the ecosystem in which firms operate reached a critical mass, the evolution of existing firms and the creation of new entities produced a dynamic domain in which the processes of firm formation, demise, and recycling occur on a continuous basis.

• Paradoxically, this ecosystem enables continuity and change to coexist. It thrives on processes of flexible recycling, as star-ups and spinoffs are formed, and on continuous recalibration, as incumbent firms reassess their business models. Flexibility, “the ability to do something differently or do something other than that originally intended”, is a sine qua non for high-technology firms, since conditions are rarely stable enough to enable what economists term “perfect adaptation”.

• This process of “flexible recycling” is enhanced in the absence of the typical stigma associated with organizational failure. Indeed the high failure rate may be more of an asset, in that it increases the rates of experimentation and speed of recycling, and, entrepreneurs learn, just as scientists do, much from failed experiments. Since organizational death, in and of itself, is not perceived as a finite expression of failure, entrepreneurs are able to entertain what would normally be considered “outlandish” risks. Moreover, prospects of failure and ephemerality can also reduce feelings of overconfidence and invulnerability among successful incumbents and keep them on their toes. In such a setting, large incumbent firms strive to become “agile giants” capable of rapid maneuvering and recalibrating.

• The short life cycle of many high-technology firms may be helpful for sustaining the long-term innovative capability of an ecosystem such as Silicon Valley. In
Silicon Valley has two important economic activities:

- **Economy One**: conventional activities of existing organizations... established firms and other organizations.. such as universities and corporate research laboratories
- **Economy Two**: fabric of institutions aimed at encouraging and nurturing new firm formation.

- Silicon Valley’s Economy One and Two are interlinked by organizational histories, personal relations, and technological trajectories; yet they can also be seen as conceptually distinct.
University – Industry Relations

The US academic technology licensing model was legislated in 1980 with the Bayh-Dole Act,

- passed in the context of grave concerns about the economic competitiveness of the US as its economy suffered from recessions and stagflation following the oil shocks beginning in 1971.
- The Bayh-Dole Act allowed the ownership of an invention from federal research funding to reside with the university, small business, or non-profit organization. Previously, ownership was required to go to the federal government. Given the government’s $75 billion or so budget assigned to research in the 1970s, this was a game-changer, providing strong economic incentives to commercialize the products of research (Stevens 2004).

After the Bayh-Dole was enacted, research universities almost all established technology transfer offices that aimed to become a central hub for patents from universities and to negotiate licensing arrangements with industry. The degrees to which these were successful are mixed. We will introduce specific Stanford examples below, but a few notable points should be emphasized
A Look at Stanford’s TLO

- Stanford= considered one of the most successful
- established in 1970
- over 10,000 patents and invention disclosures have come to the office since then approximately 4200 licenses. Of those, about 1200 are active.
- $1.66 billion generated by royalties
- …but over $1.0 billion came from only three big inventions. So 3/10000 = big winners, generating 2/3 of all income over the course of 44 years.
  - Only 33 cases generated over $5 million, with 87 generating $1 million or more in royalties.
- In 2014, approximately $108 million in royalty revenue; 644 inventions generated income, but only brought in royalties of over $100,000, with 6 cases bringing in $1 million or more.
- The legal expenses were a staggering $9.8 million, just under 10% of the revenue (OTL 2014).
- In perspective: SU’s total operating budget FY2012-2013 = $4.4 billion.
  - $1.27 billion in sponsored research, with 84% of that coming from government sponsors. The industry affiliate programs, of which the campus has 56, generated $193 million. The university’s endowment was $17 billion, and pre-specified returns from investments of the endowment can be used toward operating expenses

University-Industry Relationships

The university-industry relationships are multi-faceted and complex. Universities and industry in Silicon Valley interact in all the following areas: licensing, academic spin-offs, collaborative research, contract research, consulting, ad-hoc advice and networking for practitioners, teaching, personnel exchanges, and student supervision (Grimaldi, Kenney et al. 2011). Almost all of these mechanisms are outside “the technology transfer office centered coordination” model.

Industry visitors spending time in universities, and university faculty and researchers taking sabbaticals or other time to spend in company labs are common mechanisms of bidirectional exchange.
In an analysis of the origins of Silicon Valley, Lécuyer (2006) notes the critical importance of the bidirectional ties between university and industry. He show how Stanford researchers relied heavily on technologies developed in Silicon Valley to advance their own research. Only by having close relations with cutting edge industry, whose personnel they could invite to Stanford as collaborators, were Stanford researchers able to make technological innovations of their own, while training engineers to become the workforce of the newest technologies.

Stanford and UC Berkeley provided much of the basis for Silicon Valley, but they could not have done so without feedback loops from Silicon Valley helping them stay at the forefront of industry.

This is a point echoed by Kenney and Mowery (2014) analyzing the role of University of California schools in their respective economies, such as Silicon Valley, San Diego, Los Angeles, Santa Barbara, and Davis (and Napa Valley). The industry environment surrounding the university was critical in shaping how the universities could contribute to local economic development (Lécuyer 2014).

→ University-industry ties are not a one-way street with university technologies harvested by industry, but that successful universities depend on effective ties with the surrounding industry.
University-Industry Ties

• income from licenses and patenting is clearly not the primary reason Stanford and UC Berkeley engage in these activities and encourage technology transfers to industry.

• value lies in the long-term relationships with industry that ensure that faculty and research are defining cutting edge new technological trajectories. This gives faculty competitiveness for the next round of federally funded research, which is actually the main portion of the university’s research income, as covered in the next section (Lenoir 2014).

• Strong university-industry ties can also anchor relationships that can lead to philanthropic gifts. In 2001, for example, Stanford received a $400 million gift from the Hewlett Foundation, set up by Hewlett-Packard co-founder William Hewlett; Stanford’s total gift income from FY 2012 was over $1 billion.

• Strong industry university ties can also lead to new private-public partnerships, such as the $500 million, ten year contract between BP and primarily UC Berkeley, which led to the creation of a new Energy Biosciences Institute. Or Toyota’s $25 million into Stanford initiative on artificial intelligence.
University Entrepreneurship

- Forbes’ most entrepreneurial research universities: Stanford = #1 in 2014 (based on their entrepreneurial ratio – the number of alumni and students who identified themselves as founders and business owners on LinkedIn divided by the school’s total graduate and undergraduate students.
- The same survey ranked UC Berkeley as #3 in the U.S.
- Pitchbook (a database for M&A, private equity, and venture capital) created a list of schools whose alumni founded VC-funded companies between 2010 and the third quarter of 2013. Stanford leads with 190 companies, and UC Berkeley is second with 160 companies.
- Neither Stanford nor Berkeley has explicit incentives for faculty or students to become involved in entrepreneurship. (e.g., tenure, promotion, etc.)
- Entrepreneurship is instead viewed as a way to retain high quality faculty by allowing them to pursue their business interests while remaining at the university. Being involved in entrepreneurship can also be a way to maintain a strong connection with working on cutting edge areas and help with faculty’s teaching and research (Lenoir 2014).