



A Strategic Overview of the Silicon Valley Ecosystem: Towards Effectively “Harnessing” the Ecosystem:

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4. Startups in the Silicon Valley Ecosystem: How They Relate to Large Firms and Other Actors

In order to understand the strategic options available to large Japanese firms in Silicon Valley, we must first understand the role of large established firms in the Silicon Valley ecosystem. As noted earlier, large firms have a symbiotic relationship with startup firms. We therefore examine the role of large firms in Silicon Valley with respect to the logic of how startups firms view other actors in the ecosystem.

A successful environment for startup firms requires startups to access markets for their innovative products and services. The primary question is therefore: who are the buyers of startups’ products and services? The secondary question, in order to better understand why the system functions as it does, is: why did these buyers become critical purchasers of startups’ products, services, and startup firms themselves?

The primary buyers of Silicon Valley startups’ products and services, other than consumers (B to C), are **large firms**. This includes traditional large firms that have existed for a long time, such as IBM, Lockheed, and HP, as well as large firms that became large relatively recently, ranging from Apple and Oracle to Google and Facebook.

Large firms provide market access for start-up companies in two main ways. First, they may serve in traditional customer roles. This is especially important when large companies become the first customers or reference customers to start-ups. Second, large companies may acquire start-up companies through M&A activity. In this case, the large company can provide its resources to make the idea of the acquired start-up company achieve even greater and/or more rapid market success than the start-up could attain otherwise.

The role of **government** as a major lead buyer for Silicon Valley startups’ products and services is often understated in analyses of Silicon Valley—particularly among many participants themselves in Silicon Valley. The government, which includes the military and aerospace, played a critical role in the historical development of Silicon Valley, and continues to exert a significant presence in shaping technological trajectories.

4.1. Large firms as customers

Large firms have traditionally acted as lead buyers of startups' products and services. This has enabled startups to move well beyond consumer-oriented products and services (B to C) and become critical game-changers in business-oriented (B to B) economic activities. There are three distinct patterns of dynamics worth highlighting.

The first is that *established large firms*, such as those listed on the New York Stock Exchange (NYSE), which can be headquartered anywhere, are willing to purchase startup firms' products and services. Firms ranging from Citibank to Chevron, which go well beyond the IT industry, are willing to buy software and services from startups.

A good recent example of beneficiaries of this dynamic is Salesforce.com, founded in 1999 by a former Oracle executive. Salesforce.com originally provided Customer Relations Management (CRM), disrupting the packaged software CRM industry by offering CRM as a service that was "pay-as-you-go." Salesforce.com's services grew to a platform that allowed third-parties to offer specialized software services, further enhancing the core offerings of Salesforce.com. The company's success in getting large firms as early customers enabled it to grow at a meteoric rate, leading to its 2004 IPO on the NYSE. Without large companies as customers, it would not have been possible to attain this growth level. For large firms, switching from existing vendors for something as core as CRM was not a trivial decision, but they were willing to switch to the startup's services once they understood its potential and functionality, especially as they saw others adopting it.

A broader point is that the US-centered information technology (IT) revolution owes much of its rapid develop to lead users, which are large corporations, who aggressively install IT systems.¹ The historical pattern has been that they often install computer systems to solve one type of problem—such as airlines installing reservation management systems—only to discover that they can use that information to completely reorganize the business. In the airline case, this meant discovering that with reservations information, they could implement a new system of supply and demand management to effectively route their airline routes to radically increase operating efficiency. This role of *large corporations as lead users of IT* has contributed to their being receptive to adopting products and services from startups. A key reason that innovation large corporations become lead users is that they are subject to high levels of competition.

Many of the large established firms have established branch offices in Silicon Valley to gain a foothold in the area and access information early. As a historical study notes, large East Coast firms have a long history of attempting to take advantage of Silicon Valley, with limited success.²

¹ Cohen, S., J. B. DeLong and J. Zysman (2000). Tools for Thought: What is New and Important about the "E-economy". Berkeley, CA, Berkeley Roundtable on the International Economy, University of California at Berkeley.

² Kenney, M. (2000). Understanding Silicon Valley : the anatomy of an entrepreneurial region. Stanford, Calif., Stanford University Press.

The second dynamic of large-firm purchasing of startups' products and services is by *established Silicon Valley IT firms*, which often started as startups themselves, becoming major customers of startups. Apple, for example, originally a Silicon Valley startup, famously procured its iTunes software from outside the company, later integrating it into its iPod music player and online music store that disrupted the music industry. Hewlett Packard, which was founded by Stanford graduates with the support of key faculty, is also headquartered next to Stanford, has actively purchased startups.

Silicon Valley actually traces its historical roots to developing and manufacturing advanced electronics components, growing from large firm and government buyers. From the early 20th century, when large East Coast firms such as RCA dominated consumer products and held a wide range of intellectual property, San Francisco Bay Area firms began specializing in high-end electronics components. The initial area of their expertise included long range radio and communications technologies, since the Bay Area faces the Pacific. These firms focused on niche, specialized areas—one might consider the core business model for almost a century as depending on large buyers.³

4.2. Government as Lead Buyer of Silicon Valley Technologies

Government as a lead buyer has been a crucial driver of startup growth in Silicon Valley since its early days.⁴ Many of the early radio technologies were sold to the US Navy, which was rapidly expanding into the Pacific as the US projected its power towards Asia. In the postwar period, the Cold War with the USSR created massive pressure for the US government to pour resources into science and technology development, especially after the USSR was first to successfully launch an orbiting satellite, the Sputnik.

Aeronautics and aerospace were areas of concentration in the Bay Area. Lockheed Missiles and Space (which later became Lockheed-Martin) was the largest employer in the area for much of the postwar period (28,000 at its peak), with a majority of its sales going to government. Semiconductors and other specialized technologies pioneered by startups also had government as the key lead buyer. As of 2000, Silicon Valley was one of the leading recipients of defense contracts, receiving about four times the national average and twice per worker what Los Angeles—another focus point of military-industrial collaboration, receives.⁵

The military played a critical historical role in growing startup companies from Silicon Valley into large companies during the Cold War. Varian Associates⁶, Watkins-Johnson⁷, and

³ Sturgeon, T. J. (2000). How Silicon Valley came to be. Understanding Silicon Valley: Anatomy of an Entrepreneurial Region. M. Kenney, Stanford University Press: 15-47.

⁴ Leslie, S. (2000). The Biggest "Angel" of Them All: The Military and the Making of Silicon Valley. Understanding Silicon Valley : the anatomy of an entrepreneurial region. M. Kenney. Stanford, CA, Stanford University Press.

⁵ Ibid.

⁶ Varian Associates was founded in 1948 by brothers Russell and Sigurd Varian, with Russell holding a bachelor's and master's in physics from Stanford, along with the Stanford's physics department head at the time, Leonard Schoff, and Edward Ginzton, a professor of physics who had done undergraduate and PhD work at Stanford in physics, and several others. Varian Labs pioneered the klystron, which is a tube

Hewlett Packard owed much of their growth to military contracts. Hoping to benefit from the local expertise, established East coast companies such as General Electric, Sylvania, and Zenith all set up outposts in the form of laboratories and production facilities in the Bay Area. Many spinoffs from these large companies provided a growing ecosystem of startup firms with specialized technologies and know-how.

Firms that were specialized while primarily selling to the government *then broadened to commercial areas* as procurement budgets decreased and the government became a more difficult customer, beginning in the 1960s. Some of the specialty firms such as Varian Associates suffered, but people left those companies went on to more successfully diversified companies such as Hewlett Packard and various semiconductor firms that became the core of Silicon Valley.⁸

4.3. M&A by Large Firms

Beyond purchasing the products and services of startup firms, large firms actively purchase startup firms themselves. This can be a way to acquire not only a specific service or technology, but also to acquire the entire capabilities of the firm to create the next new offerings—if integrated and incentivized successfully. It also precludes rivals from obtaining it as well, which can lead to bidding wars.

that can amplify electromagnetic waves at microwave frequencies. Its technological specialties also included small linear accelerators to generate photons, and nuclear magnetic resonance technology. It held numerous contacts with the military, developing the fuse for atomic weapons, for example. Varian Associates was the first firm to occupy space in the Stanford Industrial Park in 1958, widely recognized as one of the initial sites from which Silicon Valley in its postwar form was born. Edward Ginzton, one of its founders and it's CEO for a time—considered one of the founding fathers of Silicon Valley—has an applied physics labs at Stanford named after him. The Ginzton Laboratory, which pursues research in “quantum electronics, semiconductor lasers, picosecond pulse techniques, optical microscopy, tunneling and force microscopy, fiber optics, condensed matter, superconductive materials and their microwave applications, and acoustic techniques for nondestructive evaluation of semiconductors and other materials.” (<https://ginzton.stanford.edu/history>)

⁷ Watkins-Johnson is described as the most financially successful of the Stanford spinoffs in the early postwar period. Co-founder Dean Watkins was a Stanford professor, and Watkins-Johnson, located in Stanford Industrial Park, developed and manufactured microwave tubes, mostly for surveillance, reconnaissance, countermeasures, and telemetry. These technologies came from Watkin's research efforts at his Stanford lab. “Founded in 1957, sales in 1958 were \$500,000, growing to \$4.6 million in 1961, \$9.5 million in 1963, and \$16.8 million in 1966.” Leslie, S. (2000). *The Biggest "Angel" of Them All: The Military and the Making of Silicon Valley. Understanding Silicon Valley : the anatomy of an entrepreneurial region*. M. Kenney. Stanford, CA, Stanford University Press.

⁸ Lenoir, T. (2014). *Inventing the entrepreneurial university: Stanford and the co-evolution of Silicon Valley. Building Technology Transfer Within Research Universities: An Entrepreneurial Approach*. T. J. Allen and R. P. O'Shea. Cambridge, UK, Cambridge University Press: 88-128.

Figure 3.

Year	Number Total	Number Known	Price (\$Mil)	Average (\$Mil)	Mean time to Exit (Years)	Median Time to Exit (Years)
1985	7	3	300.2	100.1	7	4.8
1986	8	1	63.4	63.4	3.4	3.5
1987	11	4	667.2	166.8	4.9	3.5
1988	17	9	920.7	102.3	4.7	4.1
1989	21	10	746.9	74.7	4.3	3.6
1990	19	7	120.3	17.2	5.8	5.5
1991	16	4	190.5	47.6	6	5
1992	69	43	2119.1	49.3	4.7	4
1993	59	36	1332.9	37	5.3	4.7
1994	84	57	3208.4	56.3	5.8	5.3
1995	92	58	3801.8	65.5	4.6	4.1
1996	108	76	8230.8	108.3	5.2	4.1
1997	145	100	7798	78	4.5	3.1
1998	189	113	8002	70.8	4.5	2.8
1999	228	155	38710.6	249.7	3.6	2.8
2000	379	245	79996.4	326.5	3.2	2.7
2001	384	175	25115.6	143.5	3	2.2
2002	365	166	11913.2	71.8	3.5	2.9
2003	323	134	8240.8	61.5	4.3	3.6
2004	402	199	28846.1	145	5	4.6
2005	446	201	19717.3	98.1	5.4	5.2
2006	484	208	24291	116.8	5.7	5.7
2007	488	201	30745.5	153	5.8	6.3
2008	417	134	16236.9	121.2	5.8	5.6
2009	351	109	12364.9	113.4	5.7	5.5
2010	523	150	17707.3	118	5.8	5
2011	490	169	24093.2	142.6	5.8	5
2012	473	132	22694.2	171.9	6.2	5.6
2013	376	94	16586.5	176.5	5.9	5

Source: National Venture Capital Industry Association

Newly large firms—successful startups themselves within the past two decades—are particularly prominent in M&A deals. The recent economic boom in Silicon Valley has given these new firms that grew into large firms, such as Amazon, Google and Facebook, ample cash and stock valuations to aggressively purchase companies. It is noteworthy that Japanese firm Rakuten was one of the 2014 “mega-deal” purchasers. The 19 billion dollar purchase of WhatsApp, a mobile message application, by Facebook, was particularly noteworthy since the amount was far greater than almost every other.

Figure 4. Significant Large M&A Deals in 2014 Involving Startups

Firm Sold	Acquired By	Estimated Amount	Service Description
WhatsApp	Facebook	\$22 billion	Free mobile messenger and social networking app
Trulia	Zillow (Merger)	\$3.5 billion	Online real estate portal
Nest Labs	Google	\$3.2 billion	Internet controlled thermo-stats/smoke alarms with extensive data collection
Beats Electronics	Apple	\$3 billion	High-end headphone manufacturer with online music store
Oculus	Facebook	\$2 billion	Virtual reality headsets
Twitch	Amazon	\$970 million	Gaming video platform
Viber	Rakuten	\$900 million	Free messenger/phone call app
Divide	Google	\$120 million	Mobile productivity app
Convertro	AOL	\$101 million	Cross-platform advertising analytics software

Source: <http://www.inc.com/jeremy-quittner/ten-top-exits-of-2014.html>

Cisco Systems played a major role in pioneering the new Silicon Valley industrial model during the 1990s of using M&A to rapidly acquire new technologies and capabilities, without owning its own manufacturing facilities.⁹ Cisco was founded in 1984, with two of its three founders being computer operations employees at Stanford.¹⁰ Cisco rode the wave of the world’s explosive growth of demand for Internet networking equipment, dominating global markets from the mid-1990s onwards. Its innovation model was to aggressively purchase companies and technologies from outside rather than develop them in-house. For example, it purchased nine in 1998, 23 in 2000, and 11 in 2012. It also chose to outsource virtually all of its manufacturing, focusing on design and freeing it from owning and operating physical manufacturing facilities. In 2000, though at the top of the US “dot-com boom,” Cisco had the highest market capitalization in the world. In 2014, it remains one of the largest market cap firms and a major presence in Silicon Valley.

4.4. US Production Transformation into “Open Innovation” – a Partial Result of Japanese Manufacturing Success

In understanding why large firms in the US provide crucial early markets for startups’ services and products, and often buy startups themselves, we must look to the radical

⁹ Surgeon calls this “modular production,” describing how the American model of production was shifting towards one of modular production networks, with large companies limiting their core activities and making use of outsourced R&D and manufacturing. Sturgeon, T. J. (2002). "Modular production networks: a new American model of industrial organization." *Industrial and corporate change* 11(3): 451-496.

¹⁰ Although Stanford initially apparently considered suing the former employees for what it considered as theft of its software, hardware, and intellectual property surrounding networking, it later licensed router software and computer boards to Cisco, in 1987.

transformation of large corporations in the US. Interestingly, the transformation was significantly driven by the success of Japanese firms in manufacturing.

Until the 1980s, US large corporations resembled what we now think of as the traditional Japanese large firm model. Lifetime employment was the norm at large blue-chip companies such as IBM, HP, AT&T, General Electric, oil companies, and the Big 3 auto companies, for example. The innovation models were based on in-house R&D, with AT&T's Bell Laboratories leading the way in basic and applied research, investing a wide range of technologies including transistors, motion pictures, television, stereophonic sound, and laser technology. CEO compensation was not tied to companies' share prices on the stock market, and institutional investors did not have a major say in corporate governance. Companies tended to be vertically integrated, controlling most aspects of their supply chains themselves.

After the oil shocks hit the US, and the US economy experienced years of stagnant growth combined with inflation, many large US firms faced dire financial straits. They were outcompeted by Japanese manufacturing firms, particularly from the early 1980s, and the US economy seemed far from recovery. In this context, large firms in the US that survived engaged in a major transformation of how they operated.

IBM was perhaps the most dramatic example, as it neared bankruptcy in the late 1980s and early 1990s. Its new CEO, Louis Gerstner, appointed in 1993, transformed many of the operating tenants of the company, jettisoning the norm of lifetime employment, engaged in major layoffs (about 100,000 in the first few years), and terminated or sold a wide variety of business areas, focusing on core businesses.¹¹ They began acquiring other companies and services, departing from their longstanding norm of relying almost exclusively on in-house products and services. IBM shut down its PC hardware division, then later sold its notebook PC division. It halted development of its operating system, OS/2 that was losing badly to Windows despite many arguing that it was a technically superior product. Gerstner, who was recruited from outside the company after successfully turning around American Express, replaced a CEO that had been promoted from within IBM, as had many of the top managers. He was also the first CEO to receive a very large compensation package, tied to the company's performance and aligned with the interests of shareholders. The fortunes of IBM then turned around, and it retained a strong position in the IT industry—though never dominant as it had been during the postwar era of mainframe computers.

IBM, though one of the most dramatic, was not alone in its transformation. Although AT&T was split up due to a settlement in an antitrust suit brought by the US Department of Justice, it kept Bell Labs. However, it spun out the manufacturing arm, along with Bell Labs,

¹¹ For example, despite having an operating system, OS/2 that many argued was technically superior to Microsoft Windows at the time, OS/2 had almost no market share. While IBM's previous CEO and other executives, who had risen from within IBM, were unable to let it go, Gerstner had no qualms about shutting down the program. He also presided over shutting down the PC hardware division, and later set the stage for selling the notebook computer division to Lenovo. Instead, Gerstner focused on providing integrated IT services to corporations, leading to a dramatic rebound of IBM.

which became Lucent. Lucent eventually essentially dissolved Bell Labs, ending an era of the major US corporate R&D labs that covered a wide range of basic and applied research.

The transformation of US corporate practices was nothing short of part of a deep shift in the structure and logic of its political economy and core innovation system. Economist William Lazonick has described this transformation as a shift from the Old Economy Business Model (OEBM) to a New Economy Business Model (NEBM).

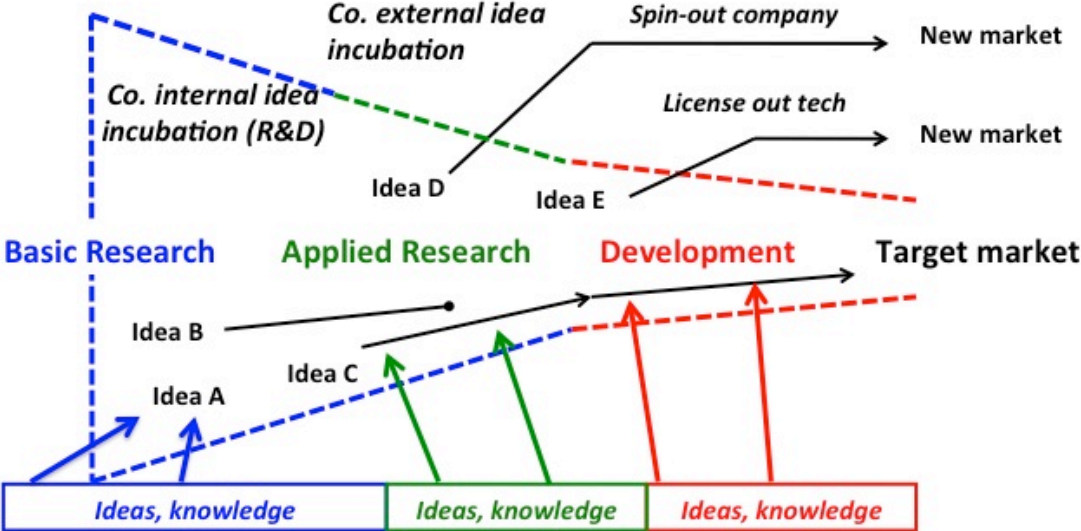
Figure 5. Old Economy Business Model (OEBM) and New Economy Business Model (NEBM) in the Information and Communications Technology (ICT) Industries

	OEBM	NEBM
Strategy, product	Growth by building on internal capabilities; business expansion into new product markets based on related technologies; geographic expansion to access national product markets.	New firm entry into specialized markets; sale of branded components to system integrators; accumulation of new capabilities by acquiring young technology firms
Strategy, process	Corporate R&D labs; development and patenting of proprietary technologies; vertical integration of the value chain, at home and abroad.	Cross-licensing of technology based on open systems; vertical specialization of the value chain; outsourcing and offshoring.
Finance	Venture finance from personal savings, family, and business associates; NYSE listing; payment of steady dividends; growth finance from retentions leveraged with bond issues.	Organized venture capital; initial public offering on NASDAQ; low or no dividends; growth finance from retentions plus stock as acquisition currency; stock repurchases to support stock price.
Organization	Secure employment: career with one company; salaried and hourly employees; unions; defined-benefit pensions; employer-funded medical insurance in employment and retirement.	Insecure employment: inter-firm mobility of labor; broad-based stock options; non-union; defined-contribution pensions; employee bears greater burden of medical insurance.

Source: (Lazonick 2009)

A highly popular conception of “open innovation,” articulated and popularized by Henry Chesbrough, describes the result of the pervasive shift in innovation by large US companies.¹²

Figure 6. Open Innovation by Henry Chesbrough

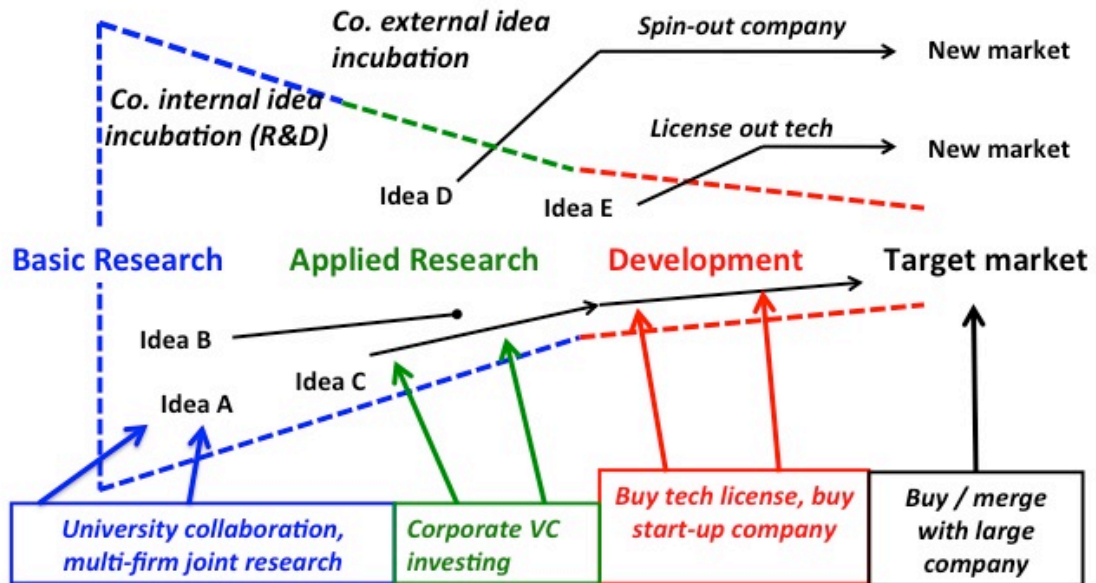


Source: Adapted from Chesbrough (2003)

In the traditional innovation system, all phases of innovation—basic research, applied research, development, and commercialization—took place within corporate boundaries. As the US innovation system transformed, the corporate boundaries became more porous. Companies increasingly brought in ideas and technologies from outside the company. They also became more aggressive in spinning out existing ideas from within the company. As Richard Dasher contends, university collaboration and multi-firm joint research began to play a bigger role in basic research, corporate venture capital investing became more important in applied research, the purchase of technology licenses and startup firms grew in significant for development, and buying and merging became important in the commercialization process.

¹² Chesbrough, H. W. (2003). Open innovation : the new imperative for creating and profiting from technology. Boston, Mass., Harvard Business School Press.

Figure 7. Open Innovation and Sources of Ideas, Stages of Investment



Source: Richard Dasher (2013)¹³

¹³ Dasher, R. (2013). "Disruptive Ideas, Open Innovation, and New Value Chains: Trends in Asia." Retrieved June 15, 2014, from <http://asia.stanford.edu/us-atmc/wordpress/wp-content/uploads/2013/10/131003-Dasher-EE402A.pdf>.