

Silicon Valley's Secret Ingredient



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Introduction

The term Silicon Valley was first coined back in 1971 in a series of articles in Electronic News, a weekly semiconductor-industry magazine, [1]. It referred to the cluster of semi-conductor firms operating in the Santa Clara County, located in the southern part of the San Francisco Bay Area, California, USA. However overtime this has expanded in terms of both industry and geography.

Silicon Valley now refers to the cluster of innovative high-technology companies that expand from San Mateo in the North, the Fremont/Newark area in the East and down through the Santa Cruz Mountains to Santa Cruz in the South. Stanford University lies at the heart of the region with nearby downtown San Jose being the self-proclaimed capital of this unique cluster of innovative and entrepreneurial activity.

Given the importance of high-technology industry and the need to innovate in today's global market it is no surprise that governments around the world have sort to replicate Silicon Valley's success, [2]. So much so the term "Siliconia" was created to capture the attempts of the many Silicon Valley "wannabes" around the world, [3], (see Appendix A).

Most attempts have fallen significantly short of initial expectations, [4] achieving only limited local notoriety. For example the "Silicon Plain" in Finland and "Silicon Saxony" in Germany are rarely mentioned outside their countries. The Multimedia Super Corridor, (MSC), south of Kuala Lumpur, Malaysia is more well-known. However, it has faced numerous problems including the 1997 East Asian Financial Crisis, [5].

Although the difficulties faced by the MSC have to some degree been explained, it is more challenging to understand why other areas around the world have not been able to replicate Silicon Valley's success. Even today, the majority of start-ups exploiting Web 2.0, the latest development in Internet technology, are found predominately within the Valley, [6]. This essay examines why attempts to replicate the success of this innovative high-technology cluster have repeatedly failed and suggests a possible missing secret ingredient that is essential for success.

Silicon Glen – An Early Attempt

Back in the 1980's the Scottish Development Agency developed a plan to transform Scotland into Europe's own Silicon Valley, [7]. Through financial and material government inducements the region had already attracted a number of high-technology companies, such as IBM and Motorola. Although these investments were branches of large multi-national corporations, it was thought that if this trend in investment could be maintained, a new entrepreneurial spirit would take hold. It was hoped that the environment would encourage entrepreneurial engineers to "spin-out" small, fast growing companies from the monolithic multi-nationals, as is frequently the case in Silicon Valley.

By 1996 the Silicon Glen region directly employed 55,000 people and produced 35% of Europe's personal computers and 12% of the world's semiconductors, [8]. Electronics components had overtaken Whisky as Scotland's leading export, [9]. However, there was little entrepreneurial activity and when a global downturn hit the industry only five years later it had a dramatic impact on the region.

With the need to cut costs the multi-nationals cut workforces and closed factories, moving work to Asia and Eastern Europe in the search for cheaper labour. The few native Scottish companies that did exist acted mostly as sub-contractors to the large multi-nationals and therefore faced almost certain closure.

It became clear that merely relying on a geographical cluster of high-technology companies fell significantly short of what was required to produce the next Silicon Valley. This sentiment was best captured by Hugh Aitken, head of Sun Microsystems' Scottish business, when in 2002 he said of the Silicon Glen region:

"It's as near to Silicon Valley as it is to the moon," [10].

Porter's Diamond of Advantage

In the 1990 book, the Competitive Advantage of Nations, Michael Porter presented the "Diamond of Advantage", see Figure 1. The model identifies four broad attributes that combine to determine a region's competitiveness in a given industry, [11]. It therefore can be applied to Silicon Valley to highlight the key set of criteria necessary for a thriving high-technology cluster.

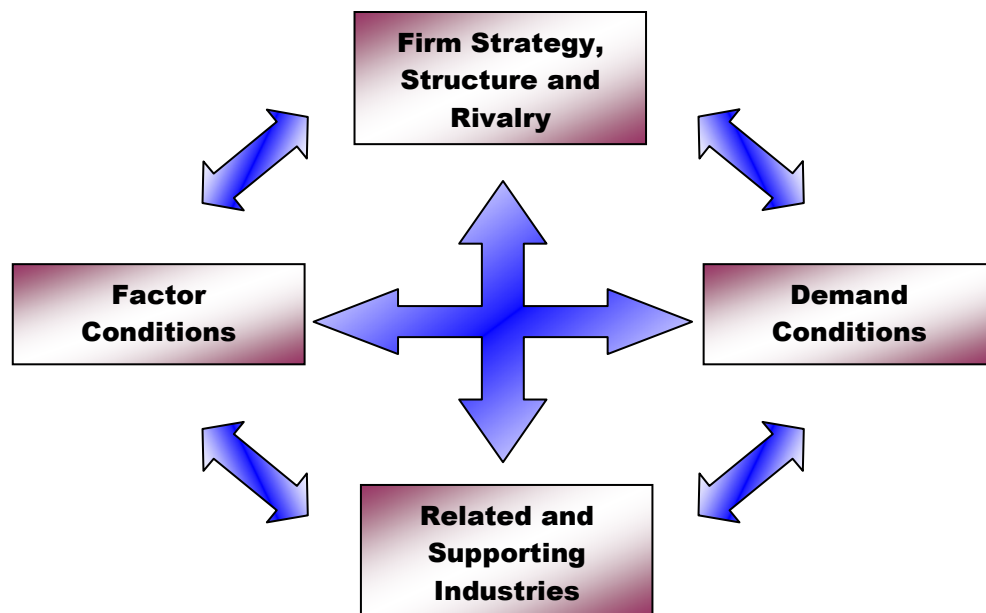


Figure 1 – Porter's Diamond of Advantage

The first of the four attributes, *factor endowments*, refers to the regions assets. Porter distinguished between basic factors, such as natural resources, and advanced factors, such as infrastructure and skilled labour. Basic factors may initially seem unimportant as the high-technology industry use of natural resources is limited. However it is essential that the highly skilled labour remain in the region and therefore it can be argued that the pleasant Californian climate plays a key role.

Advanced factors clearly play an important role. The supply of highly skilled labour from Stanford University is seen as a critical component of Silicon Valley's success, as is the region's advanced free market economy.

The second attribute, *demand conditions*, refers to the home demand for the industry's products. Porter argues that an industry will gain a competitive advantage in a nation whose home market is sophisticated and demanding for the products of that industry. During Silicon Valley's early life approximately two fifths of all semiconductor procurements were by defence agencies seeking to fulfil Government financed projects, [1]. This not only helped drive growth but encouraged established companies such as Lockheed to work with the innovative start-ups.

The third of Porter's attributes, *related and supporting industries*, highlights the benefits of clusters. Porter provides evidence that clusters offer firms a competitive advantage. For example, valuable knowledge can transfer between firms within the same geographical region. Clusters drive competition forcing firms to innovate, stimulating R&D, which leads to business "spin-outs" and the introduction of new services and the development of new skills. There is significance evidence that this has been the case for Silicon Valley. For example, in 1955 a Stanford graduate founded Shockley Transistor, to commercialise the transistor as an alternative to vacuum tubes, [1]. Two years later after a disagreement over whether to use silicon or germanium, eight employees spun-out their own company, Fairchild Semiconductor. It is from here that two of the original eight teamed up with a venture capitalist to form Intel, which today is the largest semiconductor company in the world, [12].

The last of the four attributes on the Diamond of Advantage focuses on *firm strategy, structure, and rivalry*. Porter argues that nations are characterised by different management ideologies. For example, he claims many leaders of US companies have financial backgrounds, which often leads to an emphasis on achieving short-term financial goals. However, German and Japanese companies are often engineering led, resulting in an emphasis on manufacturing efficiency and design, [11].

Since the majority of Silicon Valley start-ups are backed by venture capital, most follow a strategy of seeking high market share through innovation and fast growth, whilst paying minimal attention to process efficiency. This ensures a sufficient return from the relatively small minority of investments that are successful.

Using Porter's model it has been possible to identify key factors that influenced Silicon Valley's growth. However the question as to whether these factors alone are sufficient to create innovative high-technology clusters remains unanswered.

The Missing Ingredient

Scotland's Silicon Glen had many of the attributes identified by the Diamond of Advantage as being critical for replicating Silicon Valley's success. For example, there were a number of high-quality Scottish universities with well-respected science programs. There were also examples where such universities have invested effort in developing technology transfer initiatives. For example, Heriot-Watt University located just west of Edinburgh was the first in Europe to develop a research park where companies could operate on campus, [13].

However, the Scottish Development Agency policy of encouraging investment through government incentives attracted the wrong kind of investment. Instead of developing centres of innovation, Silicon Glen ended up with factories churning out electronic products that were fast becoming commodities. This situation was again summarised by Hugh Aitken, when he stated.

“Silicon Glen was a screwdriver shop. The old screwdriver business is long gone: now, all that sort of thing is done in Eastern Europe,” [10].

Given the mistakes of Silicon Glen and the insights gained from Porter's model one might expect that more recent attempts to replicate Silicon Valley would have achieved greater success. However this has not been the case, as highlighted below.

The Singapore Government announced the One Network for Everyone (ONE) project in June 1996, [14]. It had three distinct phases. The first was to develop a broadband infrastructure of high-capacity networks and switches ensuring widespread high-speed Internet access. The second phase was to exploit the infrastructure by developing an advanced applications and services industry. The final phase was to focus on mass adoption of the Internet thereby making Singapore a high-technology haven.

In addition to these efforts the Singapore Government created a one billion dollar fund in an attempt to encourage venture capital investment to the region, [15]. They hoped the influence of venture capitalists would bring about the innovation and entrepreneurial activity commonly found within Silicon Valley.

The ONE project helped Singapore join the top tier of countries in terms of Internet penetration. It led to a significant shift in society's behaviour and understanding of what the Internet could do. Online-learning, shopping and banking all became common place as did the use of e-government services, and on-demand services for video and music, [15]. However, the scale of entrepreneurial activity remains behind that of its Californian role model.

Singapore and Scotland are not alone in their ambition to create another Silicon Valley. Many countries, including those in the European Union, and more recently China have instigated various initiatives and made changes to government policy in an attempt to provide the conditions necessary for an innovative and entrepreneurial high-technology cluster to prosper, [4].

Research has shown that modifying legal policy, such as weakening bankruptcy laws does help to increase entrepreneurial behaviour, [16], and no one argues with Porter's thesis that there are advantages to be gained from clusters. The benefits of investing in an advanced infrastructure are clear, as are those of a highly skilled labour force. However, to date these attributes alone have been insufficient to create a high-technology cluster that can compete against Silicon Valley.

It is suggested that the main reason why it has not been possible to replicate the success of Silicon Valley is due to a fundamental difference in *culture*. Unless those working in a high-technology cluster have the same **beliefs, attitudes and values** as those in Silicon Valley they are unlikely to replicate its achievements, regardless of the physical, legal and financial environment.

To understand how this unique culture developed and the overwhelming influences it has on those who live and work in the region it is necessary to understand how Silicon Valley came about.

The Making of Silicon Valley

The Californian region was first colonised by the Spanish Empire in 1796. It fell under Mexican rule following the Mexican War of Independence in 1821, and after the subsequent Mexican-American war of 1846-1848 finally came under the control of the United States of America. The Californian state we know today became its thirty-first state on the 9th September 1850, [17].

As the Mexican-American war was coming to a close, on 24th January 1848 gold was discovered at Sutton's Mill, in Coloma, a sawmill approximately 160 miles north-west of San-Jose. By 1849 news of the gold finds had spread around the world, and gold-seekers and merchants from Latin America, Europe and Asia were descending in great numbers on California, leading to what we now know as the *Gold Rush*, [18].

The dramatic growth in the population and the economy had a substantial effect on the region. However perhaps the longest legacy of the Gold Rush is the emergence of what became known as the *Californian Dream*. The idea that by taking a risk, combined with hard work and a little luck, one can achieve great wealth.

During the height of the Gold Rush, Amasa Leland Stanford moved from Wisconsin to join the many thousands seeking their fortune. When the Gold Rush came to an end in 1856 he moved to San Francisco and co-founded the Central Pacific Railroad Company with his three brothers. Over the years his family accumulated great wealth and in 1891, in memory of his only child who died of typhoid, he and his wife founded the Leland Stanford Junior University, [1]. Stanford University, as it is now known, is where many believe Silicon Valley took root.

Fredrick Terman, a Professor of Electrical Engineering at Stanford University, was concerned that many of his graduates moved to the East Coast because of a lack of suitable employment in the region. To mitigate the problem he encouraged two of his students, William Hewlett and David Packard to locally commercialise an audio-oscillator they had developed. In 1939 they secured a deal with Walt Disney Studios from which they never looked back.

Similar start-ups soon began to appear leading Stanford University to respond by creating specialised programs and focused research facilities. These changes culminated in 1951 with the creation of an industrial park on the university campus, offering facilities for newly-formed companies. By the early 1970's a venture capital industry had been established to support the numerous start-ups.

As the decade progressed, the semiconductor industry began moving towards mass production, which pushed down prices. For example, the price of Intel's 8088 microprocessor went from \$110 to \$8 in just five years. Japanese companies who excelled at mass production techniques were easily gaining a competitive advantage over those in Silicon Valley. Whereas commoditisation resulted in a major economic downturn in Scotland's Silicon Glen, Silicon Valley responded by returning to what it knew best – commercialising innovative high technology. By expanding into software the region went on to produce a number of today's leading computer companies. Today the region remains a hub for high-technology, full of innovative risk takers seeking to make their fortune. It appears the *Californian Dream* is stronger than ever.

The Importance of Culture

Although the Gold Rush is long gone the impact of the venturesome gold-seekers can still be felt in Silicon Valley. It is widely commented that the region rewards risk taking, whilst not punishing those who fail, [19]. In fact failure is treated as a badge of honour making the recipient better qualified to succeed in the future, [20]. The Valley is also noted for its overriding upbeat self-confidence where anything is considered possible. Both of these qualities reflect the heritage of the gold-seekers who were prepared to risk everything, travelling from all corners of the world in search of riches. Today's gold-seekers follow the same Californian Dream the only difference being that for their hard work and entrepreneurial risks they are rewarded with stock options as opposed to nuggets of gold.

A fundamental problem in replicating Silicon Valley's success is that in many regions around the world there is often no ambition to follow the Californian Dream. For example, a Finnish minister of finance once famously referred to stock options as "an evil capitalist tool", [21]. This may explain why when a Finnish venture capitalist asked a room full of start-up companies, "Who wants to be a millionaire?" Only one or two raised their hands. The motivation of most was the advancement of science and technology, not the accumulation of wealth.

Culture also provides an explanation for Singapore's lack of progress at rivalling the innovation and entrepreneurial activity of Silicon Valley. Differences in culture lead to different levels of risk perception and acceptance, [22]. Like many Asian and European countries the stigma associated with failure is extreme in Singapore, [23]. The government attempted to address this taboo by creating the Phoenix Award, which recognises the value of failure. At the 2003 award ceremony, a government minister stated its aim was to

"... salute entrepreneurs who have braved the realities of commercial failure, adjusted to challenges and changed circumstances, and forged ahead to succeed in their enterprises," [24].

Even when governments appreciate the need to encourage entrepreneurship through changes in policy cultural hurdles can prove difficult to overcome. For example, the inflexibility in French labour laws has long been seen as a problem to entrepreneurship. The country's laws make it extremely difficult to dismiss someone from employment. This has resulted in significant youth unemployment as companies are reluctant to take on staff with no employment history. The French Government attempted to overcome this problem by reforming employment laws however, this struck at the heart of French work culture. Mass demonstrations took place which resulted in the reforms being scrapped, [25].

Conclusion

It is not surprising that the majority of attempts to replicate Silicon Valley's success have focused on the need for a cluster of high-technology companies. Although a concentrated geographical region is important, [26], Porter's Diamond of Advantage highlights many additional factors are necessary to replicate the success of Silicon Valley, including highly skilled labour and a demanding local market. However, it is argued that the most fundamental requirement is the need for an innovative risk-taking culture.

Culture is difficult to define and almost impossible to change, however it has been shown to play a critical role in determining the competitiveness of a given industry. Without the influx of gold-seekers during the Gold Rush and the creation of the Californian Dream it is argued that Silicon Valley would have never come about. Returning to Porter's Diamond of Advantage, it is argued that culture affects both factor and demand conditions, as well as a firm's strategy and structure and that of its related industries. For example the use of Wireless Application Protocol (WAP) phones is significantly lower in the UK when compared with Scandinavia, where new mobile technology is rapidly absorbed, [27], highlighting the influence that culture has on demand conditions. It is therefore suggested that culture should reside at the centre of the diamond influencing these four other factors, as shown in Figure 2.

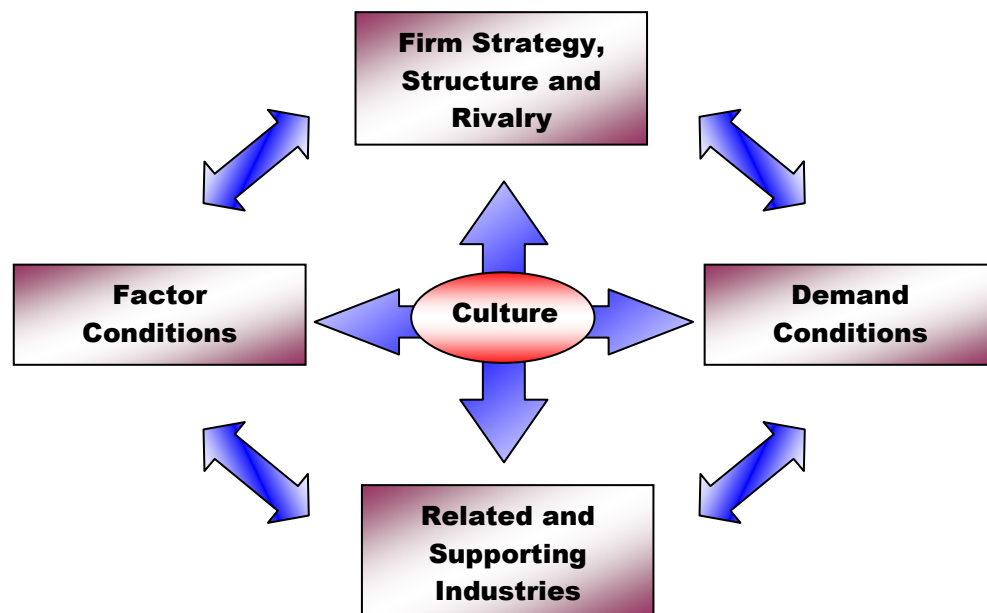


Figure 2 – Modified Diamond of Advantage

In response to the question of where the next Silicon Valley will be, Richard Irving, a seasoned Silicon Valley venture capitalist, offered the following.

“There are two answers. The first is nowhere and the second is everywhere – both are true. There is no one place, but it is definitively happening in many areas, [28]”

This captures the idea that Silicon Valley was unique and resulted from a critical mass of entrepreneurial culture, innovative technology, highly-skilled labour and venture capital, which combined in a way that is unlikely ever to be repeated. However this is no longer a problem as venture capitalists are now prepared to capture innovation in one part of the globe, develop it in a second, and market it in a third. For example, India now attracts significant foreign venture capital, [29]. Irving highlights how venture capitalist views have changed and why attempts to bring all the necessary components for the next Silicon Valley together in one location, is now much less important.

“When I first arrived in the Valley [in 1986] everybody would say if we are going to start a company everyone’s going to be under the same roof, right here in Silicon Valley. That’s not true anymore – people are now saying well we can have the Engineers are over here, we can have sales and marketing there, it doesn’t matter. They are comfortable with a distributed company. It is recognition that innovation can arise in many different places – it is all part of globalisation, [28].”

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Appendix A – “Siliconia” Around the World

The following is a selection of locations around the world that have been recognised for having a high-technology cluster, [30].

- Silicon Alps - Carinthia, Austria
- Silicon Bog - the midlands of Ireland
- Silicon Ditch - the M4 Corridor, west out of London, England
- Silicon Fen - Cambridge, England
- Silicon Forest Australia - eastern Australia
- Silicon Glen - the region around Livingston, Scotland
- Silicon Isle - Ireland
- Silicon Plain - Kempele, Finland
- Silicon Plains - Lincoln, Nebraska (and) Atadim Park, in north Tel Aviv, Israel
- Silicon Plateau - Bangalore, India
- Silicon Polder - The Netherlands
- Silicon Saxony - eastern state of Saxony, Germany
- Silicon Spires - Oxford, England
- Silicon Valais - Valais, Switzerland
- Silicon Valley North - area around Ottawa, Canada
- Silicon Valley of the East - Penang State, Malaysia
- Silicon Wadi – Israel