COMPARING AMERICAN AND EUROPEAN INNOVATION CULTURES

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Innovation – the improvement of existing or the creation of entirely new products, processes, services, and business or organizational models – drives long-term economic growth and improvements in standards of living and quality of life for peoples throughout the world. In fact, the U.S. Department of Commerce reports that technological innovation can be linked to three-quarters of the United States' economic growth rate since the end of World War II (Rai et al., 2010). Put simply, innovation is nothing less than the creation of new value for the world. Yet this is a lesson now understood by virtually all countries, giving rise to an intense competition for global innovation leadership, as Robert Atkinson and Stephen Ezell of the Information Technology and Innovation Foundation (ITIF) write in *Innovation Economics: The Race for Global Advantage* (Atkinson/Ezell, 2012). That has led many countries to design sophisticated national innovation ecosystems that bring together disparate policies toward finance, scientific research, technology commercialization, education and skills development, tax, trade, intellectual property (IP), government procurement, and labor and regulatory policies in an integrated fashion that seeks to drive economic growth by fostering innovation.

But while smart policies can contribute greatly to bolstering a nation's innovation capacity, underlying those factors lays a country's (or region's) fundamental *innovation culture*, which informs and provides the social-political framework through which innovation occurs in a country. Indeed, innovation involves a complex set of processes that strongly relates to contextual factors (Vieria et al., 2010). 'Innovation culture' has relevance at a number of levels – for example, individual, societal, organizational, national – and differs greatly between Europe, the United States, and Asia and in fact

even differs within the same countries and regions over periods of time. This chapter explores the innovation cultures of Europe with the one of the United States and examines how those disparate innovation cultures have informed these regions' innovation policies and affected their output of entrepreneurial and innovative activities over time. To be sure, a nation's innovation culture is neither monolithic nor immutable, but it can hold key characteristics that significantly impact a nation's ability to innovate.

INNOVATION CULTURE

Before assessing what role, if any, innovation culture plays in how ready a nation or organization is to innovate, we must ask: what is an innovation culture? The anthropologist Edward B. Taylor defined culture as 'that complex whole which includes knowledge, belief, art, morals, law, custom, and any other capabilities and habits acquired by man as a member of society' (Taylor, 1889). The Dutch social psychologist Geert Hofstede's pioneering work in cultural dimensions theory led him to develop a model of national culture that contains five dimensions: power distance (the extent to which the less powerful members of organizations and institutions accept and expect that power is distributed unequally), individualism, masculinity, uncertainty avoidance, and long-term orientation (added later) (Didero et al., 2008). Building from this framework of national culture, Hofstede wrote that '[i]nnovation culture is to be understood in terms of attitudes towards innovation, technology, exchange of knowledge, entrepreneurial activities, business, uncertainty and related behavior and historical trajectories' (Hofstede, 2001).

Innovation is inherently and inextricably linked to change – that is, to the disruption of the status quo and the existing method of doing things, whether with regard to the technologies or processes deployed to create value for customers or constituents. Indeed, as Joseph Schumpeter, the Austrian patron saint of innovation economics famously wrote, 'It is the process of industrial mutation – if I may use that biological

term – that incessantly revolutionizes the economic structure *from within,* incessantly destroying the old one, incessantly creating a new one. This process of Creative Destruction is the essential fact about capitalism' (Schumpeter, 1975). With those words, Schumpeter effectively anticipated the 'political economy of innovation,' highlighting the reality that this creative destruction – that is, innovation – forces individuals, organizations, and even whole regions and nations to adapt or to suffer the consequences of not doing so. For innovation can turn industries (and occupations) into vestigial 'buggy whip industries' with little purpose, just as the automobile replaced the carriage a century ago and as the driverless car (or autonomous vehicle) is poised to replace the person-driven car today (Ezell, 2014). But while most gain handsomely from innovations, for those invested in the old – old products, services, industries, occupations, institutions, forms of work organization, and production processes – innovation is risky and often met with trepidation at best (Atkinson/Ezell, 2012). And all too frequently those invested in the old fight, often vigorously and effectively, protect their interests against particular innovations. As such, a key component of an organization or nation's innovation culture is not only how creative it is to imagine, develop, and commercialize new technologies, products, or services, but also how it reacts and adapts to change and manifests a willingness to take risks as well as how its citizens view the likely impacts of scientific or technological change.

Thus, not having a culture that supports innovation stands #1 among the 'Big Ten Innovation Killers.' As innovation evangelist Joyce Wycoff writes, 'Culture is the playing field of innovation. Unless the culture honors ideas and supports risk-taking, innovation will be stifled before it begins [...] Culture can change but it is a slow process' (Wycoff, 2004). Wycoff describes culture as a concept to describe how innovation is influenced by various human factors: 'Culture is the reflection of leadership, people and values: the outward and observable expression of how they work and behave together. An environment that is flexible, empowering, welcomes ideas, tolerates

risk, celebrates success, fosters respect, and encourages fun is crucial to innovation' (Wycoff, 2004). In other words, an effective innovation culture is vital to innovation success at the organizational level.

Dan Mote of the U.S. National Academy of Engineering argues that effective cultures of innovation at the organizational level exhibit seven key characteristics, they:

1) have strong leadership committed to innovation;
2) deploy minimal hierarchy in decision making;
3) are committed to deliverables and implementations;
4) value disparate talents and entrepreneurship;
5) value ideas, the creative and the unconventional;
6) move quickly but adapt readily; and
7) are willing to accept failures (Mote, 2013).

Writing about organizational innovation culture in *Wired* magazine, John Carter offers similar hallmarks. As he writes, innovation cultures:

1) invest in their people;
2) tolerate risk and failure;
3) support inquiry and the scientific method;
4) value trust;
5) encourage opposing points of view;
6) ban politics; and
7) embrace the individual.

Certainly many such lists abound, but the key point is that all organizations should conscientiously construct an effective innovation culture and commit to its central tenets.

Yet innovation culture is no less important at the national level. In their article 'How does culture contribute to innovation,' the Estonian researchers Kaasa and Vadi

measure patenting intensity at the national level as an innovation measurement and find 'significant support for the argument that the capability of a country or region to initiate innovation is related to its culture' (Kaasa/Vadi, 2008). Specifically, the authors find a 'reliable link between cultural dimensions and patenting intensity' (ibid). They also find evidence that cultures that excessively value the family tend to be more conservative and less open to new and creative ideas, while cultures focusing more on relationships with persons outside families are more open, in part because relationships with persons with different backgrounds enable a broader world view as a powerful source of new ideas (ibid).

Likewise, the Portuguese researchers Vieira, Neira, and Ferreira find in their study 'Culture impact on innovation: Econometric analysis of European countries,' that 'the cultural environment is of utmost importance for countries to be innovative' (Vieira et al., 2010). The authors examine Hofstede's four original components of his cultural dimensions theory – power distance, individualism, masculinity, and uncertainty avoidance – and find that (in Europe at least), 'three out of four cultural dimensions produce an impact on innovation' with the corresponding implication that 'some countries present more innovation potential than others and, consequently, are in a more suitable position to be competitive and develop entrepreneurial activities [...] with the differences among European nations being quite pronounced' (ibid). Interestingly, the authors find that innovation (as measured by R&D expenditure) is more significant in societies where individualism is higher, which the authors interpret to mean that the innovation process finds a more positive cultural environment in societies that value and reward freedom, autonomy, and initiative (ibid). (In contrast, ITIF finds that nations that effectively balance the tension between individualism – emphasis on individual rights and freedom – and communitarianism – emphasis on the collective good – are in better positions to win the global innovation race [Atkinson/Ezell, 2012].) The Portuguese authors also find the effects of excessive masculinity and of power distance

on innovation to be negative. Uncertainty avoidance, on the other hand, was found to have no impact on innovation (Vieira et al., 2010). But while certainly the specifics of these findings can be debated, their research clearly establishes a connection between a nation's cultural attributes and its innovation propensity.

At the national level, a culture of innovation provides an environment that supports creative thinking and advances efforts to extract economic and social value from knowledge, and, in doing so, generates new or improved products, services or processes. A healthy innovation culture provides a shared set of values and mutually reinforcing beliefs about the importance of innovation as well as an integrated pattern of behavior that supports research and innovation. Finally, a thriving national innovation culture leverages the existing strengths of a country's research and innovation ecosystem.

EUROPE'S INNOVATION CULTURE

The following section examines Europe's innovation culture, past and present.

THE EVOLUTION OF EUROPE'S INNOVATION CULTURE

Europe has a profound history of innovation achievement stretching back centuries: aqueducts, the printing press, the telescope, the steam engine, the mechanical loom, the television, the automobile, and, some argue, the first aeroplane, to name just a few. Indeed, Europe was the birthplace of the Renaissance and the scientific revolution, a period that prized scientific and intellectual curiosity and the innovations they engendered. Europe's scientific revolution gave rise not only to the industrial revolution of the late eighteenth and nineteenth century but also to the great flourishing of intellectual and creative fervent that characterized European capitals such as Berlin, London, Paris, and Vienna in the late nineteenth and early twentieth centuries.

Austria's Innovation Culture circa 1900

Austria – and Vienna in particular – embodied the vibrant intellectual moment at the turn of the twentieth century. Openness to people with different cultural backgrounds became one of the reasons why Vienna stood among the world's most innovative cities at the turn from the nineteenth to the twentieth century, as creative minds from all over Europe moved to the capital city of the Habsburg Empire, considered a cultural melting pot at the time. As Eric Kandel writes in *The Age of Insight* about Vienna circa 1900: 'One of the characteristic features of Viennese life at that time was the continual, easy interaction of artists, writers, and thinkers with scientists' (Kandel, 2012). Indeed, 'Vienna benefitted from an influx of talented individuals from different religious, social, cultural, ethnic, and educational backgrounds.' In fact, this influx contributed to the emergence of the University of Vienna as one of the world's great research universities. As Kandel continues:

> 'Viennese life at the turn of the century provided opportunities in salons and coffeehouses for scientists, writers, and artists to come together in an atmosphere that was at once inspiring, optimistic, and politically engaged. The advances in biology, medicine, physics, chemistry, and the related fields of logic and economics brought with them the realization that science was no longer the narrow and restricted province of scientists but had become an integral part of Viennese culture.' (Kandel, 2012)

In that era, scientists and inventors in the Habsburg Empire such as Josef Ressel (designing one of the first ship propellers), Ferdinand Mannlicher (inventing the rotary magazine), Carl Auer von Welsbach (inventing the incandescent gas mantle), Sigmund Freud (founding psychoanalysis), and Viktor Kaplan (making the first turbine) changed the way the world works with groundbreaking discoveries.

> And in the field of medicine, the Austrian capital – with the Vienna School of Medicine developed at the Vienna General Hospital – boasted a world-leading institution that attracted talent from across the globe. 'American students in particular were drawn to the medical school because of its growing reputation for excellence [...] in contrast to the poor quality of nineteenth-century instruction and practice in the United States.' In fact, the intellectual historians Allan Janik and Stephen Toulmin argue that the United States owes its current preeminence in the medical sciences in part to the thousands of medical students who traveled to Vienna at a time when the standards of American medicine were low (Kandel, 2012).

The turn of the twentieth century also sparked tremendous growth in entrepreneurial and commercial innovation throughout Europe. Indeed, as *The Economist* notes, 'the vast majority of Europe's big companies were born around the turn of the last century. So was much of the German *Mittelstand*, and clusters of manufacturers from Lombardy to the Scottish lowlands' (The Economist, 2012). Leading European firms, to this day, created at that time include Denmark's Maersk (1904), Germany's Thyssen-Krupp (1891) and Daimler-Motoren-Gesellschaft (1901), France's L'Oréal (1909), Switzerland's Roche (1896), the precursors of Sweden's modern ABB (ASEA in 1883 and the Swiss firm Brown, Boveri and Cie in 1891), and the United Kingdom's Rolls Royce (1906) (Economist, 2012, and author research).

But as David Landis wrote in *The Unbound Prometheus: Technological Change and Industrial Development in Western Europe from 1750 to the Present*, 'technological change is never automatic. It means the displacement of established methods, damage of vested interests, and often serious human dislocations' (Landis, 2003). And so the tumultuous period of the industrial revolution gave rise to an anti-progress-

oriented Luddite movement – inspired by Englishman Ned Ludd, who led a movement to destroy mechanized textile looms – that sought to resist the impact technological innovation makes on society and the economy. And though the Luddite movement sprouted in Europe, and in many ways remains strong there today, it has become a global phenomenon, as ITIF writes in *The 2014 Luddite Awards* (Atkinson, 2015).

This development was significantly compounded by the two world wars Europe endured in the twentieth century. As The Economist notes, the devastation of the two World Wars 'made Europeans more risk-averse than they had previously been' (The Economist, 2012). As Leslie Hannah, a business historian at the London School of Economics, observes, 'markets that had been closely linked before 1914 fell back into fragments' which limited European firms' ability to achieve scale and grow large – particularly in the decades before the European Union's single market was formed (The Economist, 2012). In fact, according to Nicolas Véron of the Brussels-based think-tank Bruegel, from 1950 to 2007 Europe gave rise to just twelve new large companies – at a time when the United States produced fifty-two. Worse, only three large new European firms were listed between 1975 and 2007 (Véron, 2008). In contrast, as Véron notes, '[s]ince the Industrial Revolution, the United States has never ceased to produce new champions [e.g., entrepreneurial start-ups that become listed corporations]. Specifically, 33 % of its champions, representing 27.4 % of its aggregate market capitalization (as of 2007) were born after 1945; of these, 25 companies (14 %of U.S. champions, representing 13 % of aggregate market capitalization) were born in the last quarter of the 20th century' (Véron, 2008).[1]

[1] Those companies being Apple, Genentech, Unitedhealth, Oracle, Home Depot, Boston Scientific, EMC, Amgen, Time Warner Cable, DirecTV, Adobe Systems, Costco Wholesale, Cisco Systems, Dell, Qualcomm, XTO Energy, Celgene, Weatherford International, Gilead Sciences, Capital One Financial, Garmin, Amazon.com, Yahoo!, eBay, and Google.

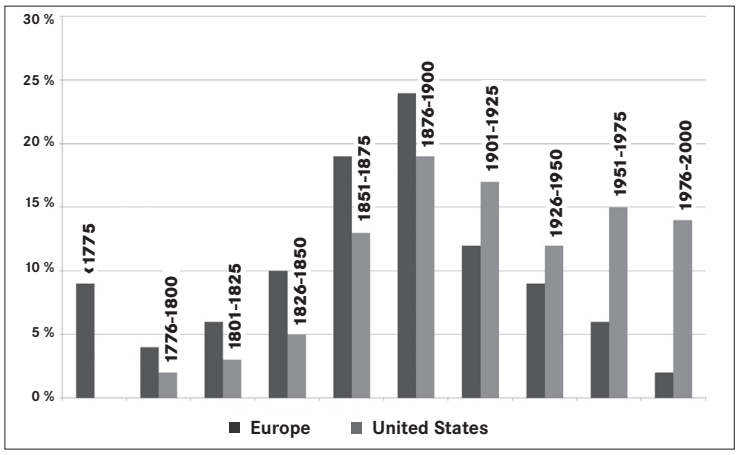


FIGURE 1

Age structure of European and U.S. enterprises in the FT Global 500 (as of September 2007); taken from Véron (2008)

Figure 1 depicts the startling disparity in age structure of the leading American and European enterprises in the *FT Global 500* as of September 30, 2007.

EUROPE'S INNOVATION CULTURE TODAY

Europe's modern innovation culture is complex and certainly not homogenous; it exhibits a wide diversity across the European continent. European nations, in general, field some of the world's most sophisticated science, innovation, and technology support agencies. These agencies foster the innovation competencies and skills of their countries' private sector firms while also promoting innovation within government agencies themselves. European nations have also led in the formulation of national innovation strategies which seek to explicitly link science, technology, and innovation with economic and employment growth, effectively creating a game plan for how their countries can compete and win in innovation-based economic activity.

There's also evidence that European firms are fairly active innovators. In fact, the European Union's (EU's) *Sixth Community Innovation Survey* (CIS) found that 52 % of EU-27 enterprises reported innovation activity between 2006 and 2008 (Dahl, 2010).

By comparison, the U.S. National Science Foundation's 2008 Business R&D and Innovation Survey (BRDIS), which covered the same period and asked the exact same questions as the CIS, found that just 9 % of surveyed U.S. firms were active innovators from 2006 to 2008 (although 22 % of U.S. manufacturing companies reported innovation activity) (Boroush, 2010).[2] So, at least by this indicator, European firms are, on average, more innovative than American ones.

In other words, Europe is hungry for innovation from its enterprises, governments, and institutions. But Europe's innovation challenge is that it still has not realized to the full extent that it cannot achieve an innovation economy without embracing at least a modest amount of Schumpeterian creative destruction while maintaining an expansive, if expensive, social welfare state. The Nordic countries try to manage this tension through an innovative 'flexicurity' approach that promises citizens not job security but 'skills security' (Atkinson/Ezell, 2012). For, as much as European leaders embrace innovation, they have a decidedly ambivalent view of it. When they refer to innovation, they rather seem to mean science- and technology-based funding, not innovation in Schumpeterian terms. For innovation is the constant transformation of an economy and its institutions. And some countries in Europe seem to be reluctant to accept constant transformation, especially if it has the potential to upset the delicate balance of carefully calibrated social democratic societies. Put simply, even though Schumpeter was a European, most Europeans are not Schumpeterians. Europe wants the benefits of a knowledge-based technology economy without the creative destruction that not only accompanies it, but is required to achieve it. To be sure, some in Europe get this,

[2] What accounts for this difference in reported innovation activity between U.S. and European firms is unclear. Since the survey instruments are similar, the differences either reflect a different industrial composition in the U.S., U.S. firms' inexperience in responding to the survey, or the less sanguine possibility that European firms as a whole may in fact be more innovative than American ones. So important is the question that in February 2011 the U.S. National Academies of Science commissioned a new study that will seek to ascertain the reasons for the different reported rates of innovation between U.S. and EU enterprises.

as Paul Giacobbi, a member of the French Assembly, observed: 'The idea that nothing will change, that no factory will ever close, and restructuring will not be a permanent feature is contrary to everything that the direction of the world tells us every day' (Giacobbi, 2010). Unless Europe embraces the idea that innovation entails plant closures and job losses, new technologies with uncertain social or environmental impacts, and new kinds of business models and organizations, it will be challenging for Europe to keep up in the race for global innovation advantage (Atkinson/Ezell, 2012).

Sclerotic regulatory policies – particularly with regard to labor, competition, and bankruptcy policy – in addition to inadequate access to risk capital are probably the two largest inhibitors to Europe's innovation economy. For instance, a 2004 report prepared for the OECD by Eric Bartelsman found that the 'rates of innovation' (e.g., launches of innovative new products or services) between U.S. and EU enterprises were actually the same (Bartelsman et al., 2005). However, Bartelsman found that the United States did a much better job than Europe of more quickly allocating capital and labor to the most promising innovative concepts and start-up businesses, so the U.S. was spawning more 'winners,' even though the underlying rates of innovation were analogous. As an archetypal case, Bartelsman points to the Dutch bank ING Group's efforts to launch an online banking service in Europe. ING Group was the first bank in the world to introduce online banking, but Dutch regulators – fearing the impact online banking would have on employment (i.e., tellers) – introduced laws that slowed the introduction of online banking and compelled ING to launch its service first in the United States, not Europe (McDowell, 2005).

Similar reactions to innovative, information and communications technology (ICT)-based business models and innovations persist across Europe today. For example, France's Culture Minister has attempted to categorize Amazon.com's free shipping of online orders away from what it is – a business model innovation – and classify it as 'a strategy of dumping' (Collier, 2013). Or think of the legal battles the ride-sharing

car service Uber is facing in Belgium and Germany (Euractiv, 2014). The irony is that while Europe wants to foster its own world-class internet companies, its regulators – often lobbied by companies with vested interests – fear the competition these firms would bring to incumbent interests. With such hurdles, it's no surprise when *The Economist* argues that 'Europe's culture is deeply inhospitable to entrepreneurs' and that 'Europe [has exhibited a] chronic failure to encourage ambitious entrepreneurs' One problem, as *The Economist* points out, is that 'European executives are extremely risk-averse [...] young firms quickly find that established European companies don't like working with small ones' (The Economist, 2012).

Meanwhile, an existential challenge for European entrepreneurs remains securing adequate access to risk capital. As *The Economist* notes, '[f]or the €1.5 to €4 million that firms need to work an idea up into a real business model, money is in desperately short supply' in Europe. Figure 2 shows the vast disparity in levels of venture capital activity between the United States and Europe from 1995 through 2010. In fact, over those years, the United States invested US$321 billion more in venture capital investment into young, innovative entrepreneurial companies than European Union nations did, with the United States investing US$478.4 billion to the European Union's US$157.2 billion in venture capital over that time frame (OECD, 2013).

However, European policymakers are aware of this gap and are taking measures to address it, such as through the creation of the European Investment Fund (EIF), a body financed by the European Union, which invested €600 million (US$800 million) into venture capital funds in 2013 out of a Europe-wide total of €4 billion (US$4.5 billion) (The Economist, 2014). In the same line, in 2013 the Austrian government created the 'Gründerfonds' (~ start-up fund), an investment vehicle of € 65 million to support young companies with high growth potential in their initial growth phase; the investment volume per deal is in the range of €100 thousand to €3 million. Moreover, the total fundraising for European private equity activity of €53.6 billion (US$61.2 billion)

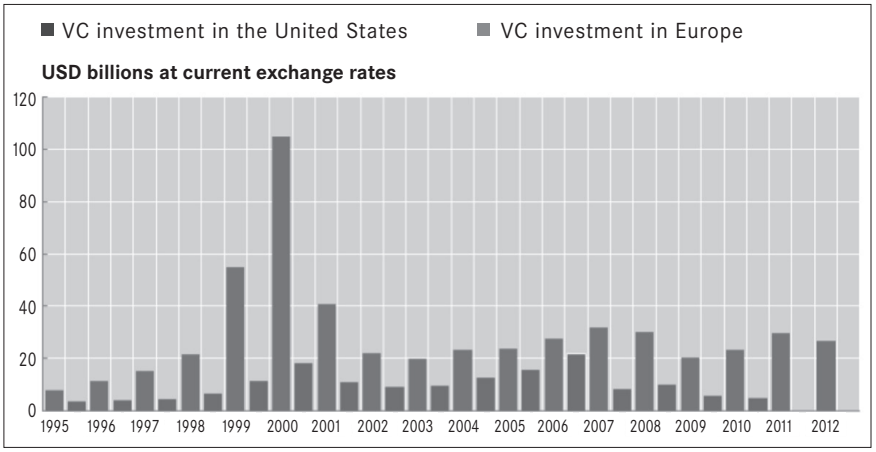


FIGURE 2

VC investment in the United States and Europe, 1995–2012 (OECD, 2013)

in 2013 more than doubled the volume of 2012 (EVCA, 2013). Still, Europe's young entrepreneurs remain significantly underfinanced.

One reason posited for the scarcity of venture capital in Europe relative to the United States, as Peter Thiel notes, is that venture returns in Europe have underperformed those in America (NESTA, 2013). In part, that's because of deeper capital markets in the United States that more readily enable firm exits, through initial public offerings or M&A activity, allowing venture capitalists to better monetize their investments. On this issue, one other challenge for European entrepreneurs is that it's more difficult for them to use equity as part of incentive compensation structures. For example, Denmark explicitly discourages entrepreneurs from giving shares to employers, as their tax laws impose an additional 25% tax on any shareholder in possession of less than 10% of the company. In case of an exit, a stock-owning employee would owe 67% of gains to the Danish government. Hurdles such as these have meant that all too many European innovators have left continental Europe for the United States (or even the United Kingdom). For instance, it's estimated that 50,000 French nationals now live in Silicon Valley alone.

At the other end of the spectrum for Europe's entrepreneurs lies another challenge, one pertaining to firm dissolution and bankruptcy. As *The Economist* describes a 2010 European Commission study that examined insolvency regimes across European countries, it found that, '[s]ome countries keep failed entrepreneurs in limbo for years' and that 'many [European] countries treat honest insolvent entrepreneurs more or less like fraudsters, though only a tiny fraction of bankruptcies involve any fraud at all' (The Economist, 2012). In France, the maximum typical time from the end of the liquidation process until a bankruptee is free from debts is nine years, as Figure 3 shows.

And as *The New York Times* writes in the article 'Au revoir, Entrepreneurs' about France, 'Defeat is seen as so ignominious that France's central bank alerts lenders to entrepreneurs who have filed for bankruptcy, effectively preventing them from obtaining money for new projects.' In Germany, it takes six years to get a fresh start, but 'bankrupts can face a lifetime ban on senior executive positions at big companies.' In contrast, in Silicon Valley, the attitude some venture capitalists take toward young entrepreneurs is, 'don't talk to me until you're on your third start-up [with two

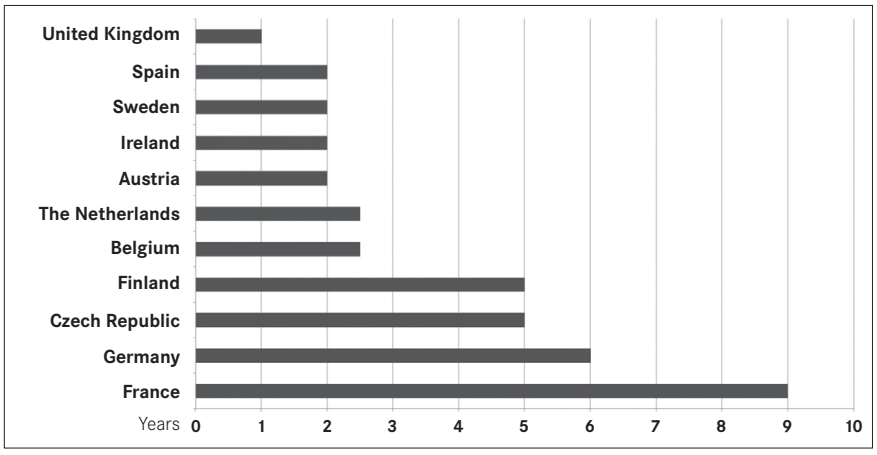


FIGURE 3

Maximum time from end of liquidation process until a bankruptee is clear of debts (European Commission, 2011).

failures already behind you] because you haven't learned anything useful.' This viewpoint is not prevalent enough in Europe.

However, there are entrepreneurs in Europe who defy logic and culture, think big, don't let failure stop them, and single-handedly create new industries 'in the Silicon Valley way.' Among them is the Austrian Dietrich Mateschitz, one of the most successful entrepreneurs of our time. Despite initial failure and losing his entire life savings, Mateschitz has created Red Bull, the dominant energy drink in the world, thus revolutionizing the beverage industry by adding a new category. Like other newcomers such as Uber, Red Bull faced struggles and was initially banned in France, Denmark and Norway, but the drink was eventually legalized in all three countries.

Of course, Mateschitz is not the only example of a successful, industry-changing modern European entrepreneur. A collaboration of Estonian and Scandinavian innovators led by Priit Kasesalu and Jaan Tallinn created the breakthrough voice over internet service Skype, later acquired by eBay for US$ 2.6 billion. The Swedes Daniel Ek and Martin Lorentzon launched the innovative music streaming service Spotify in 2006, leveraging a novel digital rights management approach. And of course the flamboyant Brit Sir Richard Branson, in the Mateschitz mold, has built his Virgin empire based on an irreverent, iconoclastic brand strategy that has enabled Branson to sell customers everything from cell phone subscriptions and music to air travel and space flight under the Virgin banner.

Yet despite such role models, there's still a perception – at least in the United States – that even Europe's most ambitious entrepreneurs may not be ambitious enough. A leading Silicon Valley-based U.S. venture capitalist in the renewable energy sector noted that his firm was less inclined to support European entrepreneurs. He stated that entrepreneurs from the United States, Asia, and Europe tended to be roughly at parity with regard to the core science and technological inventions behind their

start-up's innovative product, but the real difference was that the American and Asian entrepreneurs had developed far more aggressive business models that sought to build billion-dollar companies and disrupt entire industries. This venture capitalist felt that the European entrepreneurs tended to write business plans that would lead to successful companies that would find a certain market niche and work within the existing system. But as he noted, venture capitalists look for 'irrationally ambitious' individuals who wish to fundamentally disrupt established markets, industries, and business models, and he felt that, in general, European entrepreneurs' business plans failed to reflect those aspirations. A similar sense emerges from some Nordic countries, where there's actually a sense of entrepreneurs who are too successful being socially shunned. That is, if they disrupt the finely tuned social justice system too much – whether by making too much money or by launching companies so disruptive that it contributes to unemployment – they are socially frowned upon.

EUROPE'S HIDDEN CHAMPIONS

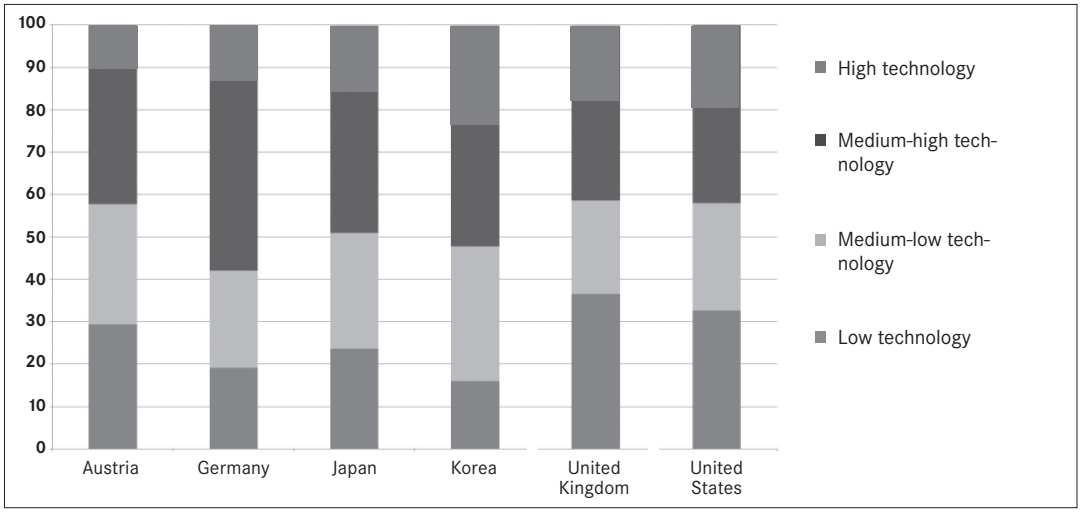
Although European entrepreneurs seem to take a more modest approach when building a company – at least from a U.S. perspective – there are a good number of extremely successful, yet unknown, companies that aim to be among the top three in their global markets, have less than US$5 billion in revenue, and are little known to the general public. Coined by the German Business Consultant Herman Simon as 'hidden champions,' he describes these mid-level companies as 'simmering under the surface of the global economy while dominating their markets.' These businesses are not only some of the most intriguing companies on the planet, but they are also raking in cash to little or no fanfare. In fact, two-thirds of them are family owned with only 8% of these 'hidden champions' having required private equity investment (Simon, 2008). Austria, Germany, and Switzerland are home to more than 55% of all so-called 'hidden champions' worldwide. Although this area has a population less than 100 million

(1.5% of the world population), there are more small and medium-sized world market leaders located there than in the rest of the world. Research has shown that the success of these hidden champions is derived from distinctive factors such as a strong focus on production, outstanding in-house innovation and research, a highly skilled labor force – in Austria's case, the dual system of apprenticeship and vocational education – strong exports, and a high vertical integration of manufacturing (21st Austria, 2015).

For Germany, Simon observes that there are clusters of unknown world market leaders across the country. In fact, ninety percent of Germany's *Mittelstand* operate in business-to-business markets and seventy percent are found in Germany's countryside, but such is their dominance that eighty percent of the world's medium-sized market leaders are based in Germany, Austria, or Scandinavia (The Economist, November 2010). Germany's *Mittelstand* employ over one million workers and export more than eighty percent of their production (The Economist, March 2010). The reason for this, according to Simon, is that entrepreneurship is infectious and contagious. The social network that binds people together in these regions provides the inspiration for them to emulate their neighbors' successes and build a market leader in their own field. Hence, for Simon, Germany is more entrepreneurial than many think, but these entrepreneurs remain hidden – in contrast to places such as the highly visible Silicon Valley (Simon).

The strength of Austria and Germany's hidden champions can clearly be seen in Figure 4, which examines the 'technological intensity' of various countries' manufacturing sectors as either 'low-technology,' 'medium-low technology,' 'medium-high technology,' or 'high-technology.' (The OECD classifies a sector as 'high-technology' if global R&D expenditure is greater than 5% of sales; 'medium-high technology' if global R&D expenditure is 3–5% of sales; 'medium-low technology' if global R&D is 1–3% of sales; and 'low technology' if global R&D expenditure is less than 1% of

FIGURE 4 **Composition of manufacturing sector by technological intensity, 2007 (OECD, STAN)[3]**



sales.) Indeed, 45.1 % of Germany's and 32.4 % of Austria's manufacturing enterprises are located in the medium-to-high technology range, reflecting the strong influence of their hidden champions. However, if there is a weakness for Germany and Austria in this picture, it is that they underperform the United States in their share of the most innovative, R&D-intense manufacturing sectors (for example, sectors such as aerospace, information and communications technology, medical devices, and pharmaceuticals manufacturing) (Ezell/Atkinson, 2011).

The United States has much to learn from Austria and Germany's approach to the innovation ecosystem that supports these hidden champions, in particular the emphasis on collaborative education and skills development. In fact, a number of European companies that have recently made foreign direct investments in the United

[3] Data displayed is 2007, or most recent year available.

States to launch new manufacturing facilities – including Siemens, Volkswagen, and Voestalpine – have also imported their apprenticeship training models. For instance, when Siemens opened a new gas turbine manufacturing facility in Charlotte, North Carolina, in 2011, Siemens partnered with Central Piedmont Community College to launch an apprenticeship program in which students studied half-time at the college, worked half-time at Siemens, and were prepared with the requisite skills to work full-time at Siemens' plant upon graduation. The Austrian company Blum and the Swiss firm Daetwyler had actually started this *Apprenticeship 2000* program already in 1995 (Apprenticeship 2000).

This enlightened approach to workforce development – particularly in Europe's Nordic and German-speaking nations – was never more fully on display than during the height of the Great Recession. As the Great Recession sharply constricted global demand, instead of releasing idling workers (as was too often the case in the United States), the German government conceived a 'Kurzarbeit' program in collaboration with and co-funded by German industry, unions, and state governments, through which workers in manufacturing facilities not needing to make full production would work half time and be reskilled or up-skilled half-time (The Economist, 2010b). Accordingly, when global demand recovered in the wake of the Great Recession, German firms were fully staffed, and with a workforce reskilled to leverage the technologies and manufacturing processes of the future (Nager, 2014). While the way many American corporations (laudably) give back to their communities is through donations or sponsorships to community service programs, often the way Austrian and German companies do so is through these types of enlightened investments in their workforce.

Another hallmark of the European system is its intensely collaborative nature. As Figure 5 shows, almost seventy percent of European firms surveyed report that they collaborate with other enterprises in innovative activities, a rate more than double that of enterprises in the United States, in China and India, or in other OECD nations. The

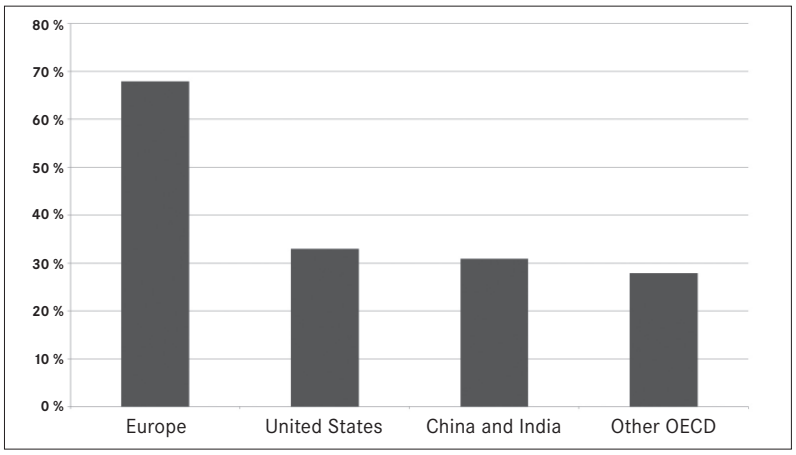


FIGURE 5

Percentage of nations' firms that cooperate in innovative activities (Chaminade et al., 2010)

collaborative nature of European innovation fits well with the modern concept of 'open innovation,' which emphasizes the importance of looking for innovative ideas outside the company and of partnering with customers, suppliers, universities, research institutes, and partner enterprises in the innovation process. However, there is evidence that the innovation process in the United States is also becoming more collaborative. As Matthew Block and Fred Keller write in *Where Do Innovations Comes From? Transformations in the U.S. National Innovation System, 1970–2006*, whereas in the 1970s, approximately eighty percent of award-winning U.S. innovations came from large firms acting on their own, today, approximately two-thirds of award-winning U.S. innovations involve some kind of inter-organizational collaboration (Block/Keller, 2008). Indeed, cultural attitudes toward science, technology, and innovation are important. The 2014 World Values Survey revealed significant disparity among European nations as to whether citizens believed that the 'world is better off, or worse off' because of technology. Twenty-one percent of respondents in Sweden and 20.4 % in Germany believe science and technology will make the world much better off, while just 6.7 % believed so in the Netherlands and 11.9 % in Spain. Attitudes in Germany and Sweden

were closer to those in the United States and China, however, as 19.6% and 18.3% of Americans and Chinese respectively, felt that science and technology will leave the world in a better place (World Values Survey). In Europe, the World Values Survey found similar values hold for the statement that 'Science and technology are making our lives healthier, easier, and more comfortable.' 25.4% of Swedish and 19.6% of Germans believed that, considerably more than the 14.9% of Spaniards and 13.2% of Dutch who felt that way. Interestingly, Europeans were slightly more inclined to believe that science and technology are making our lives healthier, easier, and more comfortable than Americans, although Chinese believed significantly stronger than Europeans or Americans that this is the case. These attitudes appear to matter as there is a strong positive correlation (0.44) between the extent to which a nation's citizens think that more emphasis on technology is good and their overall per capita GDP growth rate over the last decade (Atkinson/Ezell, 2012).

In conclusion, it's important to reaffirm that Europe remains a vibrant and robust center of global innovation. For instance, European research teams recently achieved the first landing of a space probe on a comet, which has already shed important light on the formation of the Earth, and led the discovery of a new fundamental particle, the Higgs Boson, which has provided critical information on the origin of the universe (MIT, 2015). Europe has also surpassed the United States in developing a medical device innovation ecosystem and its researchers and innovative start-ups are at parity or even ahead of American ones in a vast array of advanced-technology fields including pharmaceuticals, robotics, quantum computing, 3-D printing (additive manufacturing), nano-manufacturing, and other fields. But Europe's challenge will be to ensure that these technologies get developed not only by its leading industrialists, such as ABB, Siemens, or Philips, but also by young, innovative entrepreneurial firms that can be dynamic new economic and employment growth drivers for the European economy.

THE UNITED STATES' INNOVATION CULTURE

As in Europe, America's innovation culture is not monolithic. It has undergone significant change over time and continues to vary markedly within regions. Moreover, American's attitudes toward science and technology have changed significantly over the generations. This section examines the past and present of America's innovation culture.

THE EVOLUTION OF THE UNITED STATES' INNOVATION CULTURE

America's free-wheeling, entrepreneurial, creative innovation culture owes much both to its original Judeo-Christian heritage and to the pioneering frontier mentality that marked America's earliest settlers (coming from Europe), who as they moved westward relied on a self-sufficient, problem-solving spirit.

Indeed, Americans have long embraced both innovation and the inevitability of social and economic progress. For example, the stirring musical pageant 'Our Country 'Tis of Thee,' written by Walter Ehret in the 1950s, is filled with such optimistic statements as 'There was no stopping a nation of tinkerers and whittlers, long accustomed to making, repairing, improving and changing,' and 'So when you're spellin' the word America, do not forget the 'I' for the inventors,' and 'Progress! That was the word that made the century turn.' This optimistic sense was reflected not just in story and song, but in the writings of intellectuals who saw technology as a powerful force for liberation and enlightenment. Economist Benjamin Anderson wrote in the 1930s, 'On no account must we retard or interfere with the most rapid utilization of new inventions' (Bix, 2000). America came to lead the world in innovation in part because it was willing to accept and embrace risk and change and then not over-react if there was a problem. As Robert Friedel, a technology historian at the University of Maryland, summarizes this mindset in *A Culture of Improvement: Technology and the Western Millennium,* '[b]y the middle decades of the twentieth century, the improvement of

technologies of all kinds appeared to be an imperative – political, social, economic, cultural – throughout the West, but particularly in the United States [...] Few agendas seemed clearer both to politicians and the public at large than the pursuit of technological promise' (Friedel, 2010).

THE ROLE OF THE U.S. GOVERNMENT

But while America has cultivated the mythology of the 'lone innovator making a breakthrough innovation in his garage,' the reality is that the federal government has played a catalytic role in powering the U.S. innovation ecosystem, including as a funder of research and development (R&D), early procurer of innovative technologies, and source of innovations emerging from national laboratories. In fact, as ITIF writes in *Federally Supported Innovations: 22 Examples of Major Technology Advances That Stem From Federal Research Support,* the origins of many foundational technologies – such as wireless phones, supercomputers, search engines, artificial intelligence, gene sequencing, medical diagnostic and seismic imaging, and hydraulic fracturing – can be traced to at least an initial investment of U.S. federal R&D support and funds (Singer, 2014). Clearly, federal funding of research has helped drive American innovation and played a key role in enabling U.S. leadership in a host of advanced technology industries, from computer hardware, software, and aviation, to biotechnology, as ITIF writes in *Understanding the U.S. National Innovation System* (Atkinson, 2014).

To be sure, U.S. federal government support for innovation dates back to the beginning of the U.S. republic, when in the 1800s the U.S. Armories became the most advanced manufacturers in the country, producing gun parts to a level of standardization that made them interchangeable. Throughout the 1800s and into the early 1900s, the U.S. government played a pivotal role in supporting platform innovations such as the U.S. canal, transcontinental railroad, and telegraph systems and establishing the agricultural extension services supporting agricultural innovation. But it was the Se-

cond World War and the ensuing Cold War and Space Race that institutionalized the foundational federal role in U.S. R&D, resulting in remarkable advances in fields as diverse as electronics, information technology, jet aircraft, radar, atomic power, and life sciences.

After the Second World War, a more science-based system of innovation emerged in the United States, inspired in part by Vannevar Bush, director of the U.S. Office of Scientific Research and Development during the Second World War, whose seminal report 'Science, the Endless Frontier' laid out a vision of government funding of basic research in partnership with universities and industry (Isaacson, 2014a). As Bush wrote, the Second World War had made it 'clear beyond all doubt' that basic science – such as discovering the fundamental principles behind nuclear and particle physics, computer sciences, biologic sciences, etc. – 'is absolutely essential to national security' (Isaacson, 2014a, 219). As Bush wrote in 'Science, the Endless Frontier':

> 'New products and new processes do not appear full-grown. They are founded on new principles and conceptions, which in turn are painstakingly developed in the purest realms of science. A nation which depends upon others for its basic scientific knowledge will be slow in its industrial progress and weak in its competitive position in world trade.' (Bush, 1945)

As Walter Isaacson observes in *The Innovators,* Bush had outlined the so-called 'linear model of innovation' and his vision catalyzed 'the creation of a triangular relationship among government, industry, and academia [that] was, in its own way, one of the significant innovations that helped produce the technological revolution of the late twentieth century' (Isaacson, 2014). Bush played a key role in persuading Congress to establish America's National Science Foundation, which became a key

funder of basic scientific research. Thus, the U.S. national innovation system post the Second World War became characterized by large, centralized corporate R&D laboratories (often receiving significant federal funding and performing significant amounts of basic scientific research) such as Bell Labs (which invented the integrated circuit) or Xerox's PARC lab, significantly increased federal funding for research universities, and substantial funding of a system of national laboratories. Military laboratories and research institutions such as RAND and DARPA (the Defense Advanced Research Projects Agency) also became key sources of military and civilian innovation (see box). Moreover, the U.S. government as the dominant purchaser of early generations of semiconductors, computing, and networking equipment supporting military priorities such as air defense systems and missile technology (both for nuclear defense and the space race) played a central role in driving price points for emerging computing technologies low enough that commercial business markets for computing technologies became feasible, catalyzing the global information technology revolution. Indeed, it was a succession of innovative integrated circuit manufacturers from Shockley Semiconductor to Fairchild Semiconductor to Intel (along with contributions from the Stanford Research Park and firms including Hewlett-Packard) that would transform the apricot and almond fields south of San Francisco into the world-famous Silicon Valley.

The Evolution of the U.S. Defense Advanced Research Projects Agency

The U.S. Defense Advanced Research Projects Agency (DARPA) was created by President Eisenhower in 1958 in the wake of the Soviet launch of the Sputnik satellite with the initial mission of 'preventing technological surprise' and later 'causing technological surprise' to America's enemies. DARPA's charter originally called for it to develop advanced technologies with both defense and commercial applica-

tion (although after 9/11, DARPA's focus has shifted to supporting the warfighter). DARPA played a catalytic role in developing the Internet, its ARPANET system being one of the world's first distributed computing networks.

But as Erica Fuchs writes in 'Rethinking the Role of the State in Technology Development: DARPA and The Case for Embedded Network Governance,' in addition to its own research on advanced technologies, one of DARPA's greatest contributions to the U.S. national innovation system has been as a connector and amplifier of the disparate research activities occurring throughout America's research laboratories. As Fuchs writes, 'DARPA orchestrates the involvement of established companies with start-ups and academic experts, supports knowledge sharing between industry competitors through invitation-only workshops, provides third-party validation of new technology directions, and supports technology platform development.' Explaining how DARPA has played a key role in extending next-generation semiconductor development, Fuchs notes: 'As a central node to which information from the U.S. research community flowed, DARPA's program manager was able to recognize the potential of Si-Ge [silicon-germanium] technology, provide funding, coordinate research activities, and thus help launch a research effort that led to fundamental semiconductor breakthroughs, thus extending Moore's Law' (Fuchs, 2010).

America's strong academic-industry-government/military complex powered the United States to a world-leading economic and innovation position in the post-war era. But public attitudes toward the promise of science, technology, and innovation in the United States (as in Europe) began to sour in the latter half of the twentieth century. Particularly in the 1960s and 1970s, America's culture became less supportive of technology and innovation. Ironically, one only need visit the Smithsonian Museum

in Washington, D.C., to see the trend on display. The Smithsonian was once known as the National Museum of History and Technology, but when Roger Kennedy became director in 1979, in a period when technology was equated with nuclear war and Three Mile Island, he dropped 'technology' from its name. While a symbolic deletion, it reflected the new attitude toward technology. Rather than celebrate it, the Smithsonian began to focus on 'the social impact of machines and technology' – code for technology's purported negative and disruptive effects (Atkinson/Ezell, 2012). After reviewing a 1994 'Science in American Life' exhibit, one commentator stated, '[t]here is not much on pure science or the thrill of scientific discovery, and there is a great deal on science's unintended consequences' (Thompson, 2001). New York University's Neil Postman summed up this view when he wrote, 'I think the single most important lesson we should have learned in the past twenty years is that technological progress is not the same as human progress. Technology always comes at a price' (Kompf, 2004).

AMERICA'S INNOVATION CULTURE TODAY

However, with those caveats aside, there's little doubt that America maintains the world's most vibrant (and well-financed) innovation culture. And there's no question that the San Francisco-Silicon Valley region – which covers approximately 2,000 square miles, contains three million people, and would be the world's nineteenth-largest economy if a country – comprises the world's most fertile innovation hub. That's why the *2012 Global Startup Ecosystem Report* ranked Silicon Valley the world's number one innovation ecosystem (Herrmann et al., 2012).[4] Compared to start-ups in other ecosystems the report studied, Silicon Valley has 35 % more serial entrepreneurs and

[4] Tel Aviv, Los Angeles, Seattle, Boston, and New York rank second through sixth; and four European cities – London, Paris, Moscow, and Berlin rate in the top twenty.

20 % more mentors, while Silicon Valley start-ups raise 32 % more capital than their peers across all phases of development and are 30 % less likely to go after 'niche' markets (Herrmann et al., 2012). Rather, Silicon Valley start-ups tend to be 'born global,' in contrast to many European start-ups, which initially seek to service local, rather than global, markets.

Indeed, Silicon Valley boasts one of the most unique, difficult-to-replicate regional innovation ecosystems in the world. Silicon Valley is: 1) replete with five world-class research universities, five U.S. national research laboratories, and dozens of world-class corporate and private research institutions; 2) a half-century of intense federal R&D investment, with Santa Clara county in the heart of Silicon Valley receiving more federal R&D investment than any other U.S. county from 1950 to 2005; 3) forty percent of U.S. venture capital invested and seven of America's top ten VC investors; 4) six of the world's top ten ICT companies located within a ten-square-mile radius; and 5) a concentration of both advanced-degree holders and foreign-born start-up founders more than twice the national average (Ezell, 2014). In short, Silicon Valley has built a virtuous, self-reinforcing innovation system that attracts world-class, high-skill talent, reveres entrepreneurship, fosters a nurturing and mentoring community, and boasts successful companies that throw off entrepreneurs and capital that seed future generations of innovators.

But the take-away message for companies throughout the world not located in Silicon Valley – whether in America, Europe, Asia, or Africa – is simple: 'You don't have to be in Silicon Valley, but Silicon Valley has to be in you.' In other words, entrepreneurs and enterprises need to embody the spirit and values that guide the Valley. (There is, however, a trend that major companies from various sectors set up an 'innovation center' in Silicon Valley, in order to be closer to where the world of tomorrow is invented – and where their business model might be the next to be challenged, or worse, made obsolete.)

It starts with the conviction that the role of the innovator is to stand in the future and imagine a vision of a world transformed. As Steve Jobs famously said, 'Only the people who are crazy enough to think they can change the world are the ones who actually do' (Apple, 1998). That was a take-off on Alan Kay's observation that the best way to predict the future is to invent it. But the key insight is that successful entrepreneurs, as so well embodied by the innovation culture of Silicon Valley, set radically ambitious goals. That's why Google declared that its animating mission is to organize all of the world's information and make it accessible and why Elon Musk, founder of SpaceX, has proclaimed his organization's mission as making human life interplanetary.

Clearly, these are extraordinarily ambitious, risky goals. But as Larry Keeley, the Founder and President of the innovation consultancy Doblin observes, innovation is risky – but what is really risky is not innovating. And that's where the Valley's attitude toward failure comes in: recognizing that failure has value as long as it results in useful learning. As Drew Houston, the Co-founder of Dropbox notes, there is no need to worry about failure: One only has to be right once. As Luigi Caputo's article 'Fail Often and Fast: The Secret of Silicon Valley Success' notes, 'A positive view of failure is pervasive throughout Silicon Valley' (Caputo, 2014). As the article notes, 'Many entrepreneurs who have changed the world started from failure,' including Henry Ford, Richard Branson, Steve Jobs, Bill Gates, and Google's Sergei Brin and Larry Page (the latter of whom, after proposing a merger of the fledgling Google with Yahoo in 1998, were told 'to continue work on their scholastic project'). (Caputo, 2014). But the 'fail fast to succeed sooner' mantra is more than just a 'ra-ra chant' to embolden young entrepreneurs. Rather, as Peter Sims writes in his book *Little Bets: How Breakthrough Ideas Emerge from Small Discoveries,* a key insight of 'lean entrepreneurship' is rapid learning – placing early 'beta' versions of a product into a market, garnering customer feedback, and rapidly iterating design of the product, service, and software on a collaborative, co-creation basis with customers. This allows

companies to rapidly improve their product or service, while engaging 'venturesome consumers' who are likely to lead adoption of the product and service.

Another hallmark of the Silicon Valley innovation culture is 'design thinking'. In particular, this refers to the use of advanced social research tools such as ethnography, anthropology, and psychography to identify unmet or unarticulated customer wants and needs and to try to respond to them with innovative services. In other words, it's not enough to merely ask customers what they want; the best innovators invest time to discover underlying human needs that customers can't always articulate for themselves. Or, as Henry Ford said, 'If I'd simply asked my customers what they wanted, they would have said a faster horse.' In the late 1990s, when AT&T asked McKinsey to estimate the size of the global market for mobile phones, McKinsey estimated a global market of perhaps 1 million devices. Today, there are almost as many cell-phone subscriptions, 6.8 billion, as there are people on this earth, seven billion. To be fair, McKinsey's estimate was based on the technology and price point of the mobile device that existed at the time, but it missed the underlying human need for connection. (McKinsey's *faux pas* calls to mind the famous prediction offered by Thomas Watson, then-President of IBM, in 1943 that, 'there is a world market for maybe five computers,' again missing how fundamentally computers would change the global economy.) It was a similar kind of customer-needs based insight – that people want to control how we listen to our own music – that led Texas Instruments' co-founder Pat Haggerty to apply transistors to radios, Sony's Akio Morita to develop the Walkman, and Steve Jobs to invent the iPod. The point is that many of the best innovations spring from discovery-oriented, design-based, customer-focused explorations, and this is what Silicon Valley's innovation culture excels at discovering.

But innovative technologies and compelling products are not enough – they must be connected to an effective business model. Or as John Seeley Brown, the famed

director of Xerox's Palo Alto Research Center (PARC) noted, successful entrepreneurial businesses must effectively simultaneously answer three questions: 1) Is it technically feasible? 2) Is it customer desirable? 3) Is it financially profitable for the firm? Or, as Walter Isaacson writes in *The Innovators,* 'Innovation requires having at least three things: a great idea, the engineering talent to execute it, and the business savvy (plus deal-making moxie) to turn it into a successful product.' As Isaacson quotes Nolan Bushnell, founder of Atari, the world's first computer-based arcade video game manufacturer, 'I am proud of the way we were able to engineer Pong, but I'm even more proud of the way I figured out and financially engineered the business. Engineering the game was easy. Growing the company without money was hard' (Isaacson, 2014).

Another essential element of both the Silicon Valley innovation ecosystem and historically the U.S. national innovation ecosystem has been its openness to welcoming high-skill, foreign-born talent (although admittedly this has abated in recent years as America has made it more difficult for foreign-born students to remain in America upon graduation). Nevertheless, the United States still maintains the allure to attract talent from all over the world that Vienna possessed a century ago. In fact, more than fifty percent of all Silicon Valley start-up companies have at least one foreign-born founder. There's actually another parallel between the Vienna of 1900 and Silicon Valley today, namely its interdisciplinary position at the intersection of art and science. Similar to Eric Kandel's observations about Vienna circa 1900, Piero Scaruffi argues that the success of Silicon Valley is not merely based on the factors usually attributed to it (e.g., defense R&D and procurement, funding from DARPA, Fred Terman's influence at Stanford, the creation of the Stanford Research Park, the discovery of the integrated circuit at Shockley Semiconductor, Xerox's PARC, or Apple's success with personal music and computing). Rather, Scaruffi argues that cultural factors play an equally important role. In particular, he notes the influence of eccentric artists and writers

who came to the Bay Area in the 1950s and before, the mindset of the student protests, and the hippie culture that spawned the Summer of Love, the first 'Earth Day' (1970) and Gay Pride Parade (1970), the Survival Research Labs (1978), and Burning Man (1986).

Specifically, Scaruffi argues that the first major wave of immigration of young educated people from all over the world to Silicon Valley took place during the hippie era, and that the first major wave of technology was driven by the independents, amateurs, and hobbyists, for whom an anti-corporate and even anti-government sentiment existed. (This was the theme of Steven Levy's book *Hackers: Heroes of the Computer Revolution,* which noted that many of the later-exalted innovators of the Valley, including Steve Jobs and Steve Wozniak at Apple, started off as curious technology hackers [Levy, 2010].) In Silicon Valley, that mindset empowered young, educated people to seek to change the world with disruptive products. Scaruffi also points out that the famous culture of failure, the reward of success, and the casual work environment in Silicon Valley stem from the artist's way of life (Scaruffi, 2014). In a like manner, as Walter Isaacson, author of the books *Steve Jobs* and *The Innovators,* emphasized at a 2014 lecture for the National Endowment for the Humanities, the best innovators are the ones who stand at the intersection of sciences and the humanities and 'can connect the arts to the sciences and have a rebellious sense of wonder that opens them to the beauty of both' (Isaacson, 2014).

It would be a mistake to instantly equate the innovation culture that exists in Silicon Valley to all of America. Indeed, America would be a far more innovative country if the Valley's mantras were embraced in all corners of the United States, in not just its emerging technology industries but also in its traditional manufacturing sectors such as automobiles and in the government agencies and departments that account for an increasing share of America's GDP. Nevertheless, there is something unassailably distinct about America's innovation culture. As John Randt, a Senior Fellow

at the America Council summarizes, 'American innovation is the product of two indispensable ingredients: The indomitability of the American spirit to solve problems – a quality necessary to overcome the repeated failure upon which all great discovery and creativity is based – together with our system's exquisite interplay of free market competition and collaboration' (U.S. Chamber of Commerce, 2013). Or, as Bret Swanson, the President of Entropy Economics frames it, '[t]he essence of American innovation is creative entrepreneurship. Innovations come from garages, corporate labs, and even government research centers. Our open system, built on a foundation of a few basic rules, allows and encourages individuals to create the future' (ibid.).

HOW INNOVATION CULTURES TRANSLATE INTO INNOVATION RESULTS

Economies are successful when their businesses thrive, and when their entrepreneurs turn ideas into businesses. So how do American, and European – but also Asian – companies fare in this regard? To be sure, Europe fields some of the world's most competitive economies. According to the World Economic Forum Global Competitiveness Index 2014, the United States (3), along with several central and northern European states – Switzerland (1), Finland (4), Germany (5), Netherlands (8), UK (9), Sweden (10) – and three Asian nations – Singapore (2), Japan (6), Hong Kong (7) – were the ten most competitive economies in the world (Schwab, 2015).

However, Europe fares less well at seeding high-potential, fast-growing technology start-up companies. For instance, on *Fast Company's* list of the sixty 'World's Most Innovative Companies in 2014,' forty-two are American, eight hail from Asia, and only two, Shazam and Philips, are European (Safian, 2014). But this may reflect the American bias of the publisher. European innovators fare much better on *Forbes'* 2014 list of 'The World's Most Innovative Companies.' While American-based enter-

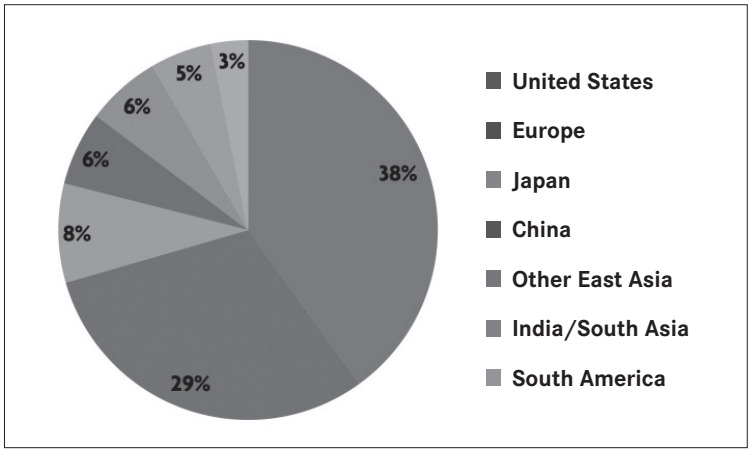


FIGURE 6

Location of *Forbes'* The World's Most Innovation Companies, 2014 (Forbes, 2014)

prises claim thirty-eight percent of the Top 100 innovators in 2014 on *Forbes'* list, European innovators claim twenty-nine percent, with Pacific Rim nations accounting for twenty percent (six percent of which are Chinese), as Figure 6 shows (Forbes, 2014).

The U.S. also leads the Bloomberg Businessweek Tech 100, which ranks the world's leading technology companies, accounting for forty-four percent of the world's top technology companies (Bloomberg Tech 100). Asia follows with thirty-four percent of the leaders, including eleven from Japan, eight from China, eight from Taiwan, six from India, and three from Singapore. Only seven of the global top 100 high-tech companies are headquartered in Europe (three in the UK, three in Germany, and one in Belgium), while South America fields six (five in Brazil and one in Argentina). These statistics should be concerning for European policymakers. As the consulting firm AT Kearny concurs in its report, Rebooting Europe's High-Tech Sector, 'our research over the past few years has demonstrated, Europe's high-tech sector is declining,' which is troublesome because 'Europe's global competitiveness depends on a vibrant high-tech sector' (AT Kearny, 2014).

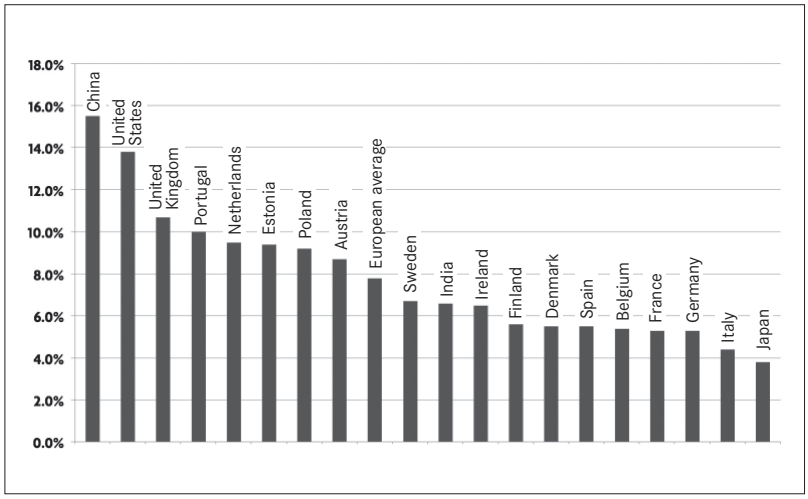


FIGURE 7

Early-stage entrepreneurial activity (% population aged 18–64) (Singer, 2015)

Unfortunately, the data shows that Europe still has a problem creating new businesses destined for growth (The Economist, 2012). According to the 2014 Global Entrepreneurship Monitor, the Total Early-Stage Entrepreneurship Activity rate (which measures the percentage of individuals aged 18–64 in an economy who are in the process of starting a business or are already running a new business, not older than forty-two months) shows both China and the United States leading Europe in entrepreneurial activity (Singer et al., 2015). Both China's early-stage entrepreneurial activity rate, at 15.5 %, and the United States' at 13.8 %, significantly outstrip the European average at 7.8 %, and even Europe's most industrious entrepreneur, the United Kingdom, at 10.7 %, as Figure 7 shows.

Encouraging the formation of more young, innovative, entrepreneurial high-tech start-up companies must be a central component of European policymakers going forward.

CONCLUSION

This article has demonstrated that cultural aspects have a significant impact on innovation and inform how entrepreneurial countries, organizations, and people can be. The United States maintains the world's most vibrant innovation culture, where risk and failure are broadly tolerated, inquiry and discussion are encouraged, and the government's role in business plays a less prominent role ('The U.S. is not a country, it's a business', Dominik, 2012) and science and technology – though perhaps not all their consequences – are broadly embraced. American culture rewards success. These ingredients have contributed to the rise of fifty-two new large companies in the United States over the past sixty years, compared to Europe's twelve, as well as America's being the home of many of the world's most innovative entrepreneurial companies today.

The picture is more nuanced in Europe. There certainly is no innovation pinnacle such as Silicon Valley, which attracts the world's best and most ambitious entrepreneurs to start disruptive companies, where they find seemingly abundant risk capital from serial entrepreneurs to finance their potentially market-disrupting (or sometimes just crazy) ideas. But there is excellent science, there are ambitious entrepreneurs who start businesses (though perhaps not enough), and there are global industry leaders, particularly in the automotive, energy, chemical, life sciences, robotics, and machine tool and equipment industries. However, there are elements in the European innovation culture that need improvement: a simpler regulatory environment, a broader availability of risk capital, and more tolerance of risk and change being critically important.

Europe is clearly lagging the United States in risk capital, which has allowed the United States to quickly grow some of its young firms into global leaders. Also, if start-ups are financed through risk capital, bankruptcy aspects are less prevalent, because they don't have to take out loans from inherently risk-averse banks, which will lend

you money if you can prove that you don't need it (Bob Hope) or if you bet your house, which if you lose when the companies fails, stigmatizes the entrepreneur further.

According to the Global Entrepreneurship Monitor (GEM), the 'usual suspects' of social norms in Austria that inhibit founding activities are: the lack of risk tolerance, the lack of entrepreneurial thinking, and the fear of failure. However, between 2007 and 2012 the GEM observed a marked improvement in Austria's innovation culture (Dömötör/Fandl, 2014). If formerly closely linked markets became fragmented after 1918 and World War II, thus making Europe more risk averse, then the reopening of borders after 1989 offers an opportunity for a renaissance of (Central) Europe to position itself as one of the world's preeminent innovation hubs – as was the case at the turn from the 19th to the 20th century. Vienna and Berlin are regaining their traditional position as hubs between Eastern and Western Europe and magnets for talent from Europe and beyond. In fact, thirty-seven percent of entrepreneurs in Vienna are foreign-born (Dömötör/Fandl, 2014), underscoring the entrepreneurial spirit that immigration stimulates. Entrepreneurship is infectious and contagious – not only in the U.S., but also in Europe.

Finally, it's important to note that policymakers on both sides of the Atlantic can play an important role in stimulating an innovation culture in their nations. They can do so first by implementing a policy environment – including financial market, education, tax, competition, regulatory, and labor policy – that supports innovation. They can do so by ensuring that government agencies themselves adopt and embody innovation methods and principles and become early adopters and procurers of innovative technologies. And they can do so by designing a trade agreement in the Trans-Atlantic Trade and Investment Partnership (T-TIP) that creates the conditions by which innovative industries can flourish on both sides of the Atlantic (Wein/Ezell, 2013).

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