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## The Silicon Valley effect on wine

Less than 100 miles separates Napa Valley from Google's headquarters in Mountain View, a sprawling, leafy campus that is as good a candidate as any for the symbolic heart of today's Silicon Valley. Driving through the country lanes of California wine country, the primary sign of Silicon Valley's influence might seem to be the large homes and even larger wineries increasingly purchased with the proceeds of dot.com successes. These, however, are merely the simplest and most visible of the myriad ways California's wine industry has been shaped by the computing revolution of the past 40 years.

Napa, of course, isn't the closest piece of California wine country to Silicon Valley. Rising up off the back of the San Andreas Fault, the Santa Cruz Mountains are home to vineyards with a commanding view of the world's innovation crucible. Unsurprisingly, these mountain vineyards were the first place that three executives from the Stanford Research Institute sought to get their hands dirty in 1959. During the week, David Bennion, Charles Rosen, Hewitt Crane and Howard Zeidler were busy pioneering various aspects of computing in the heart of Silicon Valley, but on weekends, they and their families would drive up the winding roads to the Monte Bello vineyard, where they would eventually move from their garage winemaking to incorporate Ridge Vineyards, perhaps the first winery spawned by the silicon revolution.

'I think the guys spent all day in this virtual world of high tech, and when you do that, you want to put your feet on the ground somewhere', says Paul Draper, who was hired by the founding partners of Ridge in 1970 to be their winemaker. 'A vineyard gives you a sense of the real as opposed to the virtual. They loved the blend of creativity and craftsmanship they got from winemaking.'

In the early 1960s, taking a small fortune made from computer technology and pouring it into a winery would have been a rare occurrence, but these days seemingly not a month goes by that some newly minted internet millionaire or billionaire hasn't bought a massive home and a few acres of vineyard land in Napa, Sonoma, or Santa Barbara county. If Silicon Valley has produced the waves of innovation fuelling the global economy, so too has it surely produced the waves of wealth fuelling the upper echelons of the California wine industry. Those getting rich in Silicon Valley are also buying the wine.

Some might suggest that the most pernicious influence of Silicon Valley on California wine might be the high (and rising) prices of Cabernet, especially from Napa. But while the rich of Silicon Valley certainly do buy their share, no clear evidence exists that they exert a more significant influence on pricing than, for instance, Wall Street executives.

Silicon Valley's influence on the California wine industry goes deeper than simply funding vanity winery projects, big cellars stocked with expensive Cabernet, and lots of rich tourists visiting wine country, however. Perhaps because it runs counter to the rustic romanticism of the so-called art of winemaking, few people talk about the technology revolution that has taken place in California's wineries.

'We practise pre-industrial winemaking', says Draper. 'We're basically operating with nineteenth-century methods. But for 40 years, we've had the most advanced laboratory in the world for any winery our size.'

While a winery founded by computer engineers might be expected to stock its laboratory with the latest testing equipment, Ridge was merely an early adopter of technology that has now become widespread. Advances in processing power coupled with shrinking costs of microchips and other electrical components means that technologies formerly restricted to the most well-funded research universities are now easily purchased by the average mid-sized winery.

Reasonably affordable gas chromatographs, high performance liquid chromatographs, digital hydrometers and refractometers, and even mass spectrometers are all products of the silicon revolution. And, of course, there's plenty of Silicon Valley software to keep track of all the data these systems produce, from winemaking protocol and fermentation logs to barrel-monitoring databases, bottling schedules and warehouse inventory. What winemakers used to track with painstaking written documentation in the office they now log right at the tank or out on the road into web applications on their mobile phones or tablets.

The impact of the computing revolution hasn't been restricted to the winery, however. In fact, the most dramatic advances in technology

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usage and their greatest impacts have come in the vineyards. It began in the early 1990s with satellite imaging of vineyards to identify problems or to strategise replanting, but these days most modern wine-growers are awash in data about their vineyards that most could have only dreamt of 10 years ago. Drones equipped with high-definition thermal imaging cameras to identify areas of water deficit and disease pressure easily swoop over vineyards. Arrays of wirelessly networked, compact weather stations measure subtle differences in the microclimates within a vineyard and transmit a constant stream of real-time analytics to anyone at the winery willing to fire up a web browser.

Perhaps one of the most revolutionary applications of computing and sensor technology has come from a company named Fruition Sciences, who have pioneered a system of sensors and data analysis to monitor the sap flow and hydrometric qualities of grapevines at an incredible level of detail. This data, wirelessly transmitted to a server and then analysed by proprietary algorithms, enables remarkably precise application of irrigation, resulting in both significant conservation of water, as well as improved quality of fruit, say its customers.

Tule Technologies has developed sensors to monitor evapotranspiration, or how vines lose moisture through their leaves, while still other companies manufacture sensors capable of measuring groundwater saturation, soil chemicals, and more. All of this data is being collected, analysed and presented at the fingertips of those willing to use it. And mark my words, you can bet that someone is working on augmented reality data displays that will allow someone to walk through their vineyards with a pair of glasses and see all this data superimposed on the vines themselves.

And we haven't even gotten to selling the wine yet. Few internet start-ups have had a greater impact on the wine industry in California than a company called ShipCompliant, founded by a young software entrepreneur named Jason Eckenroth who realised what a nightmare America's three-tier system was for wineries interested in shipping across state lines. Eckenroth created a web-based service that filed, maintained, tracked, paid for and produced the documentation required by every individual state in order for a winery to be able to ship their wines across state lines. It would not be an overstatement to suggest that the current revolution in direct-to-consumer sales in America (up 37% last year to more than \$239 million) could not have occurred without this single piece of software.

Nor could that revolution have occurred without the e-commerce capabilities that have transformed all aspects of consumerism or the digital advertising and social media that continues to drive demand. On the side of the trade, internet services such as SevenFifty.Com have completely changed the way that the hospitality industry buys wine, and still others have changed how they manage their wine inventories. Some wine lovers will have encountered these systems in the form of iPad-based wine lists in restaurants.

Before we leave the world of internet software, a survey of tech world influence would need to include apps such as Vivino and Delectable that are shaping how consumers learn about and shop for wines, and the transformation of how wine information is disseminated and consumed thanks to the rise of wine blogs and social media. Finally, we must not underestimate the influence of the ride-sharing apps Uber and Lyft, whose impact on California wine tourism (and a decline in Driving Under the Influence citations in Napa) continues to grow rapidly.

And that brings us back to wine tourism, which has begun to take two forms in California. The first being never-ending waves of young, very well paid professionals who represent a miracle demographic for the California wine industry. There's a reason that high-tech companies competing for the best talent in Silicon Valley have incredible gourmet farm-to-table restaurants with pop-up dinners cooked by Michelin-starred chefs and wine tastings on campus. This generation of internet professionals are travellers, foodies, craft-beer enthusiasts, and yes, oenophiles. Thanks in part to the movie SOMM, studying for the Master Sommelier certification is even rumoured to be a thing among young venture capitalists and software executives who have made their millions.

The demographic of wine tourists in Napa Valley, at least through anecdotal observation, continues to skew younger with every passing year. And wineries, once focused on weddings, are now finding themselves prime targets for corporate retreats and team-building exercises. This demographic no doubt ensures the success and proliferation of the many urban wineries that are making their homes not in Napa or Sonoma, but in downtown San Francisco.

The second form of tourism at play lies not with wine drinkers, but with winemakers. Starting a small wine label has become a trendy hobby among Silicon Valley professionals. Many satisfy their passions through winemaking services that have risen to meet the demand

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once filled by the now-defunct Crushpad, which allowed consumers to make reasonably high quality wine in small batches for personal use or for sale under their own invented brand. A few, however, take their passions further than a single barrel of wine.

One such example is Chad Richard, who was brewing beer and cider in the basement of his first internet start-up in Wisconsin before selling it and moving out to California to work at a number of companies including Apple Computer and Yelp, where he now leads the business development team. In 2005, he and a friend decided to exercise their passion for Pinot Noir by making two barrels together and bottling the wine under the brand Furthermore.

Eleven years later, Furthermore has turned into something more than a hobby. 'A year ago we bought Graton Ridge Cellars in Sebastopol', says Richard. 'That gave us our own tasting room, a winery, and our Russian River Valley estate vineyard.' More than 60 years separate Richard from the founding of Ridge Vineyards, but the impetus does not seem to have changed in the slightest. Says Richard, 'The mashup of the fast-paced tech world and nature-paced wine world is a great yin yang balancing force in my life.'

Just as with practically every other aspect of our lives of business and pleasure in western society, Silicon Valley continues to have an outsized impact on the wine business in California and in America as a whole. And just as with the other influences of the internet revolution, it is easy to say the effects are positive, but the world rarely operates in shades of black and white. As one winemaker pointed out while I was researching this story: 'Silicon Valley destroyed the wine industry in Santa Clara County. Some of the best agricultural land for grapes and fruit orchards in California are now under asphalt and concrete.'

Jancis adds a gastronomic postscript The nearest restaurants to Ridge Vineyards, where Paul and Maureen Draper (pictured in Nick's recent article Why I still love San Francisco) live, are of course in Silicon Valley. At that lunch at Zuni Café Maureen Draper observed with a sigh that whenever chefs with obvious talent surfaced in Silicon Valley they tended to be poached by well-heeled technocrats, either for their famously lavish workplace canteens or for private dining.