

## The Revolution in Enterprise Computing

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*This Sector Trends report discusses three large technology shifts taking place in computing infrastructure today (cloud computing, SaaS, and mobile), as well as their impact on enterprise software and venture capital investments.*

### Introduction

Since the dawn of Silicon Valley, large shifts in computing and the provisioning of software have led to significant wealth creation opportunities. Examining the history of large tech businesses over the last twenty-five years is instructive, as two different narratives begin to emerge. In the first, young venture-backed upstarts offer a new product or service and experience explosive growth, disrupting an existing industry and yet at the same time creating opportunities for those few incumbents nimble enough to adapt to the new challenger and operating environment. The second narrative is more familiar to observers of the venture capital industry, with many of the old incumbents simply withering away.

Largest Tech Companies in 1986	
International Business Machines Corporation	\$73,176.0
Digital Equipment Corp.	13,510.1
AT&T Teleholdings, Inc.	12,899.1
Hewlett-Packard Company	10,741.7
Motorola Solutions, Inc.	4,564.5
Nortel Networks Corp.	3,712.7
Unisys Corporation	3,663.8
Texas Instruments Inc.	2,975.9
Honeywell, Inc.	2,599.8
Automatic Data Processing, Inc.	2,590.1
<b>Total Market Cap</b>	<b>US \$130B</b>

**Figure 1: Largest Tech Companies in 1986 (Source: Capital IQ)**

As shown in Figure 1, the largest tech companies in 1986 included firms like Digital Equipment Corporation (or DEC) that were founded in the late 1950s<sup>1</sup> but are no longer in existence. At that time, Google had yet to be created and Microsoft did not make the list, with a market cap of only \$1.2 billion. The sum total market capitalization of the top ten public IT firms in 1986 was about \$130 billion.

Ten years later, the list of the largest firms had changed substantially. Six of the ten largest firms were brand new entrants to the list, and only four of the top ten in 1986 still made the cut. Moreover, the total market capitalization of those on the list of largest tech companies was around \$570 billion. This was the heyday of Microsoft's dominance, which grew to have a market cap of nearly \$100 billion by itself. Intel – the other half of the “Wintel” monopoly, as it has been called – also thrived during this period. It had been a \$2.5 billion company in 1986 and exploded in size to become the largest tech company in the world in 1996, with a market cap of \$107 billion. Together, these two companies comprised more value than the top ten had in aggregate merely ten years before. Moreover, in 1986 neither Microsoft nor Intel had even been in the top ten. An interesting fact about this duopoly is that Microsoft was a relatively new business, created to develop software for PCs and eventually a mass-market. In 1996, Intel was already 28 years old.

**The dominance that these two businesses achieved in tandem highlights the ways that a venture-backed competitor can shake up a market, either by displacing legacy businesses or by prompting new opportunities for those incumbents nimble enough to adjust to the new environment.**

Other trends tell equally interesting stories. During the early 1990s, as the Internet became more than just a novelty technology for universities and the military and instead grew to be a commerce and communications backbone for society, Cisco’s business began to thrive. The company was founded in 1984 by two Stanford professors,<sup>2</sup> went public in 1990 with a market cap of \$224 million, and reached \$41 billion in market cap by 1996 (thereby placing it in the top ten list of largest companies, as depicted in Figure 2). But, as everyone knows, the Internet still had a long way to go.

By 2006, Cisco had grown its business by another four times and was the second largest tech business in the world. Moreover, the widespread adoption of the Internet and the availability of broadband throughout the world led to derivative businesses tailored to this new technology. Google was founded in 1998, went public in 2004, and quickly surged to become one of the largest tech businesses in the world with a market cap of \$291 billion as of this writing.<sup>3</sup> If the list of the top ten firms by size in 2006 was extended to the top eleven firms, Apple would hold the 11<sup>th</sup> spot. And yet, just a few years later, Apple would be the largest business of any kind in the world, rivaling ExxonMobil’s market cap.

Largest Tech Companies in 1996		Largest Tech Companies in 2006	
Intel Corporation	\$107,477.3	Microsoft Corporation	\$293,537.5
Microsoft Corporation	98,752.5	Cisco Systems, Inc.	165,967.4
International Business Machines Corporation	78,408.2	International Business Machines Corporation	146,342.1
Nokia Corporation	60,794.7	Google Inc.	140,979.2
Hewlett-Packard Company	51,094.9	Intel Corporation	116,761.5
Cisco Systems, Inc.	41,310.7	Hewlett-Packard Company	112,070.1
Motorola Solutions, Inc.	36,314.9	Oracle Corporation	88,822.8
AT&T Teleholdings, Inc.	33,306.8	Samsung Electronics Co. Ltd.	86,075.5
Ericsson	32,359.1	Nokia Corporation	81,907.1
Hitachi Ltd.	31,939.9	Canon Inc.	74,942.0
<b>Total Market Cap</b>	<b>US \$571B</b>	<b>Total Market Cap</b>	<b>US \$1.3T</b>

Figure 2: Incumbents vs. Disruptors (Source: Capital IQ)

Microsoft and Intel’s dominance reflected their unique roles in the PC industry, which was the predominant form of computing at the time both for businesses and for the consumer market. Indeed – there had been no consumer market beforehand. By the same token, the rise of Apple and Google partly reflect the shift to mobile computing, as Android and iOS-powered phones and tablets have been sold by the billions worldwide.

Today there is an enormous technological shift in the way that software used by businesses is created, sold, delivered, and utilized. This is the next massive wave in enterprise computing and has Silicon Valley abuzz with excitement.

**Technology veterans give credit for this shift to three distinct innovations: the shift from physical infrastructure to cloud infrastructure, the shift from installed software to software delivered “as-a-service,” and the shift from desktop or PC computing to mobile computing, including phones and tablets.**

The combination of these three innovations offers the possibility of building new kinds of software businesses and displacing historical tech incumbents. Why do the arrival of these three innovations imply a paradigm shift for

enterprise software? A look at what they are and what they mean for the technology industry is in order, as the success of each theme will play a large role in venture returns for the foreseeable future.

In the past, a large enterprise would purchase software to be installed on a server owned and managed by that enterprise, which would then be used by the company's employees on PCs that were also owned by the enterprise. Long-tenured venture capital firm [Bessemer Venture Partners](#) has succinctly summarized the headaches and challenges associated with the old method of buying and using enterprise software, one in which customers were frequently encouraged to buy an entire suite of products or solutions from a single vendor:

*“ . . . for the better part of two decades, the job of the CTO in major corporations has centered around this complex decision of where and when to use a suite versus best-of-breed solutions. Should they buy a suite, with easier integration but limited functionality, or best-of-breed, with optimal performance but higher integration costs? This decision was made even more complex by the horror stories from many large corporations attempting to integrate large suite offerings across their companies with staggering costs and implementation times. Software licenses frequently ran into the millions of dollars (or tens of millions!), professional services would ultimately be another ~3x the software license costs, and the more you customized and configured the product to fit your needs, the more expensive it would be and the harder it would be to implement the next version. Many companies publicly disclosed spending upwards of \$100M and 5+ years attempting to deploy systems, often cancelling the entire project midway through and throwing it away or trying to unwind the initiative, leaving a trail of fired IT executives along the way.” - [Bessemer's Top Ten Laws of Cloud Computing](#)*

In today's cloud computing environment, nearly all of these headaches are being relieved. In the brave new world of enterprise software, employees now bring their own mobile devices to work and access software that is available via the Internet or through an app, which is installed in a data center owned by the software company or even by a third-party cloud provider. This entire stack of services and devices is completely different from what has been traditionally provided by technology incumbents, and is just one representative example of the shift from desktop-based computing to mobile computing. Examining each of these new trends in turn will illuminate their disruptive potential.

## Sector Trend – Cloud Computing



### What is Cloud Computing?

Cloud computing, simply stated, is the ability to use files and applications over the Internet instead of hosting, storing, or processing them on locally managed hardware. Because the data and software in use is not physically stored locally, it is as though it is floating around in a cloud – hence the name. This trend consists of a series of advances in data storage, security, and transmission that allow people and enterprises to store their data remotely, in a facility managed by a third party. The end result is that a corporation, small business, or individual no longer has to make nearly as many decisions regarding hardware to purchase. Instead, in many cases, there are no hardware choices to make. A software provider merely makes sure that the data and applications required by a business or individual are always available when needed.

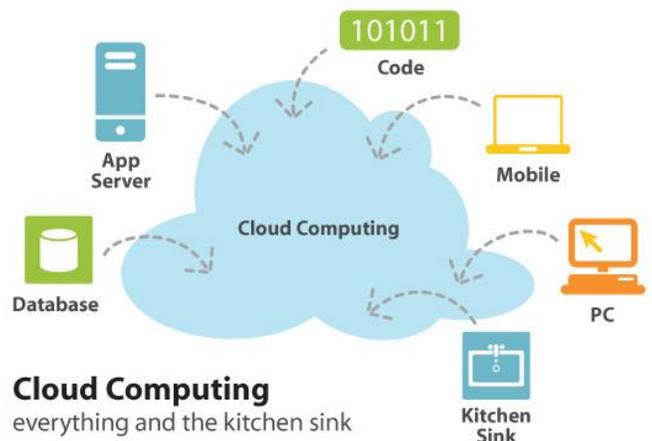


Figure 3: Everything and the Kitchen Sink (Source: Web 2.0 Journal)

One can easily understand cloud computing from the history of personal computer software over the past decade. Ten years ago, a consumer purchasing a new computer would be extremely conscious of the machine's processing power, the size of its random access memory (RAM), and its overall hard drive size. This is because so much of what the consumer might wish to do would take place on the machine and by the machine itself. Any software would be installed onto the computer and accessed by the computer's central processing unit (CPU) and operating system (OS), while the size of the RAM available would determine how fast a program might run. The size of the total memory on the hard drive would determine which types of programs would be possible to use altogether.

Today, most of these features are far less relevant. Email is no longer written on an email client that is installed on a computer – instead, it is written, stored, and retrieved largely through services like Gmail, Yahoo Mail, or Hotmail, which are all managed by third parties. No one worries about losing his or her email archives if a laptop crashes; the archives are stored by the likes of Google. The same is true of photos posted to Flickr, Facebook, or many other consumer applications.

The same transition is now happening to enterprise software. Businesses no longer need to hire expensive IT consultants or staff to help them make complicated decisions about hardware or suites of software products. They can instead make use of either “public clouds,” such as [Dropbox](#), [Box](#), and [Citrix ShareFile](#), which are used by many other businesses, or if they are of a sufficient size they can build their own “private clouds” for their employees to use, perhaps for security, governance, or other reasons.

## History and Evolution

Cloud computing was more or less created by the growth of the consumer Internet. In 1999, there were roughly 50 million broadband users worldwide. In 2012, there were perhaps two billion. As consumers began to have increasing speed and access to the Internet at their leisure, they began to use the consumer web at extraordinary levels. Google was born and scaled to the behemoth that it is today during this period, and many of the innovations related to cloud computing are a direct result of Google's need to service millions, and ultimately billions, of consumers making trillions or quadrillions of searches. Other consumer web businesses which have experienced exponential growth have had to innovate in a similar fashion, in order to handle growth that has scaled exponentially. Amazon became so adept at managing its own data centers and infrastructure that it began offering these skills as a service to third party developers via [Amazon Web Services](#).

Other tech firms caught on to this trend and began building out similar services solely for enterprises. In short, as the number of Internet users has grown and the speed at which they can access data has increased, technology businesses have figured out how to build “clouds.” For any given business, its data can be stored off-premise, in storage owned by a third-party, and in a data center run by data specialists. This also means that any given business can purchase computing and storage almost like utilities – similar to electricity, for example – on an as-needed basis, scaling up and down as needed as well.



TechCrunch

Wednesday, May 29th, 2013

## Server Sales Are Down As Cloud Apps Abound At The Expense Of IBM, Enterprise Giants

*“Cloud apps are popping up by the thousands across the market, as the developer movement speeds up. But these applications are not surfacing from that souped-up [legacy] server made for big workloads. Developers instead are turning to the cloud. Enterprise companies are buying fewer of those high-priced machines that customers once bought when IT budgets were plentiful.”*



JUN. 19, 2013 - 11:21 AM PDT

## Building the cloud enterprise: Surviving an industry shift

*“But CIOs don’t need to sacrifice the security and stability they want from on-premise solutions when they decide to move to the cloud. Enterprise software can be securely delivered and deployed at a much lower transactional cost. Enterprises can scale faster and worry less about software updates. The tools CIOs pick for their organizations can be safe for the enterprise, but they need to be better than the free tool their employees can pick up from the app store.”*

As cloud computing, in all of its forms, continues to gain adoption throughout large enterprises, businesses will have to make critical decisions related to the security, storage, and virtualization of their software, proprietary information, and data. In the future we expect to see more headlines, like those above, related to changes in the existing ecosystem and the disruption of key incumbents.

The accessibility, utility, and popularity of cloud computing has created an industry shift ripe for disruptive technology innovators. Venture capital managers are maintaining a close watch on the sector’s success and growth potential, with the goal of identifying those companies most likely to drive compelling returns for investors.

## Sector Trend – Software-as-a-Service (SaaS)

### What is SaaS?



The ability to store data easily on third-party servers and access it quickly via the Internet creates the possibility of delivering software over the web. This is precisely what is meant by the phrase “software-as-a-service,” frequently abbreviated as “SaaS.” Indeed, this is the second half of cloud computing: if your computing is in the cloud, then your software is almost by definition delivered as a service over the Internet.

## History and Evolution

The technological advancement of cloud computing has brought significant advantages to historical methods of developing, deploying, and using software. Over the past twenty years, software used by large businesses typically had a long and expensive development cycle. Enterprise software businesses developed their products for installation on desktops or servers, which required a large capital expenditure for businesses in order to purchase the necessary hardware. Software was then difficult to upgrade or customize; developers would solicit enormous amounts of feedback from potential customers and attempt to incorporate every possible fix, tweak, or redesign they could before releasing the final product, further extending the cycle of development.

Once the software was ready for market, a massive sales force began to engage corporate customers from the top down, interacting with heads of IT departments or chief information officers to sell licenses to have the software installed. The process of developing legacy software had many disadvantages. First, it was slow to iterate new versions: large software businesses would gather feedback from customers, create solutions for the next generation of software, and finally sell to large corporate customers. Second, a centralized IT department distributed, controlled, and installed legacy software across enterprises, which required the department to install new updates or versions of the software and check if any new hardware was compatible. Finally, it was only possible to customize the software by paying large sums of money to consultants or in-house developers.

With the rise of new technology, however, the process of developing and delivering software has greatly improved. In combination with cloud computing, in which a business does not have to own or physically control its computing hardware, software delivered over the Internet provides a number of advantages. Software delivered as a service is cheaper than software purchased in bulk and installed across self-owned equipment. It is more efficient because a given business no longer has to worry about scaling up or down in size; instead, it can use as much computing power and software as needed. With software as a service, there is typically no installation or downloading. Software delivered as a service is more mobile as well – employees can access the same data on multiple devices and in multiple geographic locations, untethered from their desks, with no interruption in service, and none of the historical concern about duplicate copies or version control.

All of the advantages of cloud computing and SaaS apply to software developers by decreasing the cost to develop the software itself. This decrease in price benefits small and mid-sized businesses, as well. With access to world-class software tools, these smaller customers are no longer beholden to Microsoft Office Suite or its derivatives.

## In the News



### **A Shift to SaaS and the Cloud: Enterprises Keep Old Systems in Place While Using New Technologies Incrementally to Scale Their Businesses**



Wall Street Transcript – Fri, Jun 7, 2013 12:30 PM EDT



We continue seeing headlines like these appear in specialized technology publications, as well as in the mainstream media. SaaS has become a household term and continues to create advantages for businesses that overwhelm previous software solutions. Most notably, SaaS has allowed the price of software to decline significantly, putting world-class software in the hands of all businesses, large and small.

Some managers predict that SaaS will “win the enterprise market,”<sup>4</sup> and the majority maintain their enthusiasm for startups targeting this sector. We are excited about this trend in venture investing, and we expect managers to continue achieving exits in the space.

## Sector Trend – Mobile Computing

### What is Mobile Computing?



Of the three trends highlighted throughout this series, the shift from desktop to mobile computing is perhaps the easiest to grasp. Nearly everyone in the U.S. has experienced this shift on a daily basis over the last five years, during which time the mobile computing

market has grown from a cold start in roughly 2007 to 1.5 billion smartphones in use today. According to the chart at right from [Kleiner Perkins Caufield and Byers](#), in another five years that number is expected to exceed five billion.

**Statistics like these assure the importance of mobile computing as a trend to follow, along with two concepts associated with the mobile boom: the shift towards consumerization of IT and the “bring-your-own-device” (BYOD) phenomenon.**

### History and Evolution

The consumerization of IT trend has come into vogue over the past few years and is tightly coupled with software-as-a-service (SaaS) and the growth of the mobile economy. Simply put, professional developers, IT consultants, and tech geeks no longer determine which types of IT the rest of us will use. As average consumers and employees have become more sophisticated in the types of user experiences they find intuitive and beautiful, it has become clear that software companies which design business software with the same characteristics can experience rapid adoption. Venture firm [Bessemer Venture Partners](#) is helpful in describing the impact of the trend:

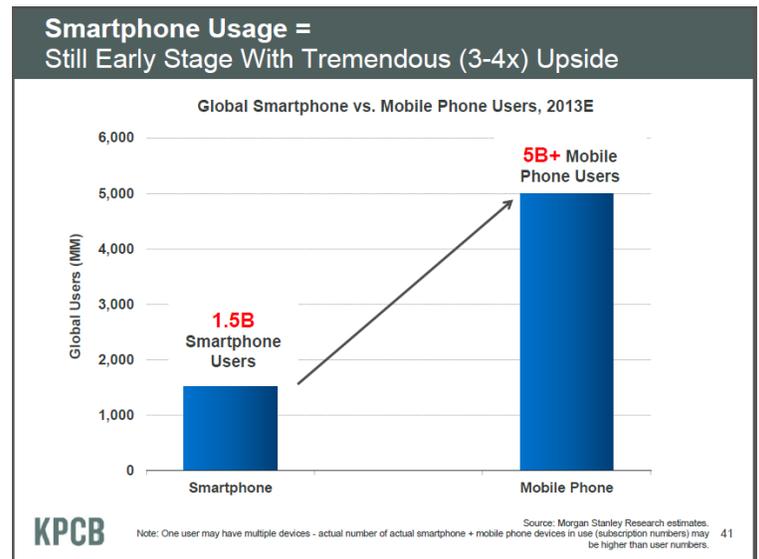


Figure 4: Internet Trends 2013 (Mary Meeker of KPCB)

*“Pandora’s box is open. Your customers all now know that software doesn’t have to suck anymore. They use rich Internet applications including Facebook and Skype to communicate with their friends; they use LinkedIn to manage their business networks, Google or Wikipedia to find accurate online content, Yelp to find restaurants, and Travelocity to book flights. Your potential customers are looking for similar ‘cheap and cheerful’ products in an open revolt against the years of oppression by the likes of SAP and Oracle.”*  
– [Bessemer’s Top Ten Laws of Cloud Computing](#)

Freemium business models can take advantage of the consumerization of IT to help SaaS businesses grow organically at large organizations. Such models allow businesses to quickly reach a wider user base and gain paying customers that “come in from the cold” from within their own organizations.

In an enterprise context, what began with corporate e-mail functioning on a [Blackberry](#) has evolved into the presence of a powerful computer in everyone’s pocket. Employees want to use these devices just as much or sometimes more than their own desktops or PCs. In many cases, they bring their personal devices to work or use personal devices at home to do work outside of typical business hours. This has led to the rise of a second trend: “bring-your-own-device” (BYOD), whereby employees use their personal devices for work. Though at first skeptical of the concept, businesses have since embraced it. [Gartner estimates](#) that by 2017, half of all employers will require employees to supply their own devices. The BYOD phenomenon creates a host of opportunities for startups to address the [security](#) and integration challenges that arise when running business applications and making company data available across multiple, varied devices.

Going further, it is likely that a new class of enterprise software will rise and take advantage of the user interfaces and sensors in smartphones, in order to create custom work experiences for a variety of businesses that are not possible on the PC-based web. There are many differences between the mobile and PC Internet experience, including the subtle but important fact that users typically access the Internet by PC rather than phone. Differences like these create opportunities for innovation.

## Conclusion

As discussed in the [introduction](#) of this sector trends series, many old incumbents simply fade away as changes in technology paradigms undermine their core competitive advantages. The tale of [DEC](#) is noteworthy. Just like Intel, DEC was founded at the beginning of the computing industry and thrived for several decades, but it was unable to cope with the shift from mainframes to PC computing in the late 1980s. A new CEO hired in 1992 embarked on an ambitious plan to reshape the company, but it was eventually sold to Compaq for pennies in 1998.<sup>5</sup> Compaq itself ceased to exist in 2002 when it was purchased by HP, and became another example of a tech business that could not adapt to massive innovation shifts.<sup>6</sup> According to MIT’s [Technology Review](#):

*“‘[Microsoft] didn’t miss cell phones,’ Bill Gates said in a TV interview in February, ‘but the way we went about it didn’t allow us to get the leadership. It was clearly a mistake.’ Gates underplayed what’s been lost. In 2009, his company’s software was on 90 percent of personal computers. At the end of 2012, it’s on just 23 percent of devices sold, when smartphones, tablets, and PCs are all accounted for.”*

Large enterprises suffer from bureaucratic inertia. Their people, processes, skillsets, and capabilities are all geared toward a few particular technologies and competitive advantages, which can make it difficult for them to pivot into new markets. For any given piece of legacy software, for example, merely shifting from PC-based operations to mobile operations involves different operating systems, programming languages, and optimization for multiple devices. Making these types of transitions may require different people with different skillsets.

Nonetheless, some old incumbents are able to thrive and prosper in the new environment, typically by purchasing their smaller, more nimble competitors. Cisco, Oracle and Microsoft are three examples of legacy firms which risk a

substantial loss of market share should they continue along their established paths. This is why all three have been so acquisitive in the past ten years. Since 2003, Cisco has acquired 59 venture-backed companies, Oracle has purchased 50, and Microsoft has acquired 44.<sup>7</sup> Time will tell if these firms are able to adapt to the new, multi-faceted enterprise IT environment, in which cloud computing, software-as-a-service, and mobile devices have begun to dominate. At the same time, perhaps some of the upstarts mentioned throughout this series will become the major NASDAQ components of the future. Regardless of the outcome, it pays to be an informed observer of these tectonic shifts in innovation.

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<sup>1</sup> ["Digital Equipment Corporation"](#), *International Directory of Company Histories*, Volume 6, St. James Press, 1992

<sup>2</sup> Carey, Pete. ["A start-up's true tale"](#). *San Jose Mercury News*. Retrieved 26 July 2012

<sup>3</sup> As of July 26, 2013, per [Yahoo! Finance](#)

<sup>4</sup> Weiss, Scott. ["The Building is the New Server"](#). *Andreessen Horowitz*. Retrieved 28 March 2013

<sup>5</sup> ["Digital Equipment Corporation: Nineteen Fifty-Seven to the Present"](#), DEC Press, 1978

<sup>6</sup> ["Hewlett-Packard in Deal to Buy Compaq for \\$25 Billion in Stock"](#). *The New York Times*. September 4, 2001

<sup>7</sup> [VentureSource](#)