AN ARTICLE FROM

CSC WORLD

SEVEN DIGITAL DISRUPTIONS SHAPING THE FUTURE OF IT

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In our first *Digital Disruptions* report, published in 1999, we projected that the Internet would continue its monumental shakeup of the business world, and we urged readers to keep an eye on other promising trends such as ubiquitous bandwidth, virtual spaces and simulation, and smart computing. "At the turn of the millennium," we said, "we stand on the verge of virtually all things 'going digital.'" And then we admitted that as digitization continued, new products and services would appear that we could not even begin to imagine.

Fast forward to today, and those products and services have appeared in force. YouTube has challenged TV's traditional business model. Facebook and MySpace are redefining political campaigns. And today's workforce often has more advanced technology at home than at the office. Digital disruptions have transformed how we live, work, play and learn. And they keep on coming, at ever faster rates.

Digital disruptions are information and communication technologies that change business models deeply, and often shockingly. These kinds of disruptions — like the telephone in the mid-1800s or the Internet/World Wide Web in the early 1990s — transform the marketplace and society so completely that it can take decades for their full effects to be realized. With digital disruptions, all the rules change. It doesn't matter how good your current business plan is; what matters is how well your organization projects and prepares to leverage the next set of digital disruptions in new business models.

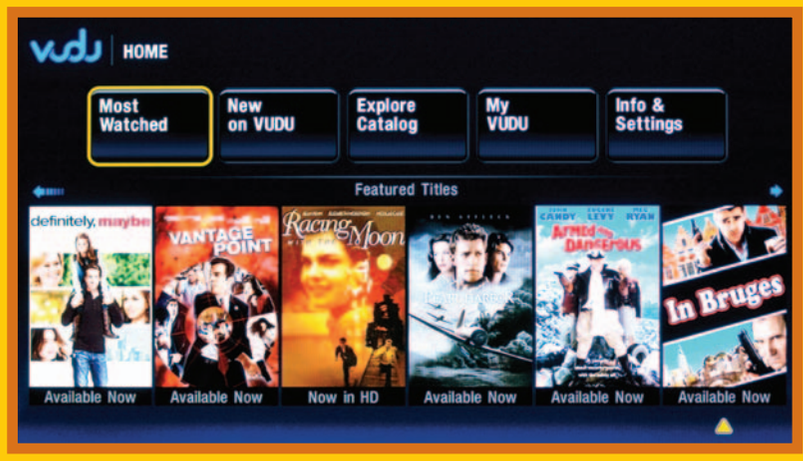
On the following pages we examine seven that we believe will profoundly affect business models in the future.

NEW MEDIA

After the public submitted questions via YouTube for 2008's CNN/YouTube-sponsored U.S. presidential debates, campaigns would never be the same again. This was a new form of questioning: by the general public, in their own words, with their emotions and faces on full display for the candidates and the public, made possible by new media. The campaigns themselves relied heavily on new media, such as YouTube commercials, viral video, and interactive, video-rich campaign Web sites, which powered fundraising, fostered communities and helped reach out to new, tech-savvy voters.

The Internet has become a global channel for this new media, breaking down the stronghold grip that Big Media — traditional TV, radio, film and news producers — have had on content and audiences. The Internet levels the playing field, allowing others — you and me — in the game. Returning to the basics of personal storytelling, new media is replacing the consumer with the 'proviewer' — a producer and proactive viewer.

The notion of citizen journalism and "microjournalism" is alive and well in the age of YouTube, Twitter, digital cameras, camera phones and blogs. Netflix, who moved DVD rentals from the store to our mailboxes and then our computers, has now pledged to deliver that content directly to our TV screens. And so ubiquitous is new media, in 2007, five of the 10 best-selling novels in Japan were originally written as short chapters on cell phones, published later as books.



Rent movies directly from your TV screen using VUDU and the Internet. Source: CSC

The entire access experience is changing, and will continue to change, as the content itself also changes. Whoever best anticipates and meets the needs of the consumer will win. The business models that will flourish are those that invite participation and give individuals more control. Ownership is not the way to win; openness, customization and personalization are the approaches of the future.

A LEGACY OF EDUCATION, RESEARCH ON EMERGING TECHNOLOGIES

Since 1968, when we created the Computer Sciences Institute, CSC has been at the forefront of educating business professionals on how to use computers and technology to improve their operations. Our purchase of the Index Group in 1988 later included the Vanguard research and advisory program, under which we were among the first to study and report on the business implications of emerging technologies, including interactive multimedia, wireless communications and supercomputing. Over the years we've been leaders in conducting surveys and holding executive forums about business and technology. And in 1999, our Leading Edge Forum (founded in 1989) published *The Era of Digital Disruptions: Exploring the Next Technology Wave*, the first of many insightful and groundbreaking reports, which we continue to publish. Here, we look back at the LEF's legacy of research and thought leadership.

2008: Digital Disruptions: Technology Innovations Powering 21st Century Business
Every few years, as the market changes, the LEF revisits the topic of Digital Disruptions. This report, a follow-up to 2002's report, identifies seven disruptions that 21st century businesses must understand to position themselves for success in an emerging economy that places value predominantly in the production, enhancement and sharing of information and cultural content.

2007: Digital Trust: Shaking Hands With the Digital Enterprise
Using the metaphor of a handshake, this report explores the ability to *create value* with security services and technologies, rather than simply protect value that already exists. Its eight volumes run through all major contemporary issues in security, including identity management, intellectual property protection and monetization, liquid security, eThreats and transparency.

2006: Connected World: Redefining the Geography of Business and How We Work and Play
This report posits that our new connected world was created by fundamental changes in the communications and IT industries — particularly, the formation of a single network for voice, data

2 LIVING IN A NEW REALITY

Virtual worlds obliterate time and space boundaries imposed by the physical world, enabling us to do what would be impossible — or nearly impossible — in our real environments. Virtual worlds and virtual reality will play an increasingly significant role in our personal and professional lives. In a virtual world, people can navigate a conference or other live event through a 3-D experience that enables them to interact with others via avatar proxies.

Because virtual worlds present data on our terms — visual, lifelike, interactive and 3-D — virtual reality helps us detect and analyze more, and ultimately make better decisions. Virtual worlds are improving dramatically with an influx of real-world data.

The city of Barcelona has incorporated city data — waterworks, electrical data, telecommunications wiring and building data — into an accurate, large-scale, virtual city. It is now being used to coordinate contracting work. Engineers, architects and other workers can see and study an area of the city before they start ripping up streets or laying concrete. Google Earth gives a 3-D rendering of the planet that can be manipulated, mashed up and drilled into as the user searches for driving directions, restaurants or shops.

CSC, meanwhile, conducted a pilot with Qwaq Forums, designed specifically for bringing virtual world capabilities to the enterprise in a secure environment. Used in tandem with e-mail, phone, wikis, IM and telepresence, Qwaq Forums allow users to hold meetings in virtual rooms, talk over VoIP headsets and collaborate in real time, such as collectively editing documents.

We will continue to see a blending of physical and virtual reality. While some question the relevance of the virtual world to the enterprise — asking if virtual marketing and sales will translate to real sales — it seems the connection will only grow stronger as organizations explore and experiment with product development, communication, learning and the new virtual worlds being developed.

The Phoenix spacecraft landed on Mars in Second Life, coinciding with the actual landing on May 25, 2008. Several members of Second Life sat on the lander after it touched down. (That's a second lander in the background, hovering.) The Second Life audience watched the lander go through its entry, descent and landing maneuvers in real time, seeing video from Mission Control, information directly from the Mission Controller's blog, and pictures as they came in.

Source: NASA Jet Propulsion Laboratory

and video based on the Internet Protocol (IP). It explores eight connectedness trends, including the all-IP enterprise, industry crossovers, bandwidth at the edge and the next frontier of mobility.

2005: Extreme Data: Rethinking the "I" in IT
This report examines four dimensions of extreme data: data everywhere, time and place, social connections and meaning. We explore how this data enables new business processes and interpersonal connections, and how it demands extreme responsibility and accountability to manage and protect.

2004: Open Source: Open for Business
Several key drivers put open source software at the center of business strategy: cost reductions, technology transparency, security and new business opportunities. In this report, the LEF explores all facets of open source, from the community that sustains it to legal and business issues that constrain it.

2003: The Architecture rEvolution
Underlying the move to more distributed operations and greater interconnectedness is a profound IT architecture rEvolution. This report explores the more significant network effects on infrastructure, applications and business processes.

2002: On the Edge: Exploring Next-Generation Digital Disruptions
This update to the original 1999 report explores such disruptions as evolutionary and revolutionary computing advances, biotechnology, and artificial intelligence systems and robotics.

2001: Get Smart: How Intelligent Technology Will Enhance Our World
Get Smart introduces the concept of "smart quotients" (SQs). The SQs — inferring, adapting, sensing, learning and anticipating — describe the attributes of software systems in much the same way that scientists describe living systems.

2000: Digital Foundations: Technology's Building Blocks for Business Breakthroughs in the 21st Century
This report explores the innovations that bring universality to digital foundations: Universal Power, Universal Information and Universal Access. All three have been technology's cornerstones for millennia, but each has reached a point where it is "everywhere."

1999: The Era of Digital Disruptions: Exploring the Next Technology Wave
This first report published by the LEF identifies 10 disruptive technologies and their associated business trends, including ubiquitous bandwidth, smart environments, net-centric computing and nanotechnology. Digital Disruptions was especially timely because in the preceding five years, the Internet-plus-Web-plus-browser was proving to be a major disruption.

Copies of many of these reports can be downloaded at www.csc.com/lefreports.

3 SOCIAL POWER

As the Internet continues to evolve, it is revealing the power of our social side — our inherent drive to connect with others and share. We have always had a social side, but the Internet is unleashing it in new ways with considerable force, showing how much can be accomplished by networked individuals. Today, we have the unprecedented ability to find experts and people we want to work with, no matter where they are in the world, and we can bring that ability to bear as we share ideas and solve problems more quickly than ever before.

In addition to social networks like LinkedIn or Facebook, applications outside the social network — from expense tracking to healthcare to music distribution — are becoming socialized. Patientslikeme.com welcomes people with medical conditions who wish to share their experiences with similar patients, compare symptoms and treatments, and learn from others. On YouTube you can learn from thousands of guitar enthusiasts how to play that difficult solo riff in Led Zeppelin's "Stairway to Heaven," or how to set up your home or small business local area network.

Social power is not lost on the enterprise, either. What once may have been considered a "soft" topic relegated to Human Resources is moving into mainstream business discourse as companies realize that social power has revenue-generating power. VirginMoneyUS.com is one example. A peer-to-peer lending site created by CSC, VirginMoneyUS.com facilitates real estate, personal, education and business loans between family and friends.

While companies are understandably wary of potential security breaches magnified by the use of social networking sites, we believe organizations need to mitigate the risks and explore and leverage social power for their own benefit. In an interconnected world, who you know, and more importantly, who your colleagues and friends know, is becoming more important than ever.

VirginMoneyUS.com is a peer-to-peer lending site created by CSC that capitalizes on people's social networks, managing loans between family and friends.
Source: VirginMoneyUS.com

INFORMATION TRANSPARENCY

Today we operate in a global marketplace, yet ironically, because of the Internet and information transparency, it is almost like we're living in a small town, where everyone knows everything about everyone. Everything from price comparisons (farecast.com) to company organization charts (orgchart.forbes.com) to hidden home-buying costs (feedisclosure.com) to the dirtiest hotels (tripadvisor.com/dirtyhotels) is on the Web for public consumption.

This visualization shows exactly where an employee is (in a cubicle) using CSC's enterprise visibility real-time tracking technology, called OmniLocation. Part of the building has become transparent so you can see the people or things being tracked. OmniLocation integrates RFID (for tracking the people inside) and GPS (for outside location) into a single presentation platform. You can also see where the building is located on the overview map. Source: CSC

In this uncertain economic time, which some argue was caused by too little transparency, there has been a greater call for more transparent government and financial institutions. In fact, U.S. President Barack Obama promised a transparent administration as a way to engage the public and earn their trust. Information transparency is largely driven by technology, but laws and privacy statutes will continue to be important factors for ensuring that the capability is developed responsibly. Regulations like Sarbanes-Oxley mandate stronger financial disclosure and transparency of financial dealings, while healthcare regulations like the Health Insurance Portability and Accountability Act (HIPAA) mandate patient privacy. Rights, however, must be balanced with potential benefits, for example the benefits to patients that electronic health records promise to deliver: reduced errors, lowered costs and a speedier flow of medical breakthroughs from lab to hospital.

And with an estimated annual 44,000 to 98,000 deaths in U.S. hospitals due to medical errors, CSC's Chief Medical Officer Dr. Robert Wah argues for transparent healthcare, whereby electronic health records — one of several key technology enablers — become standard procedure.

In the future, everyone and everything will be tracked, from employees escaping a fire in the workplace, to equipment moving underground, to oil flowing through a pipeline, to widgets coming off the assembly line. In Australia, BHP Billiton's Cannington Mine is using Radio Frequency Identification (RFID) technology to manage traffic movement in mines — the first time this technology has been operational underground.

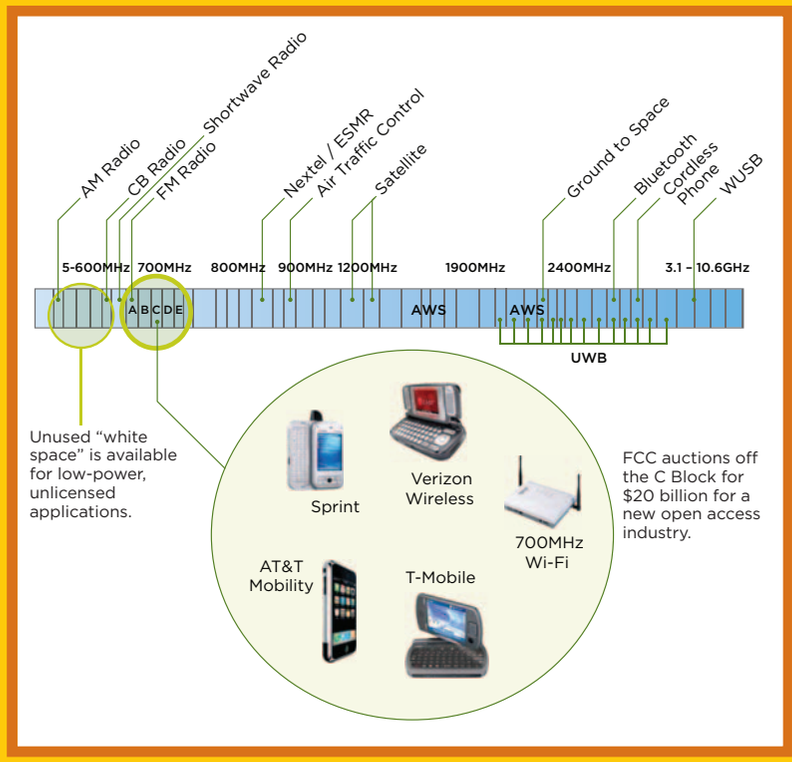
In June 2008, CSC introduced OmniLocation, integrating location and sensor technology with Web Services to create a real-world visualization of enterprise operations. It integrates location with relevant attributes about people, vehicles, assets and infrastructure, providing unprecedented visibility (transparency) into operations to improve safety, security and efficiency.

The Internet was founded on transparency and we are feeling the effects — amplified by Web 2.0 — of ubiquitous connectivity, user self-service and a culture that demands information. Savvy enterprises will leverage a data-operational strategy that puts information at the core of their business, even if the business is selling hard goods, like cars. Data adds value and drives sales. In the Networked Information Economy we are entering, says Harvard Professor Yochai Benkler, information and cultural artifacts are becoming the primary goods exchanged that add value even to hard goods. As Internet technologies and cultural norms continue to evolve, there is no end in sight to transparency and the innovations it can yield.

5 NEW WAVE OF WAVES

Imagine a day when your mobile phone works on any wireless network, not just your carrier's network, or emergency responders can operate one radio that communicates with firefighters, police, federal emergency responders, the National Guard and others seamlessly and reliably.

That day is closer than you might think. The race to stake out the wireless frontier is precipitating a spectrum battle among the established telecommunications companies; radio, cable and satellite broadcasters; Internet service providers; and startups. As the battle plays out and the demand for wireless communications increases, wireless will become the norm and wired the exception.

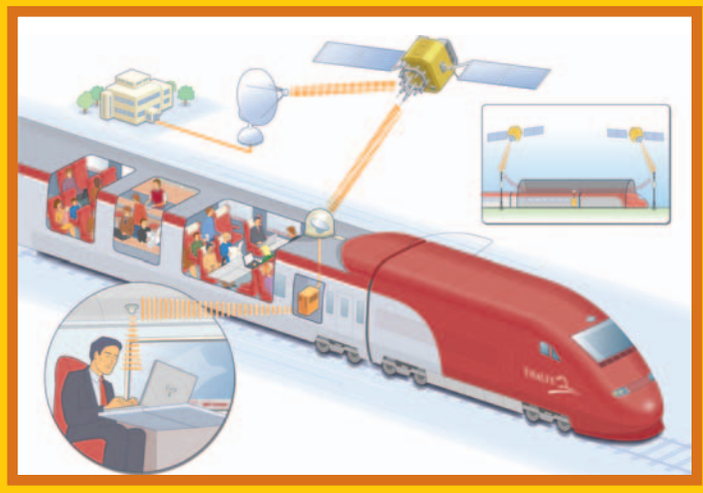


Spectrum opens up in the 700MHz band (C Block). Source: CSC

Even moving vehicles are going wireless, with planes, trains and automobiles connecting to the Internet at increasing speeds. CSC worked with Thalys International to offer six million passengers per year Internet access aboard their high-speed trains, the first European commercial passenger rail service to do so.

Today, we are no longer held back by old technologies that led to the creation of spectrum allocation to avoid interference. New technologies render spectrum allocation obsolete. New hardware and software tools are refining our ability to control radio wave signals digitally, whether cellular, broadcast TV, AM/FM radio or Wi-Fi. Currently, NASA is moving toward using the Internet Protocol (IP) to improve communications with and among its spacecraft. This "Internet-in-Space" transition, which CSC has been involved in for over 10 years, has been extremely disruptive to the "old guard" of the world's civil space agencies, but must ultimately succeed.

As our world becomes more and more connected, businesses and organizations must quickly evolve toward mobile markets. Companies and consumers alike need to prepare for this new wave of electromagnetic waves, and for the new products, services and business models that will upend traditional ways of doing business.



Internet access from a moving, high-speed Thalys International train works as follows: From the passenger's laptop, data is transmitted to one of two hotspots in the passenger's train car, and on to a central server before transmission through one of two rooftop antennae, which connect to a satellite 36,000 kilometers above or to 3G ground networks. Source: CSC

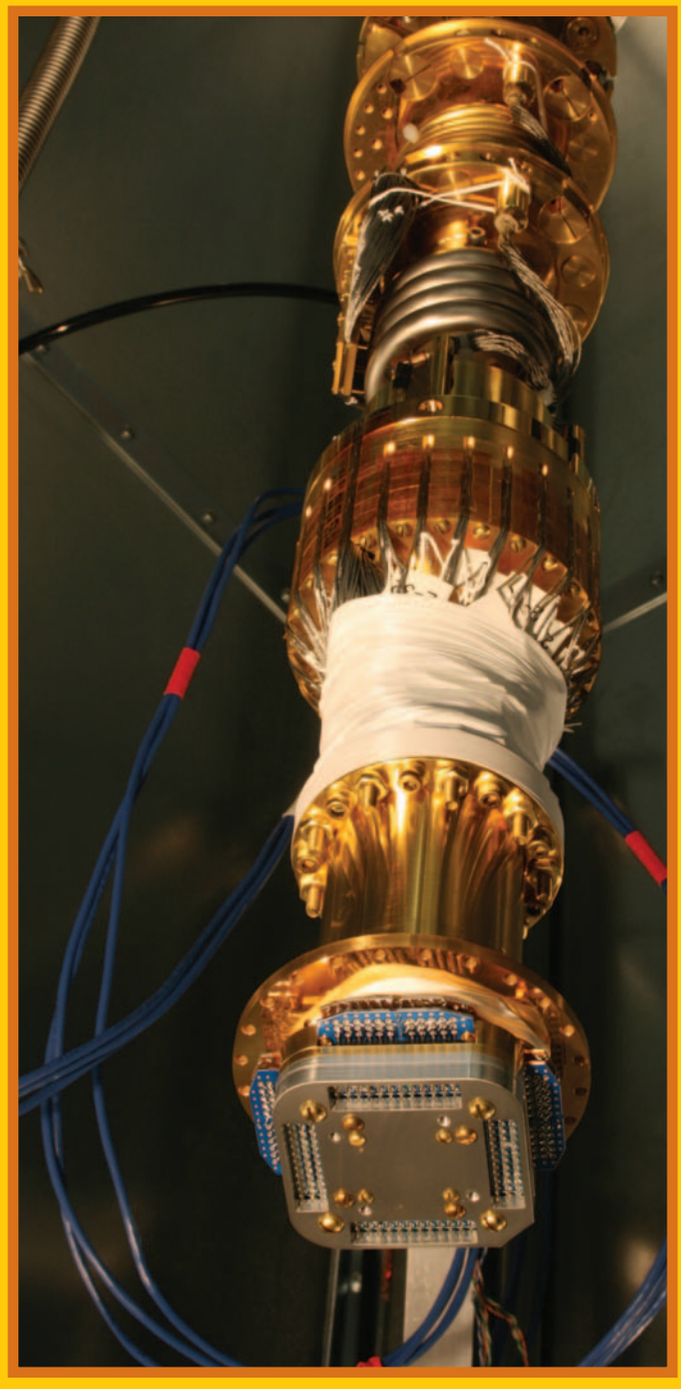
6 PLATFORM MAKEOVER

We want to access our work products from anywhere and share them with anyone at anytime. This desire, coupled with economic pressure to "do more with less" and environmental forces to embrace Green IT, is causing a natural shift of computing platforms toward virtualization and cloud computing. Centralizing data center resources on the Internet — the "cloud" — is a radical departure from business-as-usual servers owned and operated inside enterprise walls. The enterprise data center footprint shrinks, hardware inventory changes and IT can shift focus from maintenance (now handled in the cloud) to the immediate needs of the business.

At the same time, the next generation of new materials capable of computing faster than silicon is on its way, and will take us well beyond Moore's Law. As the capabilities of these materials emerge — nanotechnology, molecular computing, quantum computing, optical computing — they will challenge silicon-based business models and markets.

One of the most significant platform disruptions will arrive with quantum computing — computing based on the spin of electrons (rather than their charge) that is orders of magnitude faster than the theoretical top speed of any current processor. Although general-purpose quantum computing is still in the research phase, work is underway to leverage the unique properties of currently buildable quantum devices to solve complex commercial problems by exploring many alternatives quickly. For example, quantum computing can be applied to important logistics applications, such as package delivery: Today, the problem of optimizing "which packages go on which planes using which routes" must be solved within an hour, and poses challenges to even high-end multicore grids. In the future, quantum computing promises to do it in minutes or even seconds.

Overall, the platform makeover is about optimizing performance: powering applications to do more with less and enabling new applications that were not hitherto practical, while conserving energy.



This Superconducting Adiabatic Quantum Computer is real, though not ready for commercialization. Its performance targets are impressive: processing speeds up to 100 times faster than current state-of-the-art computers, calculations performed in seconds rather than hours and power consumption reduced by up to a million-fold.

Source: D-Wave Systems

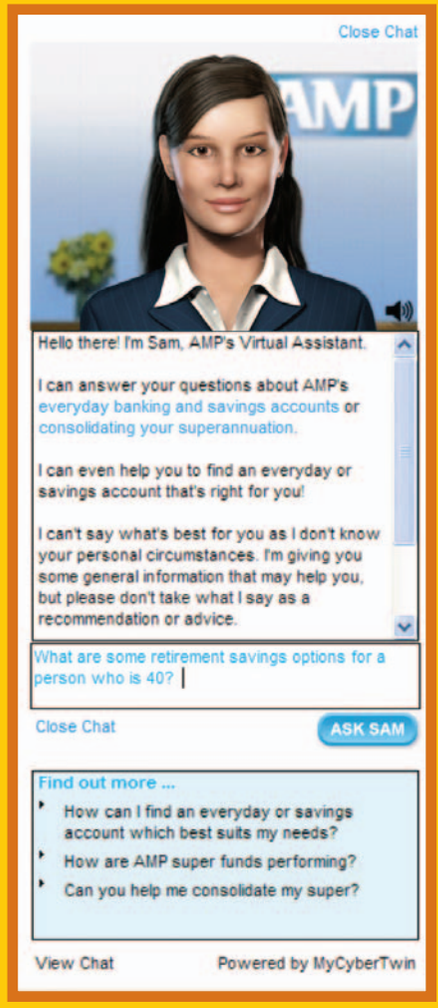
SMART(ER) WORLD 7

Today many technologies are becoming smart or smart(er), leveraging small, powerful, inexpensive processors and communications technology to take on tasks once accomplished only by humans. They will recognize patterns, appreciate the semantics of text and speech, and be able to reason and make commonsense recommendations and predictions on our behalf, much like a virtual personal assistant.

As more business is done online and consumers seek a personal experience, avatars will help handle growth and provide individual attention. Businesses will create their own avatars to act as virtual assistants responding to customer inquiries via text chat or voice, with a single avatar answering millions of questions daily.

Information-centric patterns of computing have reached their limits in terms of coping with scale, complexity, security, mobility, rich media interaction and autonomic behavior. As more people, devices, information and commerce rush to the Web, a smarter, more automated environment is needed to manage and make sense of the Web's treasure trove of data and transaction opportunities. Web 3.0, commonly referred to as the Semantic Web, addresses these issues. Next up is Web 4.0, which promises automated reasoning.

In the end, getting smart(er) is about being better informed and, as a result, having greater potential to make better decisions. Organizations need to prepare for a smart(er) world, no matter what form it takes.



Meet Sam, the virtual assistant for AMP, a large financial services firm serving customers in Australia and New Zealand. Sam can handle millions of inquiries daily for customers online.

Source: MyCyberTwin

DISRUPTIVE, BUT PRODUCTIVE

These digital disruptions will inevitably change the way we get things done. They will vaporize time, location and physicality, allowing us to find and collaborate with anyone, anywhere, anytime. This newfound freedom to instantly connect, collaborate and be more productive will spark new industries and business opportunities. These disruptions will help world gross domestic product flourish in the 21st century, much as industrial disruptions did in the 19th century, though setbacks are to be expected.

According to New York University pundit Clay Shirky, progress is not made in a straight line. When disruptions arrive, they typically take us from current business model A to a somewhat chaotic state, before taking us to new and improved business model B.

Our advice for navigating the bumps along the way:

Don't panic. We are at the stage where digital disruptions are leading us temporarily into expected chaos. It may take a decade or longer to sort out, but we will move through chaos to model B. We will end up in a better place. Look for ways to move to the new world, not for ways to recreate the world you control today.

Stay abreast of new technologies and trends. Partner with outside experts and engage your own tech-savvy staff to garner a more holistic and long-range view of the possibilities. This is necessary for organizations to be able to make informed, proactive changes to business models, and stay ahead of the competition in servicing customers.

Don't discount innovative technologies because they seem frivolous or impractical. Sure, Twitter started out as a way for college students to update their friends every 20 minutes. Today it's used by everyone from politicians to emergency first responders.

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About CSC

The mission of CSC is to be a global leader in providing technology enabled business solutions and services.

With the broadest range of capabilities, CSC offers clients the solutions they need to manage complexity, focus on core businesses, collaborate with partners and clients, and improve operations.

CSC makes a special point of understanding its clients and provides experts with real-world experience to work with them. CSC is vendor-independent, delivering solutions that best meet each client's unique requirements.

For more than 50 years, clients in industries and governments worldwide have trusted CSC with their business process and information systems outsourcing, systems integration and consulting needs.

The company trades on the New York Stock Exchange under the symbol "CSC."

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