June 2012

http://www.wipro.com | http://knowledge.wharton.upenn.edu

Knowledge@Wharton-Wipro Future of Industry Series: Technology Innovation

Balancing Power with Responsibility as Technology Makes for a Richer, Simpler World

Knowledge@Wharton-Wipro Future of Industry Series: Technology Innovation

Balancing Power with Responsibility as Technology Makes for a Richer, Simpler World

The debate is widening on whether technology is making our lives simpler or more complicated. Technology is certainly putting more power in the hands of users, allowing them to work faster and safer, and cut costs. Yet, technology can also be a treadmill that is hard to stop, and it can have potential adverse impacts on health, safety and the environment. In this white paper, Anurag Srivastava, Chief Technology Officer of Wipro Technologies in Bangalore, India, and Shawndra Hill, Wharton professor of operations and information management, reflect on this debate and offer insights into how to use technology responsibly.

Prominent essayist, author, travel writer and thinker Pico Iyer graphically captures the impact of technology on our lives in a recent Knowledge@Wharton article. "My image of the modern world is of teenagers joy-riding in a Porsche at 160 miles an hour around blind curves — which is the excitement of it, but also sometimes the unsettling quality," he says.

Is technology making our lives more exciting or unsettling? As technology puts more power in the hands of users, are we on a treadmill where getting off would mean being disconnected from the world? Is technology inexorably compromising the privacy and security of companies and individuals? Along with technology's gains come more complexity and impacts on health, safety and the environment, say Shawndra Hill, Wharton professor of operations and information management, and Anurag Srivastava, Chief Technology Officer of Bangalore, India-based Wipro Technologies. In this white paper, they ponder those questions.

As Srivastava sees it, the very nature of technology is changing. Not too long ago, technology enabled doctors, engineers, designers, geologists, scientists, pilots, bankers and other professionals "to push the envelope" of their respective practices, he says. It allowed them to work faster, safer and more accurately, and it cut costs. Today, technology is "sweeping across society to make a deeper, broader and more direct connect with people," he notes. "It is no longer confined to or controlled by privileged professionals."

TECHNOLOGY'S SWEEP, BEYOND THE REACH OF THE PRIVILEGED

The broader sweep of technology creates new capabilities, Srivastava explains. "You and I are using technology to read this paper, to distribute it, to make it searchable, to extract and edit portions of it and to store it for quick retrieval," he says. Many consider all those activities "completely normal," but it is important to "pause for a moment," he adds.

That pause, notes Srivastava, allows us to survey how our capabilities have been transformed. "We can do an incredible [amount] more: We can all be producers and global distributors of the movies we make; we can be our own online bankers; we can make excellent lobster bisque just by looking up an expert's video guide; we can instantly share our knowledge with the world using mobile technologies; we can be a DJ at a friend's party; and we do not have to deal with ignorant or inefficient customer service officers any more – we just use an IVR (interactive voice response) system. Capability, expertise and control are moving from the core to the very fringes of society."

Srivastava says the impact of this shift is "profound on cultures, social orders, communities, employee relationships and our interaction with the physical world." As he views the emerging scenario, he sees it altering a whole range of industries including utilities, health care, banking and public infrastructure. "The capacity of our networks appear to be infinite," he says, noting that the role of social media in generating thought, debate and opinion has even helped to bring about regime-changes in the Middle East.

"But things are not getting any simpler," says Srivastava. "And we have barely begun to scratch the surface. If anything, we are moving towards unprecedented complexity." He also sees a craving for what we fear we may lose to technology. "The more technology pushes us towards the future, the more we long for a past that was simpler, gentler, greener and perhaps more satisfying," he says.

INNOVATION AND INTROSPECTION

Against that backdrop, Srivastava feels the need for some soul searching. "How do we, as technologists, manufacturers and service providers — who also happen to be consumers once we leave the office — prepare for this? What does the future landscape present as opportunities and threats to businesses? What are the key developments that we need to reflect on today so that tomorrow is safer, better and sustainable?"

The answers to those questions depend on the setting and how technologies are actually used, according to Hill. For example, in reflecting on technologies that make our lives more complicated or produce unpleasant outcomes, she goes back to the original intent. "It's often the case, especially for firms, that they innovate and develop new products and services with the best of intentions to both maximize their profits and also make lives better for consumers," she says. But the actual outcomes may be undesirable, such as environmental pollution or privacy violations, she notes. "Technologies can be used for bad," Hill says. "Given that, it's important for firms to think about their potential implications."

Many companies do not do enough introspection about the impact of their technologies, especially when they are pursuing profits, according to Hill. The absence of a regulatory push might be one factor, she says. "If it's not required for them to pay attention to the environment or what they are doing to people's happiness or health, they are not necessarily going to do it, although some firms do."

Hill adds that she isn't advocating for big government to force such introspection, but thinks "there at least needs to be a conversation around what are the core human factors that firms should be paying attention to when they develop and issue new technologies." Those factors include paying attention to the environment, health care and the impact on the lives of children in terms of their education and their overall wellbeing, she explains. "To the extent that this conversation happens, it would be incredibly useful for consumers."

THE RETRO EFFECT: CRAVING AN EFFICIENT BUT UNCOMPLICATED LIFE

Intrinsically, human nature craves simplicity, according to Srivastava. "It longs to experience an efficient and uncomplicated life," he says. "Building simple technologies and applications is where the future lies."

Yet, with great simplicity comes great backend complexity, he notes, offering the example of the mobile phone as "a simple device that performs complex operations." He goes on to explain how it infuses simplicity in its complex range of offerings: It has keys that everyone understands; it can communicate with voice, text, images and video; it can become an entertainment center and help make shopping decisions; it can provide location assistance with GPS technology; and it can become a tool for things like social interaction, sales and even medical purposes.

Gadgets like mobile phones no doubt simplify and make our lives richer, but are we on a technology treadmill from which there is no escape? Does one run the risk of becoming a recluse by choosing, for example, to not be on Facebook?

"For some technologies, perhaps there is an escape," says Hill. "Can you escape Facebook? Certainly you can, especially if you are 74." Yet Hill acknowledges that there is "increasing pressure to adopt certain technologies in order to compete ... [where] if you don't, you are running the risk that you won't be able to participate." She points out how the Internet and other communication technologies have made it possible for academics to make more people aware of their work, and promote their ideas and contributions through research papers and the like. "Being able to have a conversation with people around the world at a moment's notice is a tremendous advantage," she says.

But the Internet age certainly has its downsides, too. "One burden is that you always have to be online, and that takes time and energy," says Hill. "And it's not clear yet what the benefits are." Even empirical studies on the utility of those technologies and whether they have the desired outcomes may fall short of accurate cost-benefit analyses, she notes. "The reality is, the impacts of these new technologies are really not known."

Hill adds that studies on technology's impacts have inherent limitations. "There are so many external factors that contribute to these outcomes we expect such as productivity, happiness, health and the environment," she says. It is often hard to isolate the effect or impact of those technologies on the desired outcomes. "We like to believe technologies make us more productive and happier — or that these technologies make us feel miserable since we don't communicate in person," she says. "The jury is still out on some of these questions because it is hard to measure the outcomes we care so much about."

THE FOUR VECTORS OF CHANGE

Srivastava suggests structuring the debate around four areas of change. The first is the impact of machine-to-machine communications. He describes that as "the intersection where the cyber world meets the physical world." He says "tremendous capacity" builds up when increasingly intelligent machines in the public space with idle or spare capacity are used once they are networked or connected with each other.

The second area, says Srivastava, involves networks changing "from passive to interactivity, offering extraordinary control to users," such as calling for assistance during a snowstorm or locating a hospital. That is possible with data analysis tools and the "semantic web," which refers to the drive towards common formats for data on the Internet.

Third is the way technology permeates society, he explains, noting that user experience is moving to the forefront and becoming a top priority. His fourth frontier is the "threat to individual and corporate security," as networks and technology deliver new capabilities. Threats to security will be a reason for "mounting governmental and societal concern."

Srivastava illustrates how these four vectors of change are playing out:

Machine2machine Communication: Imagine you are sitting in a café and need computing power to solve a problem. Your phone could ping other phones in the vicinity and check if it has permission to use their spare computing capacity. Using a dynamic network of intelligent machines, complex problems can be solved in real time at dramatically lowered costs. Technologies such as these can make products and services more affordable for the masses.

Machine2machine communication presents several revolutionary possibilities outside of enhancing and augmenting computing power. Consider a bank heist where the alarm system has been disabled. However, with machine2machine communication, the alarm system does not have to communicate over a phone line. It can use several ambient networks and devices to raise an alarm.

Analytics and the Semantic Web: Can machines respond to human requests? The amount of machine-readable data is growing exponentially, bringing us more rapidly to the reality of a semantic web. Imagine a network that monitors your physical condition and relays it over a Bluetooth network to the phone in your pocket, which in turn delivers the data over a 3G network to a remote hospital system. The system can analyze and respond to your own body metrics and sound an alarm if necessary. Such networks with a layer of analytics can make an inconceivable impact on individuals in areas like health care, hospitality, banking, financial services and insurance.

User Experience: The iPad's success can be attributed to its user experience (and, admittedly, its exquisite design). Tomorrow's world will demand a significant extension of this type of user experience to encompass all of the five senses – sight, sound, smell, touch and taste. Such a user experience will help connect to the past, delving deep into human memory, to produce a feeling of familiarity and comfort. And perhaps it would just as easily be able to deliver scenarios from the future, constructing them from sophisticated data models.

How can technologies of today help improve user experience? Take, for example, the music player in your car. What happens when a new media format is introduced? Do you really need to rip out and replace your hardware? Is it not possible to turn your "music player" into a simple device that plays content accessed over the Internet, regardless of the format? In reality, user expectations will change in ways that call for a higher level of engagement, but simplicity of use.

Security: Networks have no borders, and the state has no control over them. Will individuals be prepared to manage their own security? Identities will be stolen, pictures morphed and presence data manipulated, giving birth to new crimes and threatening society and the world as we know it.

DEMOCRATIZING ACCESS IN THE DEVELOPING WORLD

"Technology brings unprecedented advantages, but must be used honestly and sincerely," Srivastava believes.

Hill acknowledges the concerns Srivastava raises, and wants to draw attention to perhaps lesser-known aspects of how technology has brought

about vast changes in developing nations. Text messaging has revolutionized people's daily lives in Kenya, she says, noting that she visited that country last summer as part of a study group. While there, she observed how mobile apps help cell phone owners use their devices for micropayments, health care services and updates on crop prices, among other applications.

Those mobile apps in Kenya are powered by M-Pesa (M for mobile, pesa for money in Swahili), a branchless banking service from Kenya's mobile service provider Safaricom. "M-Pesa is one of the huge success stories in the developing world for micropayments," Hill says. "It has changed the life of even taxi drivers who can get mobile payments from their passengers." In that scenario, the benefits far outweigh the negative aspects, she adds.

Hill offers another example of how technology helps her connect with students in Ethiopia, where she conducts doctoral programs in information management. She is thankful to technology for giving her the ability to communicate via email across different time zones and with people who have different resources. "They have access to faculty in the United States, maybe even more so than students in the U.S. when they partner up, and technology has enabled that," she says. "Even from this side of the ocean, I marvel at how easy it is to communicate with my students [in Ethiopia]."

People in the developing world will have even greater access to information and resources as Internet penetration increases, says Hill. "That democratizes a lot of things — education, health care, and even to some extent, being able to voice views on politics and corruption. We are seeing that more and more." With the Internet, new solutions can be found for problems in the developing world, she adds. "It puts a lot of power in the hands of everyday people."

GREAT POWER, GREATER RESPONSIBILITY

Srivastava maintains that technology is bringing about "unprecedented innovation" as it becomes more accessible and "moves across the masses and deep into the fringes of society." With more accessible technology, he foresees the emergence of applications that serve smaller user groups, at lowered costs, and with the same robustness connecting enterprises, society and governments. With all that, the future "looks great, but needs responsible behavior at the consumer end," he cautions. "With great power comes greater responsibility."

Srivastava predicts a future where both technology's creators and users will have to balance the gains with responsible conduct. Technology's advances "will call for a more stringent regulatory environment, better security standards and a new method of creating and managing watchdog bodies responsible for digital security," he says. "The future is scary because it's so cool."

This article was produced by Knowledge@Wharton, the online business journal of The Wharton School of the University of Pennsylvania. The project was sponsored by Wipro Technologies.

www.wipro.com http://knowledge.wharton.upenn.edu

Founded in 1881 as the first collegiate business school, the Wharton School of the University of Pennsylvania is recognized globally for intellectual leadership and ongoing innovation across every major discipline of business education. With a broad global community and one of the most published business school faculties, Wharton creates ongoing economic and social value around the world. The School has 5,000 undergraduate, MBA, executive MBA, and doctoral students; more than 9,000 annual participants in executive education programs; and a powerful alumni network of 91,000 graduates.

ABOUT KNOWLEDGE@WHARTON

Knowledge@Wharton is the online business analysis journal of the Wharton School of the University of Pennsylvania. The site, which is free, captures relevant knowledge generated at Wharton and beyond by offering articles and videos based on research, conferences, speakers, books and interviews with faculty and other experts on current business topics. The Knowledge@Wharton network — including Chinese, Spanish, Portuguese, Indian, Arabic and High School editions — has more than 2.1 million subscribers worldwide.

For more information: http://knowledge.wharton.upenn.edu

ABOUT WIPRO TECHNOLOGIES

Wipro Technologies, the global IT business of Wipro Limited (NYSE:WIT) is a leading Information Technology, Consulting and Outsourcing company that delivers solutions to enable its clients do business better. Wipro Technologies delivers winning business outcomes through its deep industry experience and a 360 degree view of "Business through Technology" — helping clients create successful and adaptive businesses. A company recognized globally for its comprehensive portfolio of services, a practitioner's approach to delivering innovation and an organization wide commitment to sustainability, Wipro Technologies has 130,000 employees and clients across 54 countries.