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HOW SMART, CONNECTED PRODUCTS ARE TRANSFORMING COMPETITION

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FEATURING

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HOW SMART, CONNECTED PRODUCTS ARE TRANSFORMING COMPETITION

AT A PRIVATE HARVARD BUSINESS REVIEW breakfast sponsored by Tata Consultancy Services, Harvard Business School professor Michael Porter—the world's leading expert on competitive strategy—described how the Internet of Things is fundamentally transforming the competitive landscape. Porter drew from his recent *Harvard Business Review* article, "How Smart, Connected Products Are Transforming Competition," to go beyond the buzz about the Internet of Things to explain how profound technological changes are driving changes in how companies compete.

Competing by merely producing physical products or using technology to automate aspects of the value chain will no longer be adequate. In all industries, companies will increasingly compete by producing smart, connected devices that are part of software-enabled systems or platforms.

This transformation, which is already underway, is forcing companies to rethink everything they do. This includes which capabilities are most important, what talent is most essential, what functionality is most critical to customers, how best to differentiate, which business models to pursue, and even bet-the-company questions such as "What business are we in?"

KEY LEARNINGS

The Internet of Things Is Part of the Third Wave of IT-Driven Competition

For hundreds of years, the types of products that were produced were mechanical, and value-chain activities were performed manually. This has changed with successive waves of information technology.

WAVE 1: VALUE CHAIN AUTOMATION. In the 1960s and 1970s, IT automated previously manual processes of information collection and processing in individual activities across the value chain, such as order processing and billing, which improved productivity.

> "During this time [waves one and two], products stayed largely the same. The real action was in how the company did business. IT was the big driver of productivity growth for a couple of decades."
>
> **MICHAEL PORTER**

WAVE 2: VALUE CHAIN DISPERSION AND INTEGRATION. In the 1980s and 1990s, the Internet enabled connectivity and integration across the value chain. Customer relationship management stitched together what had been separate processes; supply chains became more global, efficient, and optimized; and again, productivity improved.

WAVE 3: SMART, CONNECTED PRODUCTS. In this wave, information technology is embedded in the products themselves, transforming value creation by triggering a new wave of transformation in the value chain. A product becomes "smart" when technology, such as a sensor, is embedded in the product. A product becomes "connected" when one product is connected to another. With miniaturization and ubiquitous connectivity, it is possible to make all types of products smart and connected.

Smart, Connected Products Provide Entirely New Types of Key Functionalities

Smart, connected products enable entirely new categories of capabilities, with each building on the preceding layers. figure 1

Capabilities of smart, connected products include:

MONITORING. With monitoring there is visibility about where a product is, what it is doing, what environment the product is being used in, and the condition of the product. By monitoring a product it is possible to set acceptable ranges and trigger alerts and alarms.

CONTROL. In addition to monitoring a product, it may be possible to embed software that enables bidirectional control over a product, controlling the product from a phone or tablet.

OPTIMIZATION. If a product can be monitored and controlled, it is possible to add algorithms to optimize its operation and performance. This can include predictive maintenance to intervene before something bad happens.

AUTONOMY. Ultimately it will be possible to create products that act on their own.

FIGURE 1

CAPABILITIES OF SMART, CONNECTED PRODUCTS

			AUTONOMY
		OPTIMIZATION	
	CONTROL		
MONITORING			
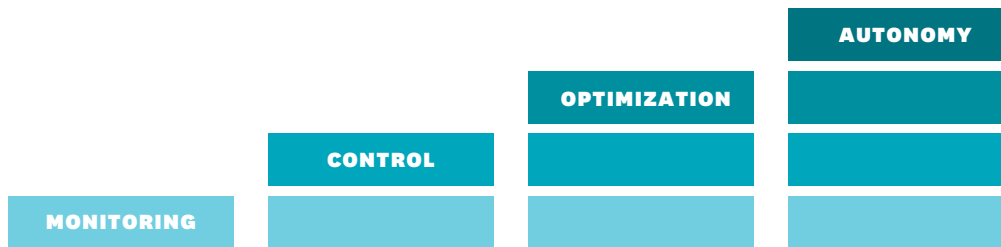
Connecting Smart Products Requires a New Type of "Technology Stack"

The connection of smart products requires a new type of technology platform or "stack." The technology stack will enable a product to connect with other products (via a wire, wireless, WiFi, Bluetooth, or cellular). It requires building a cloud to which the product will connect and creating a big data database to aggregate data from multiple products as well as from internal business systems and external sources. Analytics are needed to analyze and derive value from the massive amounts of data. There will need to be an application platform and various business applications. All of these technologies need to be connected in a secure way, which makes cybersecurity critically important and exponentially more complex. All of these elements of the technology stack need to be addressed before a product is developed and launched.

Smart, Connected Products Have Significant Implications for Corporate Strategy

Unlike the previous waves of IT transformation that boosted firm productivity, this wave will affect companies' strategies and how companies differentiate themselves, create value, and compete, and will change the structure of industries. Smart, connected products will blur the boundaries within an industry and will shift bargaining power.
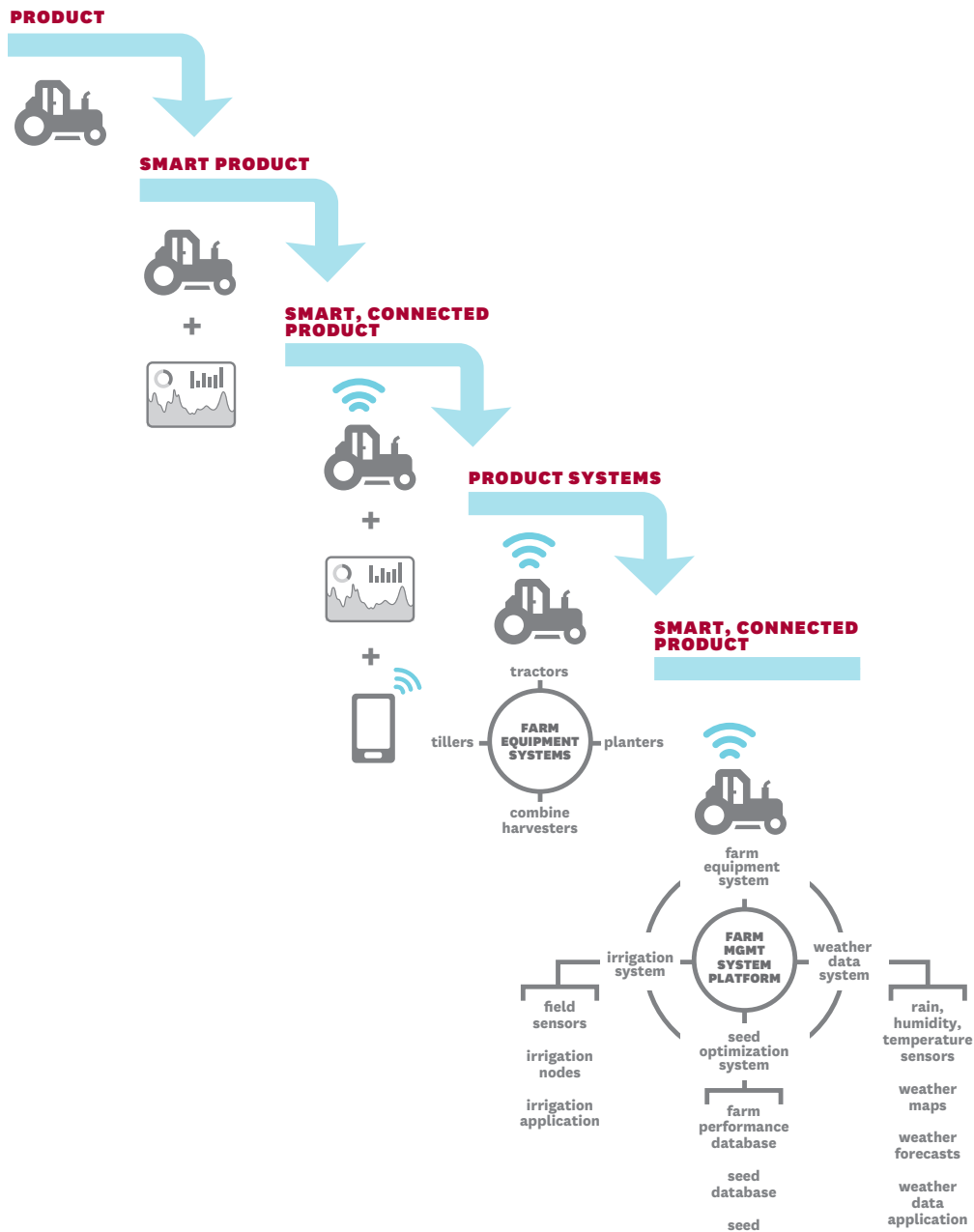
These products will change the basic principles of product design. Products will be designed to be part of systems and have "evergreen" design so they can be continuously services and upgraded, with product usage data enabling rapid redesign. They will be customized and designed for security.

Take the farm equipment industry, for example, which illustrates how smart, connected products are changing boundaries, industries, and competition. figure 2 Previously, a company made a product—a tractor. The product evolved to become a smart product, and then a connected product, which made it an even better tractor. Suppliers in this industry competed based on which company had the best smart, connected tractor.

"What used to be a single product is now a family of connected products or a whole system of families of connected products. That raises a lot of strategy questions."

MICHAEL PORTER

FIGURE 2

EXPANDING INDUSTRY BOUNDARIES—FARM EQUIPMENT EXAMPLE

PRODUCT

SMART PRODUCT

+

SMART, CONNECTED PRODUCT

+

+

PRODUCT SYSTEMS

tractors

tillers — **FARM EQUIPMENT SYSTEMS** — planters

combine harvesters

SMART, CONNECTED PRODUCT

farm equipment system

irrigation system — **FARM MGMT SYSTEM PLATFORM** — weather data system

field sensors

irrigation nodes

irrigation application

seed optimization system

farm performance database

seed database

seed

rain, humidity, temperature sensors

weather maps

weather forecasts

weather data application

The real transformation is when smart, connected products are brought together into a connected "product system" where the smart, connected tractor is integrated with other farm equipment to optimize the entire farming operation. And, one farm equipment system can be connected with other systems, creating a system of systems. This represents a fundamental change in a company's business model from making and selling a product to making entire product systems or platforms.

The possibilities now available require that companies answer major strategic questions such as what business they are in. Companies have to decide if they want to be the system integrator that provides the entire platform or one discrete product on a larger platform.

The Emergence of the Internet of Things Will Force Companies to Make Hard Strategic Choices

This wave of information technology is complicated and is forcing companies to make difficult decisions. To assist leaders in thinking through these choices, Porter has created a framework with 10 strategic questions. figure 3

These important choices include which capabilities to pursue and what functionality to embed, whether to create an open or a proprietary system, what type of data to capture and how to manage it, what business model to pursue, the scope of the offering, and more.

FIGURE 3

TEN STRATEGIC CHOICES

1	Which capabilities to pursue?
2	Functionality: Embedded in the product vs. in the cloud?
3	Open or closed system?
4	Technology development: Internal or external?
5	What data to capture?
6	How to manage data rights and access?
7	Disintermediate distribution or service channels?
8	Change the business model?
9	Sell data to outside parties?
10	Expand product scope?

> "There are big bets that companies have to make in a world of smart, connected products that are going to be profoundly important to the success of the company, which are things we never had to think about before, not in the same way."

MICHAEL PORTER

The Internet of Things Will Produce Distinct Winners and Losers

There will be many winners and losers. Winners will have to make the right choices and get the basics right. Among the key characteristics of winners will be:

ASSEMBLING THE RIGHT EXPERTISE AND TALENT. Companies will need different types of talent than in the past, which will include software engineers and data scientists.

RETHINKING PRODUCT DEVELOPMENT. The process of developing new products must be handled differently from when the products being developed were merely physical, mechanical products.

PICKING FUNCTIONALITY THAT CUSTOMERS VALUE. Technology makes an amazing array of functionality possible. But winners will focus on functionality that provides value that customers are willing to pay for.

Ultimately, the biggest factor that will distinguish winners and losers is the choice of what business a company is in.

The emergence of smart, connected products with embedded technologies is likely to drive consolidation among companies with complementary product portfolios, also resulting in new players with new products and models.

For existing companies, it is important not to view this new technological wave as incremental in nature. These technologies are transformational, with major implications for companies' strategies, for how companies compete, and for which companies will win and lose.

MICHAEL E. PORTER

BISHOP WILLIAM LAWRENCE UNIVERSITY PROFESSOR
HARVARD BUSINESS SCHOOL

Michael E. Porter is a leading authority on competitive strategy; the competitiveness and economic development of nations, states, and regions; and the application of competitive principles and strategic approaches to social needs such as health care, innovation, and corporate responsibility. Porter is generally recognized as the father of the modern strategy field, and has been identified in rankings and surveys as the world's most influential thinker on management and competitiveness. As the Bishop William Lawrence University Professor based at Harvard Business School, Porter has received the highest professional recognition that can be awarded to a Harvard faculty member.

ADI IGNATIUS

EDITOR IN CHIEF | HARVARD BUSINESS REVIEW

Adi Ignatius joined HBR as editor in chief in January 2009. Previously, he was deputy managing editor for *TIME*. He was the editor of two *New York Times* best-selling books: *President Obama: The Path to the White House* and *Prisoner of the State: The Secret Diaries of Premier Zhao Ziyang.* Prior to his 2007 appointment as deputy managing editor, Ignatius served as executive editor of *TIME* starting in 2002, and from 2004 to 2007 he also held the additional title of editor of *TIME* Canada. Ignatius joined *TIME* as deputy editor of *TIME* Asia in 1996 and was named editor of that edition in 2000. He also wrote frequently for *TIME*, including cover stories on Google Inc. and the 2007 Person of the Year profile of Vladimir Putin. Prior to joining *TIME,* Ignatius worked for many years at the *Wall Street Journal*, where his work was nominated for a Pulitzer Prize.

Ignatius was awarded a Zuckerman Fellowship at Columbia University's School of International and Public Affairs in 1990. He received his BA in history in 1981 from Haverford College. He is a member of the Council on Foreign Relations and the Asia Society.

NATARAJAN CHANDRASEKARAN

CEO AND MANAGING DIRECTOR | TATA CONSULTANCY SERVICES

Natarajan Chandrasekaran ("Chandra") is the CEO and managing director of Tata Consultancy Services (TCS), the company recognized as the industry leader in customer satisfaction and the fastest-growing brand in the IT services industry. TCS' global talent base of 318,000 consultants is helping corporations across the world simplify, strengthen, and transform their businesses. During Chandra's tenure as the chief executive since October 2009, the company has grown at a compounded annual rate of 21 percent. Responsible for formulating the company's global strategy across its footprint of 46 countries, Chandra led TCS to a market capitalization of over US$ 80 billion during 2014. He is the serving chairperson of the IT governors steering committee at the World Economic Forum and is considered the leading voice in the industry on the transformational power of technology. Beyond the office, Chandra is a passionate long-distance runner and has completed marathons in New York, Prague, Stockholm, Vienna, Chicago, and Berlin.

THIS DISCUSSION ON the future impact of smart, connected products is extremely timely. 2015 is going to be a defining year for the Internet of Things (IoT), which is poised to transform every company, industry, and society. The world economy is in the midst of a shift from the Internet economy to what can be called the Digital Consumer Economy. This shift will reshape the competitive landscape of virtually every company. The emerging digital consumer economy is characterized by empowerment of consumers with pervasive digital devices, which are embedded with sensors. These devices provide anytime, anywhere access to contextual real-time information that customers need in order to make decisions. These consumers are connected with one another via social networks and share intelligence. Equally, the companies that serve consumers are also empowered with information about these consumers, completing the information food chain. The rapid declines in the costs of processing power and sensors over the past 10 years is further fueling this transformation and making it even more affordable.

The five key technologies that we call the Digital Five Forces are also maturing and further precipitating the shift to the Digital Consumer Economy. These are Mobility and Pervasive Computing, Big Data, Social Media, Cloud, and AI-Robotics. These forces are increasingly being used in various permutations and combinations to drive new applications. As a result, new Digital Composite Forces are emerging. Foremost among them is the Internet of Things, which combines mobility and pervasive computing, big data, cloud, and—increasingly—artificial intelligence. A potential 50 billion devices are likely to be connected to the IoT in the next five years (by 2020), driving new economic opportunities.

A vast majority of business leaders are still unsure about what to do about this oncoming change, but it is crucial that they start embarking on the road to what we have termed "Digital Reimagination." This involves leveraging a combination of the Digital Five Forces and Digital Composite Forces to reimagine the enterprise along one or more of six dimensions: business models, products and services, customer segments, channels, business processes, and workplaces. Though the fundamental rules of competition and strategy do not change, the competing players undergo significant change in terms of how they operate with or relate to their own customers. Recently, we leveraged the IoT for a major global engine manufacturer to create a new services stream by using sensor-collected big data to predict failures on their engines. When such a failure is predicted, the vehicle operators are automatically sent notifications along with directions to the nearest service center. Apart from driving new maintenance revenue, this has also helped improve the customer experience by reducing inconvenient breakdowns.

The opportunities for businesses are limitless, as are the growing risks and need for cybersecurity for the new IoT networks being built. This is why we agreed at Davos that the primary priorities for the IT industry in 2015 will be twofold: First, building up a strong Internet of Things that improves the state of the world, and second, securing this through enhanced cybersecurity and global Internet governance. Most of all, we need to change competitive strategies, cultures, and mindsets to embrace this new world—one in which the default is digital.

Natarajan Chandrasekaran
CEO AND MANAGING DIRECTOR | TATA CONSULTANCY SERVICES