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How to ensure that the Industrial Internet of Things delivers on its promises

By Mark Purdy

Rolling out a transformative new technology is not the same as deriving maximum economic benefit from it. Capitalizing on the IloT begins at the policy level, where governments must ensure that critical enabling conditions are in place.

Call it the Multi-trillion Dollar Question: Can the Industrial Internet of Things jump-start the lackluster global economy, which is still struggling almost six years after the onset of the Great Recession?

David Cameron seems to think so. He wants the United Kingdom to lead this “new industrial revolution,” and has directed nearly \$125 million to IIoT research.¹ The Chinese government has designated the Industrial Internet of Things an “emerging strategic industry,” and plans to invest some \$800 million in the IIoT by 2015.² These are among several governments looking to the IIoT as a means to stimulate national competitiveness and economic growth.

And with good reason: The Industrial Internet of Things—a vast network of IP-enabled devices interacting with one another and their human operators—has the potential to help overcome structural barriers to faster growth, such as low productivity, insufficient innovation and inadequate infrastructure. This emergent web will soon incorporate billions of nodes, and will help businesses, governments and individuals monitor and manage every aspect of their daily activities and operations.³

Aggregate effects

The value of the IIoT (some estimates project it will add trillions of dollars to the global economy by 2030)⁴ derives from its aggregate effects in boosting productivity, driving the emergence of new markets and encouraging innovation. Already in the industrial sphere, sensor networks monitor capital goods and logistics, which increases

cost-saving efficiencies throughout the business process. In agriculture, similar networks deployed across farmlands optimize the use of water and other resources and contribute to more plentiful harvests. And in the consumer sphere, the IIoT is creating entirely new markets worth billions, such as in digital health and “connected lifestyle” products.

However, the vast potential of the IIoT is by no means guaranteed.

Historically, some countries have been better able than others to capitalize on the economic potential of new technology. Take the introduction of electrification in the industrialized world at the turn of the 20th century. Although many countries were at similar levels of technological development, the United States became the world leader in electrification because it embedded the new technology across the wider economy and changed production and organizational structures around it.

In other words, the technological diffusion of electricity in different countries was not the same as its *economic* diffusion. In the United States, an entrepreneurial culture, coupled with a favorable business climate, drove the rapid expansion of electrification.

While technology diffusion describes a relatively limited process of technology

¹ Gov.uk, “Prime Minister David Cameron’s speech to the CeBIT trade fair in Hanover, Germany,” January 9 2014. <https://www.gov.uk/government/speeches/cebit-2014-david-camerons-speech>

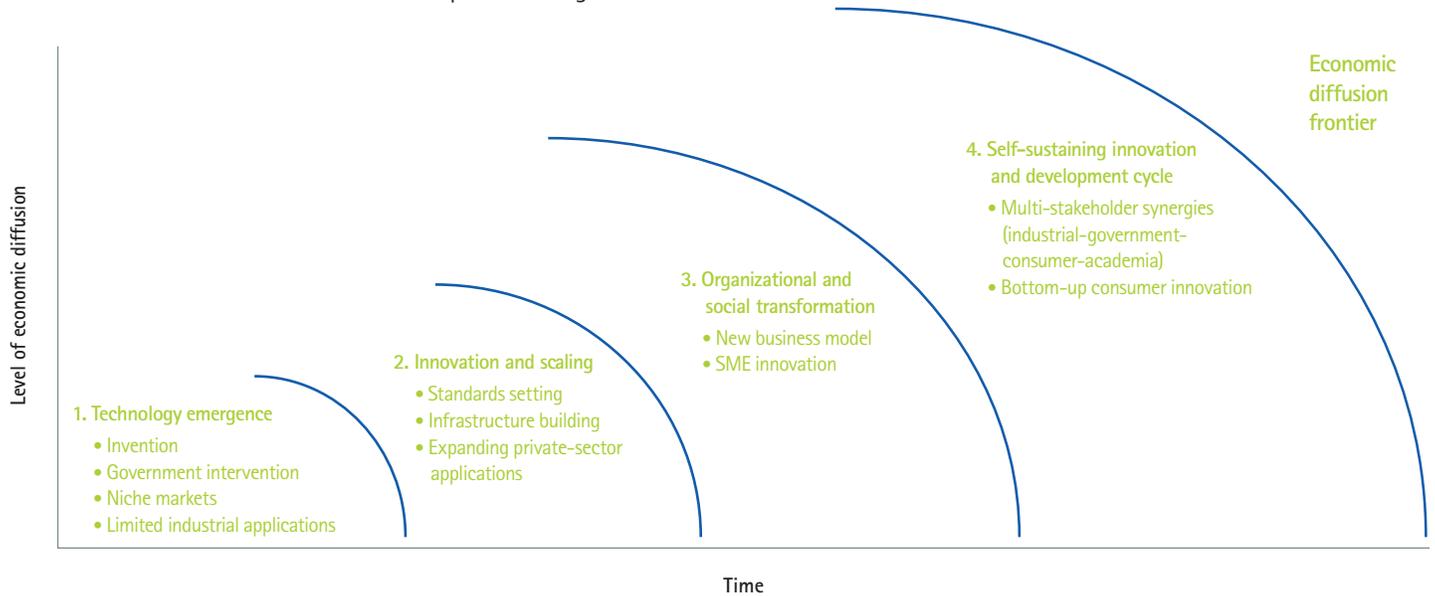
² CNN, “China looks to lead the Industrial Internet,” December 3, 2012. <http://edition.cnn.com/2012/11/28/business/china-internet-of-things/>

³ Cisco, “The Internet of Everything: How More Relevant and Valuable Connections Will Change the World,” 2012. <http://www.cisco.com/web/about/ac79/docs/innov/IoE.pdf>

⁴ GE, “Industrial Internet: Pushing the Boundaries of Minds and Machines,” November 26, 2012. http://www.ge.com/docs/chapters/Industrial_Internet.pdf; Cisco, “The Internet of Everything—A \$19 Trillion Opportunity,” 2014. <http://www.cisco.com/web/services/portfolio/consulting-services/documents/consulting-services-capturing-ioe-value-aag.pdf>

The economic diffusion of technology

The economic diffusion of technology is a multilayered process comprised of four stages, with each built on the foundations laid in previous stages.



adoption, economic diffusion carries broader implications. It requires technology diffusion, but suggests growth, innovation and financial reward spread across multiple sectors and industries. If countries do not recognize this difference and fail to create the conditions that enable economic diffusion, they run the risk of losing out on the economic potential of the IIoT.

Think of this economic diffusion of technology as a multilayered process comprised of four stages, with each stage built on the foundations laid in previous eras.

Technology emergence. Initially, the technology tends to be embryonic and available only to a limited number of users in certain niche markets or industries. Government intervention is often critical in helping the technology transition to the next stage of economic diffusion. It was crucial to the early development of the Internet, which would become the foundation for the IIoT.

Innovation and scaling. As the technology evolves, a process of standards

setting (either by government or the market) begins. Other industries start to innovate around the core technology, generating value from it. We can see this dynamic with the IIoT as technology companies race to be IIoT leaders and connected products move into the consumer sphere. This process is sped up by the fact that much of the IIoT's infrastructure piggybacks on existing telecommunications infrastructure networks. Thus, consumers, businesses and innovators can take advantage of the IIoT at relatively low cost.

Organizational and social transformation. Today, many of the world's advanced economies are on the cusp of this stage, where the technology—in this case, the IIoT—truly begins to transform society. Again, the example of electrification is instructive: Once economies of scale were achieved, electricity became an integral feature of production, while new electric-powered consumer goods, from the vacuum cleaner to the radio, changed the way individuals lived their daily lives. A similar transformation is likely to accompany the growth of the IIoT.

Self-sustaining innovation and development cycle. The new technology becomes so thoroughly diffused throughout an economy at this stage that everyday life can barely be imagined without it. Innovators exploit the technology's ubiquity to develop advanced applications. Electricity led to electronics. Electronics led to modern computing. Modern computing led to today's Internet and the IIoT.

Left behind?

Yet despite the potential inherent in a transformative technology, if certain enabling conditions are not present, a country runs the risk of getting stuck in an early stage of economic diffusion. Many countries are still struggling to diffuse basic Internet access throughout their economies, for example. Leaders can ensure this does not happen with the IIoT by crafting policies to encourage infrastructure development, workforce skills, better governance, openness and connectedness to the global economy, and innovation.

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But there is no one-size-fits-all solution. These leaders must address country-specific challenges in capitalizing on the potential of the IIoT. Answering the five following questions will help them make the optimal strategic choices.

1. What areas do you need to improve on to harness the economic potential of the IIoT? Some countries may need to invest heavily in building basic infrastructure to support the IIoT. Others will need to create a workforce with skills aligned to the needs of the IIoT economy.

2. Where do you devote your resources to build the IIoT? To get the most from the IIoT, factor time and cost constraints into your efforts, and work with the grain of the economy. For example, relatively small investments by agrarian nations in establishing IIoT sensor networks on farms and irrigation systems can have a massive payoff while leveraging comparative advantages.

3. How do you produce the factors needed for the IIoT? To build the IIoT skills base of your economy, do you nurture talent within your existing workforce ("make")? Or do you tailor immigration policy to attract skills from abroad ("buy")?

4. Who is going to guide the economic diffusion of the IIoT? Balance government-led initiatives with private-sector solutions. Whoever leads the process, governments, at a minimum, must facilitate collaboration with various stakeholders (industry, academia, NGOs) to encourage the economic diffusion of the IIoT and ensure that regulations do not stifle innovation.

5. When do you need to reevaluate your IIoT policy framework? Encourage a fast, dynamic model of policy engagement. Governments may need to switch gears rapidly given the speed at which the IIoT is likely to expand. Centralized IIoT development models may need to give way to more diversified, private-sector growth once a certain level of economic diffusion is reached.

Business and policy leaders clearly recognize the IIoT's economic potential. But rolling out a technology is not the same as deriving maximum economic benefit from that technology. Certain conditions need to be in place, and policy leaders must act to set their countries on the right path to fully capitalizing on the Industrial Internet of Things. ■

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