

## Chapter 6

# The Internet of Things: Assessing Its Potential and Identifying the Enablers Needed to Capture the Opportunity

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### ABSTRACT

*The Internet of Things (“IoT”), networks of connected machines and sensors with the ability to monitor and manage objects in the physical world electronically, has substantial economic potential. IoT technology has a wide range of applications, such as optimizing the performance of industrial operations and infrastructure systems; coordinating self-driving cars; managing the energy efficiency and security of homes and offices; and monitoring patients remotely. Drawing on a body of research by the McKinsey Global Institute (most notably, *The Internet of Things: Mapping the value beyond the hype*, June 2015), this chapter finds that the IoT could generate anywhere from \$3.9 trillion to \$11.1 trillion in annual economic impact by 2025. We arrive at these figures through a bottom-up quantification of economic surplus that examines multiple use cases clustered in nine types of settings where IoT technology has relevance. We also highlight some of the fundamental enablers that will be necessary for this value to be realized, including industrial adoption, interoperability standards, cybersecurity, and regulatory certainty regarding issues such as data sharing and liability. While these factors are not yet certain, we conclude that the current hype of IoT is somewhat justified. Indeed, if these issues are resolved quickly and fully, the eventual economic value may exceed current expectations.*

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## INTRODUCTION

The physical world is increasingly becoming an information network, populated by sensors and intelligent devices that capture continual streams of real-time information. These devices transit enormous volumes of data that can be processed with advanced analytics to choreograph the way complex systems operate. This web of connected devices, commonly referred to as the Internet of Things (IoT), represents the convergence of ubiquitous connectivity, the cloud, big data, and advanced analytics.

The purpose of the IoT is to help companies and consumers get far more out of their physical assets. These systems are already being applied in myriad ways: minimizing downtime on factory floors, tracking the progress of ships at sea, helping energy grids respond to spikes in demand, or controlling smart home appliances and security systems. The applications extend to the most personal of uses: patients with chronic diseases, for instance, can be outfitted with wearable devices and portable monitors to signal the need for preventive care before a crisis occurs, reducing both health-care costs and the enormous human toll of conditions such as diabetes. New IoT developments such as the rollout of connected and even self-driving cars continue to make headlines and capture the public's imagination.

Many business leaders have expressed a bullish outlook about the IoT's potential; Cisco chairman John Chambers, for example, has referred to it as "the biggest transition for the internet since [its] birth."<sup>1</sup> Some have dubbed this wave of technology the "Fourth Industrial Revolution." This degree of enthusiasm is backed up by investment dollars. CB Insights reports that nearly US\$4 billion had flowed into IoT projects by 2016, including startups backed both by major venture capital firms such as Andreessen-Horowitz or Sequoia Capital as well as by companies including GE, Qualcomm, and Cisco Systems.<sup>2</sup>

As when any new technology arrives on the scene, there is a risk that the hype will exceed the reality. In this chapter, we aim to step back and present a fact-based analysis of the IoT's potential to generate economic value, based on an analysis of multiple use cases. Instead of estimating the total market for IoT technologies or taking an industry-by-industry approach, we look at the full range of industrial or user settings in which the IoT could be deployed. We also consider the enablers that would be required to realize this potential.

Using this approach, we highlight three crucial figures in this chapter:

1. **More Than 10 Trillion of Annual Value:** *The economic value linked to the IoT is necessarily uncertain at this stage of its development and deployment, but in all likelihood, it is substantial. Considering a wide range of applications and assuming all consumer surplus linked to the IoT is fully reinjected into the economy, we estimate that the IoT could generate economic impact of \$3.9 trillion to \$11.1 trillion annually by 2025. This is equivalent to 11 percent of estimated world GDP in that year.*
2. **40% of Value Driven by Inter-Operability:** *The development of open interfaces between the multiple devices and environments in which IoT systems are deployed will be a critically important "external" factor determining how much of this potential value is actually realized. We estimate that up to 40 percent of the potential value hinges on the ability to achieve interoperability.*
3. **70% of Value Linked to Industrial Internet:** *A significant part of the IoT's value potential is specifically linked to the so-called "industrial internet"—that is, the deployment of these systems in the world's vast industrial machinery, processes, and operations. Like any new technology diffusion, it will take time for companies to invest in the IoT and then to create systems and new business*

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