



The Internet of Things

THE Internet of Things concept involves connecting machines, facilities, fleets, networks, and even people to sensors and controls; feeding sensor data into advanced analytics applications and predictive algorithms; automating and improving the maintenance and operation of machines and entire systems; and even enhancing human health. Cisco believes the “Internet of Everything” will have an economic impact of over \$14 trillion by 2022.¹ GE says the “Industrial Internet” could add \$15 trillion to the world economy over the next 20 years.² Companies are already spending billions to create new business models powered by the Internet of Things in sectors ranging from automotive (for example, in-vehicle information and entertainment) to health care (for example, remote patient monitoring).

The term “Internet of Things” is not new

The term Internet of Things (IoT) has been in use at least since 1999 when it was employed to promote RFID, the technology that uses low-cost radio tags to identify objects such as individual products, cases, or shipping

pallets.³ Today, though it is widely deployed in warehousing, distribution, and retail, RFID accounts for a relatively narrow set of applications of the IoT.

In recent years, diverse applications of sensors and wireless communications, forerunners of today's IoT, have been implemented in a wide range of industries. Examples include tracking the location and condition of valuable equipment such as construction and mining machinery, managing the deployment and maintenance of commercial trucking fleets,⁴ coordinating the maintenance of vending machines and ATMs, supporting roadside assistance programs such as GM's OnStar, controlling and monitoring manufacturing and processing operations, and managing electric power distribution networks to accelerate outage detection and response.⁵

Smaller, cheaper sensors and better analytics are driving the market

As sensors and communications electronics continue to decline in size and cost and improve in performance, the economics of sensor-based applications improve. Today's applications include the use of sensors so small they can be worn or even ingested, and others so rugged that they can monitor the performance of high-speed rotating machinery such as jet engines and generator turbines. At the same time, big data tools for managing and analyzing the vast data sets generated by swarms of sensors are rapidly maturing. We are seeing new applications across a wide range of sectors:

- **Automotive:** Reducing crashes; enabling driverless vehicles, smart parking, and dynamic pricing for bridges, tunnels, and urban centers
- **Health care and life sciences:** Monitoring patients at home, improving drug compliance⁶
- **Sports and fitness:** Monitoring athletic performance⁷
- **Smart buildings:** Improving security, comfort, and operating efficiency⁸
- **Heavy industry and manufacturing:** Predicting equipment failures, minimizing downtime, and managing preventive maintenance schedules⁹
- **Municipal infrastructure:** Monitoring and managing infrastructure such as storm water management systems¹⁰

These are just a few examples of the many emerging applications of the IoT. IoT has the potential to revolutionize the way we lead our lives and run our businesses. Across many industries we are likely to see new ventures formed, some incumbents disrupted, and others attempting to disrupt or adapt to the new environment.

Companies have broad needs

As companies seek to build new businesses based on the IoT, they face an array of challenges:

- **Developing strategies and business models:** Companies need help working through strategic and business model questions such as whether to focus solutions on reducing costs, generating new revenues, improving customer service, or some combination of these.
- **Creating and integrating information technology:** The technology ecosystem for enabling the Internet of Things is highly fragmented. Solutions must be assembled from components offered by various providers of sensors and communications modules, network management and control systems, communications networks, enterprise applications, and customer-facing applications. Companies need help

selecting, customizing, and integrating components into an overall solution.

- **Managing and analyzing data sets:** Sensor networks generate vast amounts of data. The opportunity at the heart of the IoT is deriving new insights and guiding superior decisions through analysis of that data. Companies need help designing and building analytic and sensor data management capabilities and creating business processes that are driven by analytic insights.
- **Designing and maintaining security and privacy:** As people's bodies, homes, and vehicles become sources of data, protecting privacy becomes more challenging. Companies that connect their critical infrastructure to communications networks are raising the stakes for cyber security. Organizations and product vendors need expert help to create security and privacy capabilities tailored to the new business models of the Internet of Things.
- **Designing new organizations:** Some IoT ventures create the need for new organizations. When automakers introduced telematics services for roadside assistance and vehicle maintenance, they became providers of subscription-based services. Deloitte has helped a number of them create the necessary organizations to offer these services to customers.

Market size and investment trends

The market for IT services in support of the IoT is significant. Gartner projects that companies will spend nearly \$3 billion this year on consulting and implementation services related to cellular machine-to-machine (M2M) communications; this figure is expected to rise to nearly \$5 billion by 2016, with mobile network operators dominating the market. The industries spending the most on such services are manufacturing, transportation, utilities, healthcare, retail, banking, and government.¹¹

Comprehensive investment trends related to IoT are hard to come by because the category is broad, spanning semiconductors, telecommunications, software, analytics and consumer, and industrial products and services. One investment data firm estimates venture capital investment of over \$750 million in more than 100 IoT companies last year.¹²

Conclusion

Buzz is building around the IoT: The volume of Google searches for the term has quadrupled since 2009.¹³ However, search activity does not equal revenue opportunity—except for Google itself. And the evocative term IoT obscures the reality that this is not a single market; applications must be tailored to the needs of specific sectors and business functions. Despite these caveats, the signals we have identified suggest significant opportunities to build important new businesses with the IoT.

Endnotes

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