



Growing Internet of Things platforms

An ecosystem of value cocreation

Growing Internet of Things platforms

Deloitte's global Internet of Things practice partners with the world's top companies, individuals, and organizations to deliver on their digital transformation ambitions—helping them go to market, live, and operate. We focus on codeveloping new services, products, and solutions, providing end-to-end consultancy and engineering services and working with some of the best platforms and partners in the industry. Feel free to reach out to any of the contacts listed at the end of this article to learn more about how our team can help you.

CONTENTS

More than just building blocks | 2

Information is value | 3

Growing green | 5

How platforms create value

How platforms operate in a digital environment | 6

Finding fertile soil | 7

How platforms build an ecosystem

Planting the seed for an IoT platform | 9

Endnotes | 11

More than just building blocks

Photosynthesis, the process by which a plant converts light energy into chemical energy, is one of nature's miracles. Generally speaking, a plant uses energy from sunlight to turn carbon dioxide and water into sugars that supply energy to the plant.¹

PHOTOSYNTHESIS is critical because, although the raw materials needed to sustain a plant may be plentiful, the plant cell alone cannot harness them to meet energy needs. The cell requires the services of a broker: chloroplasts, a small unit filled with chlorophyll, the pigment that makes plants green. It is these subunits of the plant cell that actually carry out photosynthesis, bringing together the raw materials and making energy.

Like plants, the Internet of Things (IoT) needs mechanisms to facilitate interactions across its environment if it is to flourish. Those seeking to use new IoT solutions may be in the same position as plants: with plentiful resources, but unsure how to bring them all together. There are actually so many possible choices of technologies, protocols, vendors, and integrators that it can be difficult for a company to choose the right option.² Just as plants need chloroplasts to bring together resources in the environment

and make them useable, companies in the IoT ecosystem need facilitators—namely, *platforms*—to make optimal use of the available technological raw materials. While in general, platforms serve to match up previously disconnected supply and demand to generate new value, in the IoT specifically, platforms can link those who wish to implement the IoT with the technologies or vendors that may be the best match for their needs.

This article explores ways in which platforms can offer a powerful new business model, illuminating a way to potentially create exponential value from the IoT. As with any new approach or business model, however, companies looking to create an IoT platform might face significant challenges and barriers to success. In this paper, we examine how companies can build a healthy platform business from even the smallest seed.

Just as plants need chloroplasts to bring together resources in the environment and make them useable, companies in the IoT ecosystem need facilitators—namely, *platforms*—to make optimal use of the available technological raw materials.

Information is value

TO understand why a platform may be necessary for the IoT, we should first understand what the latter is and why companies and consumers might benefit from it. The IoT is fundamentally an architecture and not a single technology.³ That is to say, IoT connects existing technologies in a specific way to enable people and companies to accomplish entirely new things, and, in doing so, it creates value for them (see the sidebar “The Information Value Loop”).⁴

By showing how component technologies come together, the Information Value Loop also models how the IoT can create value. In short, when information about the world flows around the loop, it enables new actions that could not have been taken before, creating new value. It is often easier to demonstrate how this arrangement works in a simple context: Consider a relatively closed system, such as a factory. Within the four walls of the operation, the goal may be to increase the life span of key parts. Sensors could create information about the rotations, temperature, and vibration of machinery, communicating that information to central servers where it can be aggregated and analyzed in conjunc-

tion with other data. With that analysis, a factory could create a predictive model of failure of that key part, taking action on maintenance only when failure is likely. This new action would create value in the form of reduced maintenance costs by limiting unplanned downtime and extending the pre-maintenance lifetime of the asset.⁵

However, *given the diverse nature of IoT technology, it is unlikely that any single company would have all of the devices or expertise in-house needed at every stage of the Information Value Loop.* Rather, even the biggest companies likely must choose from a vast array of technology and integration partners to make relatively simple IoT applications work. Beyond merely the physical sensors, elements as diverse as cloud-based services, application program interfaces, or data analytics models all must come together seamlessly and work in concert with each other. Therefore, one of the big challenges businesses that seek value from the IoT face is coordinating how the many required elements come together simultaneously. This creates an opportunity for the development and use of an IoT platform.

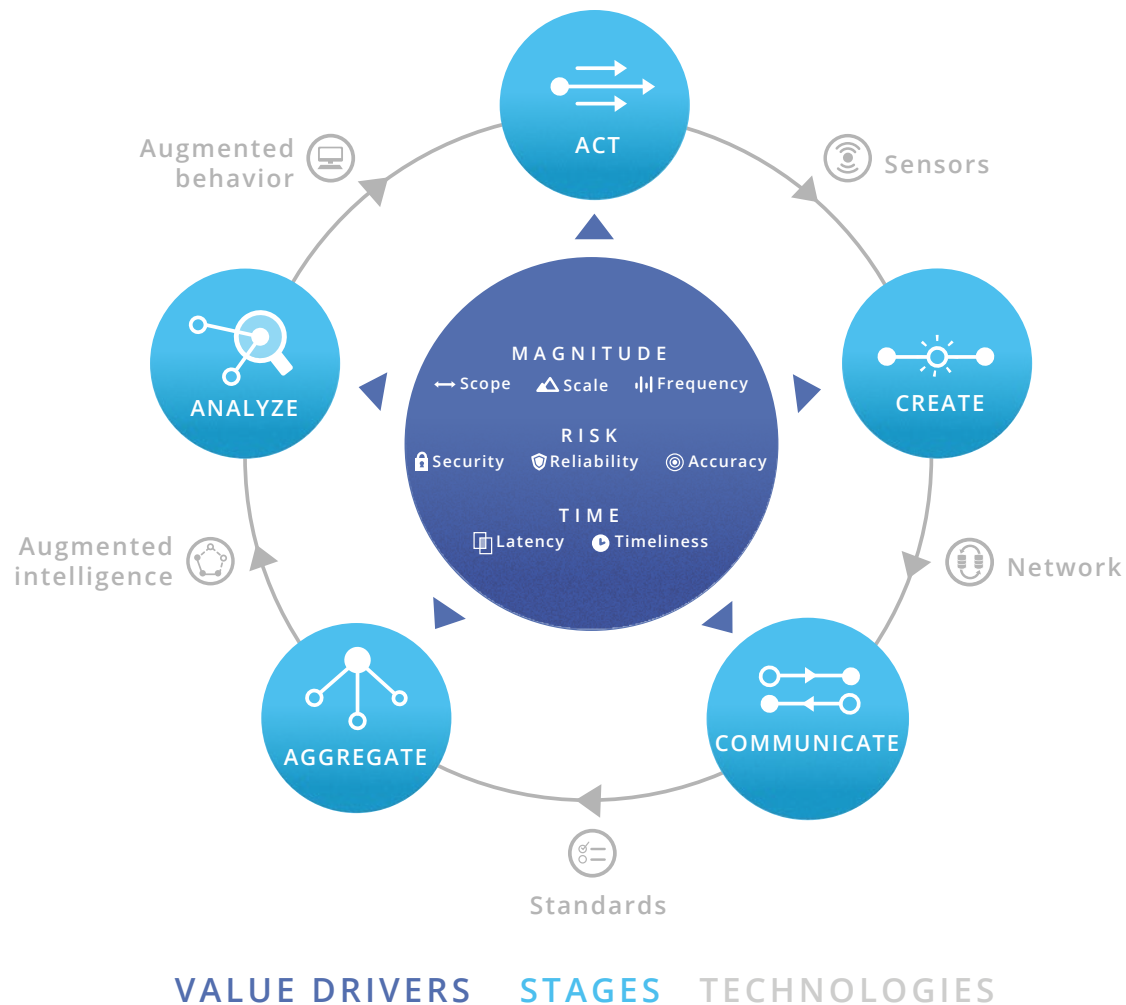
THE INFORMATION VALUE LOOP

The suite of technologies that enables the Internet of Things promises to turn almost any object into a source of information about that object. This creates both a new way to differentiate products and services and a new source of value that can be managed in its own right.

Creating value in the form of products and services gave rise to the notion of a “value chain”—the series and sequence of activities by which an organization transforms inputs into outputs. Similarly, realizing the IoT’s full potential motivates a framework that captures the series and sequence of activities by which organizations create value from information: the Information Value Loop (figure 1).

THE INFORMATION VALUE LOOP CONT.

Figure 1. The Information Value Loop



Source: Deloitte analysis.

Deloitte Insights | deloitte.com/insights

Note first that the value loop is a loop: an *action*—the state or behavior of things in the real world—gives rise to information, which is then manipulated in order to inform future action. For information to complete the loop and create value, it passes through the stages of the loop, each stage enabled by specific *technologies*. An act is monitored by a sensor that creates information. That information passes through a *network* so that it can be *communicated*, and *standards*—be they technical, legal, regulatory, or social—allow information to be *aggregated* across time and space. *Augmented intelligence* is a generic term meant to capture all manner of analytical support, which is collectively used to analyze the information. The loop is completed via *augmented behavior* technologies that enable automated, autonomous action or shape human decisions that lead to improved outcomes.

Growing green

How platforms create value

IoT implementations typically create value by facilitating the flow of information. However, at a higher level, that information flow depends on all of the right component technologies working together in the right way. Platforms can play a key role in ensuring that those looking to implement the IoT can find the right technologies in the right place at the right time.

A platform is typically a space—physical or virtual—for two parties to meet in order to create value.⁶ More precisely, the platform represents a two-sided market: one where the platform can affect the volume of transactions on one side while balancing the price paid by the other side. Today’s world features many platforms, from newspapers to dating apps to video

game consoles. In each of these examples, multiple parties are attracted and connected by the platform owner. For example, in the case of the video game console, both gamers and game developers are attracted: The console provides the “space” for gamers to find the games they want, while game developers can find a readymade audience to play their games.

IoT platforms operate in a similar manner. They connect previously disconnected supply and demand, through reusable technology products, to enable greater efficiency, more accurate pricing, and a better ability to identify and meet the needs of customers. Figure 2 illustrates some differences between a platform and a traditional product-oriented business model.

Figure 2. The evolution of platforms

EVOLUTION OF PRODUCT- TO PLATFORM-FOCUSED BUSINESS MODELS	
PRODUCT BUSINESS MODEL	PLATFORM BUSINESS MODEL
• Physical product-centric	• Digitally enabled and focused
• Single transaction, potential licensing	• Licensing, pay as you go, subscription transactions
• Closed ecosystem, traditional supplier-customer relationships	• Open and sharable content, platform components
• Initiatives, enhancements, and product life cycle driven by product owners	• Ability to find the right products and services; organizations drive or become orchestrators of ecosystem
• Resource, knowledge, and capabilities owned by organization	• Resource needs met by specialized knowledge and capabilities on on-demand basis
• Multiple marketing channels, including word of mouth	• Community with transparent evaluation of products and services

Source: Deloitte analysis.

Deloitte Insights | deloitte.com/insights

How platforms operate in a digital environment

THE underlying economics of platforms work in many situations, but the specific technologies, roles, and interactions that enable a platform can change dramatically by industry—especially when the platform makes use of digital technologies such as the IoT. For its part, an IoT platform is enabled by four key elements:

1. The technology
2. The development ecosystem
3. The solutions created
4. The users

Foundational among those four are the technologies, for without the right technologies, the ecosystems, solutions, and users would not have a functional IoT. From sensors to communication protocols to analytics tools, the technological enablers are the core of how the IoT improves operations and generates new products. The development ecosystem then can use these raw technological tools to create finished solutions to meet the needs of the platform's user base.

Platform providers should target offerings to users on both sides of the transaction. Therefore, it is important to provide different pathways so that different users can find relevant content, services, and solutions. These pathways will likely involve content filters based on the industry or role of a user. In short, the more intuitive the platform interface,

generally the more effective the pathways to content, and the easier it can be for both supply and demand to find what they are looking for. The result is a differentiated, powerful platform.

Providing the filtering and brokerage services required in a platform can represent a significant change for a company traditionally accustomed to selling products and services. GE, for example, seems to be undergoing this type of transformation; it is changing its product-centric business model to include digital, service-oriented ones to offer newer services and products. As part of that shift, GE is working to attract external developers to its Fuse crowdsourcing platform by opening up its intellectual property to customers. For example, GE can post the technical details of difficult problems that it is trying to solve to the platform, attracting external developers with prizes for the best and most innovative ideas. Through Fuse, GE is creating the space to connect companies looking for IoT solutions with those that can supply the right technological solutions—in other words, a platform.⁷

It is exactly this relationship between users and data that is at the heart of value creation for IoT platforms. By attracting software developers and other solution creators, an IoT platform can connect users with a wider array of possible solutions. Thus a platform offers the potential to create more value than a single company offering a single solution alone.

Finding fertile soil

How platforms build an ecosystem

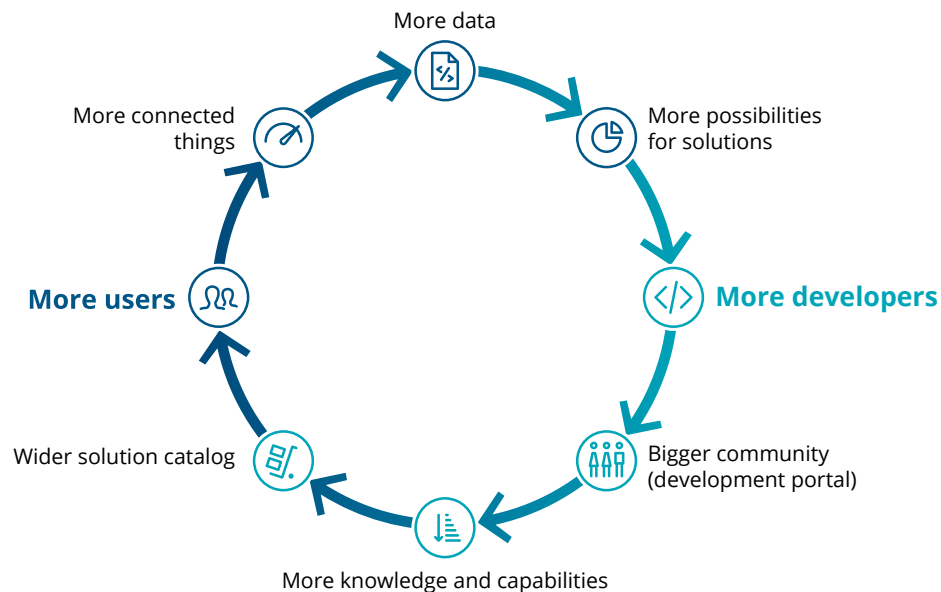
HIDDEN in the relationship between supply and demand is the secret to a platform’s success. If platforms create value by connecting customers and suppliers, then more connections—and, by extension, more participants, in the form of customers and suppliers—can translate into a more valuable platform. This concept is succinctly captured in Metcalfe’s Law, which states that the value of a network is directly proportional to the square of its participants.⁸ Therefore, wider participation from ecosystem partners offers more potential value for all of those partners—and does so exponentially.

This is applicable to both customers and developers: The more developers to choose from, the more customers will likely want to participate in a platform. Similarly, the more potential purchasers, the more attractive a platform becomes to developers, attracting even more participants. The result is

a flywheel called a *network externality* or *network effect*.⁹ The power of platforms comes from these dynamics. The engagement between each side of the market creates network effects that scale the value of the platform well beyond the value created for a single user¹⁰ (figure 3). This is what makes platforms such an attractive business model, because with \$X worth of investment to grow the network, a platform can generate \$X² worth of new revenue.

Because the network effect can scale the value of a platform so quickly, initially attracting a full, diverse ecosystem of both supply and demand can be critically important. Most organizations already have an existing ecosystem of customers, suppliers, partners, and various other stakeholders (figure 4). However, making IoT work often means attracting entirely new partners, customers, and developers—the participants in a platform ecosystem. Much like a plant must attract bees or hummingbirds for pollination,

Figure 3. Positive network effects of an IoT platform at work



Source: Deloitte analysis.

Deloitte Insights | deloitte.com/insights

so, too, must a platform creator attract ecosystem participants.

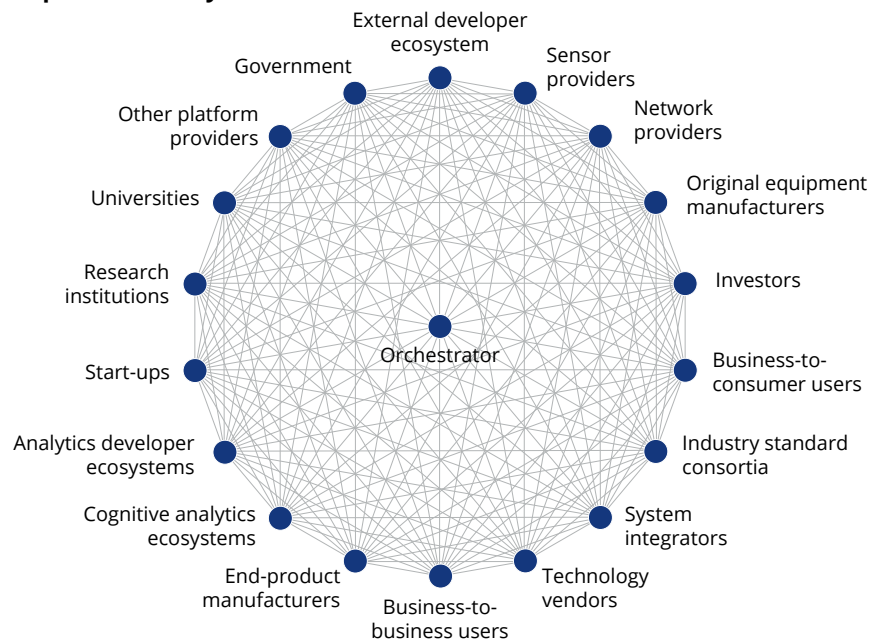
The situation is further complicated by the fact that IoT ecosystems are dynamic; participants come and go depending on the ability to attract business and external market factors. While flowers can offer nectar to attract pollinators, in a digital context, the platform owner should define ecosystem standards and practices to organize activities and attract participants, especially core participants. The goal should be to reduce barriers to participation and maximize the number of participants and, therefore, the value of the platform.

One real-world example of this principle is an initiative by the city of Tampere in Finland. The city recently started development of a smart city ecosystem to facilitate cooperation between parties and enable economic growth while improving citizens' lives.¹¹ The city has created an online community where it posts the main challenges the municipality faces, categorizing them by industry and technical areas. The goal is to orchestrate a thriving and collaborative ecosystem with multiple participants: citizens, investors, industries, technology providers, utility companies, universities, and others. In this way, developers do not see just the projects the city has put out for bid but rather a full spectrum of what

participating stakeholders are trying to accomplish. A developer in smart health care, for example, may see that a tricky problem with which he has been struggling has already been solved by another developer working in smart transport or analytics. As a result, Tampere can expect more and better solutions to be generated and quality of life to improve.¹²

For users of a platform, network effects may drive how much value they find there, but for a platform creator, network effects can be the difference between survival and failure. If a particular market is not large, then ecosystems may find themselves in a "race to scale" in order to achieve the efficiencies created by increasing network effects. Competitions in video cassettes or gaming formats are often cited as examples of this dynamic. To understand these situations, the notion of "positive feedback" may be particularly helpful.¹³ By being first, organizations can capture the bulk of users before competitors arrive. If those initial users are enough to begin to generate a network effect, the first mover can keep competitors from gaining an effective foothold. Investment in competing technology networks can be self-fulfilling: If a number of suppliers and customers invest in a particular network because they believe it will succeed, the network could grow and fulfill expectations.¹⁴

Figure 4. Example of an ecosystem



Source: Deloitte analysis.

Deloitte Insights | deloitte.com/insights

Planting the seed for an IoT platform

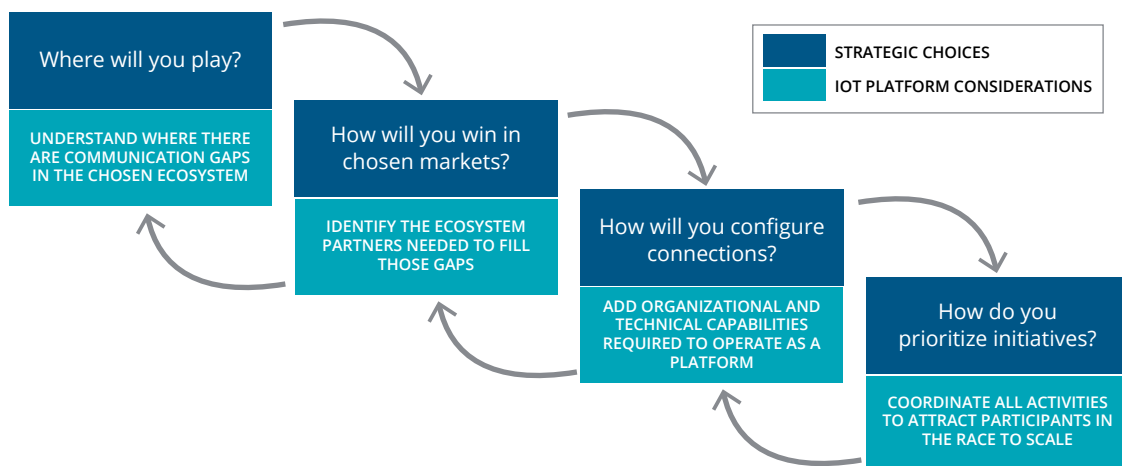
PLATFORMS offer a powerful mechanism to create greater value in the IoT. While there are many examples of platforms in the technology world, how a full-scale IoT platform would look remains unknown. As a result, the potential value that could be created from a platform with up to 20 billion nodes is staggering.¹⁵ In the face of such opportunities generated by the IoT and platform business models, many companies are diving headfirst into digital transformation. While there are obstacles on this journey, the basics of sound corporate strategic planning remain a valuable guide. Therefore, platform creators seem to face the same cascade of choices as any company (figure 5).¹⁶ However, given the unusual nature of the platform business model, the answers to these strategic questions may be somewhat unique and therefore warrant a deeper look.

1. Where will you play?

Understand where there are gaps in the ecosystem. In any ecosystem, there can be gaps and imperfect connections between participants. Therefore, identifying where the gaps currently exist in a market or system would help to identify the partners, acquisitions, or new technologies needed to potentially create a successful platform. The following questions can help in such an assessment:

- Which current processes could be improved by more information provided by digital technologies (such as maintenance cycles becoming predictive or condition-based)? What enabling technology is needed to achieve that goal? What other organizations would be necessary to create that technology?
- Who else could deliver that same value that customers find in current offerings, but by using other means?

Figure 5. The strategic choices for an IoT platform



Source: Deloitte analysis.

Deloitte Insights | deloitte.com/insights

- What other organizations could use or benefit from data the organization is already collecting in the course of operations?

2. How will you win in chosen markets?

Identify the ecosystem partners needed to fill those gaps. Once a connection gap within an ecosystem is identified, the potential platform player should begin to assess what is needed to close that gap. In the IoT, rarely is any single company able to provide all of the technology and expertise necessary to make any solution work. Therefore, identifying the right mix of technology providers, developers, integrators, customers, and others can be a critical first step toward platform development.

3. How will you configure these connections?

Add capabilities to fill that gap. With an initial set of partners and platform participants in place, a potential platform provider can begin to assess what organizational and technological capabilities it needs to make the platform work. Bringing a new platform online would not only generally involve external activities to position the platform to customers and developers but would almost certainly require new internal capabilities as well. For example, a company transitioning from a single product to a platform will likely need to add data scientists, design thinkers, cybersecurity, privacy specialists, IT as a customer-facing function, and product managers focused on bundled offerings.

4. How do you prioritize initiatives?

Attract participants in the race to scale. Finally, survival for many platforms rests on rapidly harnessing the network effect to attract more customers and more developers. This process reaches far beyond mere advertising or marketing and touches on the core of the business. Since platforms can capture value unequally from both sides—whether by charging supply, demand, or both—effectively harnessing network effects can touch every portion of a company’s operations. Understanding how ecosystem partners assign value to the platform and then coordinating all business operations to deliver the most value to the most participants are important to attracting more stakeholders and achieving positive network effects.

While these factors can seem to be daunting challenges, they are merely part of the process. Just as a plant does not go from seed to tree overnight, there is no need to have every answer at the start. Organizations and ecosystems often use prototyping to learn about the potential of digital platforms. *Think big, but start small, then scale fast* ideas that appear viable. Prototyping is especially useful to validate the potential value of a use case before performing a large-scale implementation.

Photosynthesis brings together a few simple ingredients to provide the energy that can power the growth of an entire forest. Similarly, platforms bring together supply and demand to create value via network effects. The IoT’s fragmented technological choices can be overwhelming to consumers, but that fragmentation can also be a fertile field for a new platform to grow. And while the creation of a new platform can be a difficult and daunting process, especially for companies used to selling products, understanding the core principles of platforms can help any company grow a successful business.

ENDNOTES

1. Govindjee J. Whitmarsh, "Chapter 2: The basic photosynthetic process," *Concepts in Photobiology: Photosynthesis and Photomorphogenesis*, ed. G. S. Singhal et al. (Boston: Kluwer Academic Publishers, 1999), p. 13.
2. Timothy Murphy and Mark Cotteleer, *Behavioral strategy to combat choice overload*, Deloitte University Press, December 10, 2015.
3. Jonathan Holdowsky et al., *Inside the Internet of Things: A primer on the technologies building the IoT*, Deloitte University Press, August 21, 2015.
4. Michael Raynor and Mark Cotteleer, "The more things change: Value creation, value capture, and the Internet of Things," *Deloitte Review* 17, Deloitte University Press, July 27, 2015.
5. Chris Coleman et al., *Making maintenance smarter: Predictive maintenance and the digital supply network*, Deloitte University Press, May 9, 2017.
6. Andrei Hagiu and Julian Wright, "Multi-sided platforms," Harvard working paper 12-024, 2011.
7. Kristin Kloberdanz, *Working the crowd: This fuse will set the collective brain on fire*, GE, April 28, 2017.
8. James Hendler and Jennifer Golbeck, "Metcalf's Law, Web 2.0, and the semantic web," *Journal of Web Semantics* 6, no. 1 (2008): pp. 14–20.
9. Robert Metcalfe, "It's all in your head," *Forbes*, April 20, 2007.
10. Hagiu and Wright, "Multi-sided platforms."
11. Smart Tampere website, accessed December 11, 2017.
12. Smart Tampere, "Key elements of Smart Tampere," accessed December 11, 2017.
13. Carl Shapiro and Hal Varian, *Information Rules: A Strategic Guide to the Network Economy* (Boston: Harvard Business School Press, 1999).
14. M. L. Katz and C. Shapiro, "Network externalities, competition, and compatibility," *American Economic Review* 75, no. 3 (1985): pp. 424–440.
15. This statement reflects the estimated number of connected IoT devices by 2020 from sources such as Gartner, "Gartner says 6.4 billion connected 'things' will be in use in 2016, up 30 percent from 2015," press release, November 10, 2015.
16. Erin Clark, Bruce Chew, and Robert Lurie, *Strategic capabilities: Bridging strategy and impact*, Monitor Deloitte, March 2015.

ABOUT THE AUTHORS

ROB DICKSON

Rob Dickson is a manager in Deloitte Digital. His perspective on digital platform business models has been gained through experience with global customers developing digital platforms and organizations in the past several years. He works in the Internet of Things and Industry 4.0 team in Deloitte Netherlands with experience in strategy, prototyping, and full implementation.

HELENA LISACHUK

Helena Lisachuk is a director at Deloitte Consulting BV, and she leads the Internet of Things (IoT) practice globally. She specializes in the delivery of large-scale digital transformation programs, triggered by disruptive technologies such as the IoT. She focuses on clients in high tech and telco sectors, the development of new joint value propositions in the IoT with strategic clients, and managing key alliance relationships.

ALBERTO OGURA

Alberto Ogura is a senior manager in Deloitte Digital. He is one of the leads of the Internet of Things and Industry 4.0 in Deloitte Netherlands, and he has both strategy and implementation in his project portfolio, gaining knowledge of the digital platform business and network effects over the past few years.

DR. MARK COTTELEER

Dr. Mark Cotteleer is the research director of the Center for Integrated Research. His research focuses on the application of advanced technology in pursuit of operational and supply chain improvement. Cotteleer has 25 years of consulting experience, leading teams in technology-enabled reengineering, supply chain strategy, business analytics, and process design. He has been widely published in top management and academic journals.

ACKNOWLEDGEMENTS

The authors would like to thank **Joe Mariani** of Deloitte Services LP, and **Daan Hoevers, Margo Broersen,** and **Sanne Akkerman** of Deloitte Consulting BV.

CONTACTS

Helena Lisachuk

Global IoT practice leader
Managing director, Deloitte Consulting BV
+31 (0)88 288 2286
helisachuk@deloitte.nl

Mark Cotteleer

Center for Integrated Research director
Director, Deloitte Services LP
+1 414 977 2359
mcotteleer@deloitte.com

ABOUT THE CENTER FOR INTEGRATED RESEARCH

Deloitte's Center for Integrated Research focuses on developing fresh perspectives on critical business issues that cut across industry and function, from the rapid change of emerging technologies to the consistent factor of human behavior. We uncover deep, rigorously justified insights and look at transformative topics in new ways, delivering new thinking in a variety of formats, such as research articles, short videos, and in-person workshops.

Deloitte.

Insights

Sign up for Deloitte Insights updates at www.deloitte.com/insights.



Follow @DeloitteInsight

Contributors

Editorial: Aditi Rao, Abrar Khan, Preetha Devan

Creative: Sonya Vasilieff, Molly Woodworth

Promotion: Shraddha Sachdev

Artwork: John Tomac

About Deloitte Insights

Deloitte Insights publishes original articles, reports and periodicals that provide insights for businesses, the public sector and NGOs. Our goal is to draw upon research and experience from throughout our professional services organization, and that of coauthors in academia and business, to advance the conversation on a broad spectrum of topics of interest to executives and government leaders.

Deloitte Insights is an imprint of Deloitte Development LLC.

About this publication

This publication contains general information only, and none of Deloitte Touche Tohmatsu Limited, its member firms, or its and their affiliates are, by means of this publication, rendering accounting, business, financial, investment, legal, tax, or other professional advice or services. This publication is not a substitute for such professional advice or services, nor should it be used as a basis for any decision or action that may affect your finances or your business. Before making any decision or taking any action that may affect your finances or your business, you should consult a qualified professional adviser.

None of Deloitte Touche Tohmatsu Limited, its member firms, or its and their respective affiliates shall be responsible for any loss whatsoever sustained by any person who relies on this publication.

About Deloitte

Deloitte refers to one or more of Deloitte Touche Tohmatsu Limited, a UK private company limited by guarantee ("DTTL"), its network of member firms, and their related entities. DTTL and each of its member firms are legally separate and independent entities. DTTL (also referred to as "Deloitte Global") does not provide services to clients. In the United States, Deloitte refers to one or more of the US member firms of DTTL, their related entities that operate using the "Deloitte" name in the United States and their respective affiliates. Certain services may not be available to attest clients under the rules and regulations of public accounting. Please see www.deloitte.com/about to learn more about our global network of member firms.

Copyright © 2018 Deloitte Development LLC. All rights reserved.
Member of Deloitte Touche Tohmatsu Limited