

ISSUE 77 WINTER 2014

A Strategist's Guide to the Internet of Things

The digital interconnection of billions of devices is today's most dynamic business opportunity.

BY FRANK BURKITT



EXPLODED VIEW

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A STRATEGIST'S GUIDE TO THE INTERNET OF THINGS

The digital interconnection of billions of devices is today's most dynamic business opportunity.

by Frank Burkitt

Humanity has arrived at a critical threshold in the evolution of computing. By 2020, an estimated 50 billion devices around the globe will be connected to the Internet. Perhaps a third of them will be computers, smartphones, tablets, and TVs. The remaining two-thirds will be other kinds of “things”: sensors, actuators, and newly invented intelligent devices that monitor, control, analyze, and optimize our world.

This seemingly sudden trend has been decades in the making, but is just now hitting a tipping point. The arrival of the “Internet of Things” (IoT) represents a transformative shift for the economy, similar to the introduction of the PC itself. It incorporates other major technology industry trends such as cloud computing, data analytics, and mobile communications, but goes beyond them. Unlike earlier efforts to track and control large systems, such as radio-frequency identification

(RFID), the Internet connection gives this shift almost limitless versatility. The IoT also opens a range of new business opportunities for a variety of players. These opportunities tend to fall into three broad strategic categories, each reflecting a different type of enterprise:

- “Enablers” that develop and implement the underlying technology
- “Engagers” that design, create, integrate, and deliver IoT services to customers
- “Enhancers” that devise their own value-added services, on top of the services provided by Engagers, that are unique to the Internet of Things

How will your company build value in this new world? That will depend on the type of business you have today, the capabilities you can develop for tomorrow, and, most of all, your ability to understand the meaning of this new technology.

Frank Burkitt

frank.burkitt@strategyand.pwc.com

is a senior executive advisor with Strategy& based in Los Angeles. He leads the Internet of Things and digital operations services for Strategy&'s Digital Services. He was formerly the CEO and founder of ReleasePlan, a cloud-based enterprise software company.

Also contributing to this article was *s+b* contributing editor Edward H. Baker.

Evolution and Opportunity

At present, the Internet of Things remains a wide-open playing field for enterprises. It's young, heterogeneous, and full of uncertainty. Estimates of potential economic impact by 2020 (as tracked by the Postscapes information service) range from about US\$2 trillion to more than \$14 trillion. Companies small and large, old and new, are scrambling to stake out their territory. Expectations are high: One in every six businesses is planning to roll out an IoT-based product, and three-quarters of companies are exploring how to use the IoT to improve their internal operations and services. (See "Embedding the IoT in Your Business," by Chris Curran, page 8.) Much early work is likely to focus on boosting efficiency and cutting costs, but the greatest long-term business value of the Internet of Things will involve getting to know customers—both consumers and businesses—more intimately, and providing new digital services and experiences to delight them.

Rarely, if ever, has a single technological platform combined this much complexity, speed of development, global reach, and novelty among customers. Consider the range of interconnected systems, products, and services the IoT will enable, from simple monitoring of home temperature and security to the "quantified self" (the tracking of personal health, diet, and exercise metrics), to fully networked factories and hospitals, to automated cities that respond to the movements and interests of thousands of people at once.

Yet for all its power, the IoT is still at the early-adopter stage; in the words of innovation theorist Geoffrey Moore, it has yet to "cross the chasm" into the mainstream. It thus behooves business strategists now to figure out the role they want to play, the capabilities they

will need to move forward, and the types of innovation they should pursue.

The IoT has its technological roots in the decades-long effort to monitor and control the physical environment in which people work and play. Its most basic components are embedded devices that have existed for years: thermostats that sense ambient temperature and control heating and cooling systems, sensors that manage braking systems in automobiles, pacemakers that regulate the heart, airplane black boxes that track flight paths, and location devices that monitor the whereabouts of industrial equipment. In the past, some of these devices were wired together into more complex systems. But it wasn't until they were provided with some intelligence, connected to the Internet, and empowered by a new wave of technological accessibility—through cloud computing, smartphones, and the prototyping capabilities of digital fabrication—that the IoT came into being.

For example, the Nest Learning Thermostat performs the fundamental function of an ordinary smart thermostat: It monitors temperature and turns heating and cooling systems on and off to maintain the programmed target. But the Nest also senses humidity, activity, and light, and its built-in intelligence "learns" how and when the user likes to adjust the temperature. It can even optimize the house's temperature for energy efficiency. All this, together, still doesn't make the Nest part of the IoT. But when it's connected to a utility company or the Nest Account (hosted by Google, Nest's parent company) through a home Wi-Fi network, it has far greater value. That connection allows people to monitor and change the temperature from their smartphones, modify the heating schedule, and analyze their

RARELY HAS A SINGLE TECHNOLOGICAL PLATFORM COMBINED THIS MUCH COMPLEXITY, GLOBAL REACH, AND NOVELTY.

Exhibit 1: Services Available through the Internet of Things

This list of IoT services is arranged on two critical dimensions. The horizontal rows (from *monitor* at the bottom to *optimize* at the top) represent the value delivered to customers, in order of complexity. The columns (from endpoints to enhanced services) represent the technologies of the IoT as described in this article, in increasing complexity from left to right. (Network and cloud services are not shown because they are not typically oriented to end-users.)

NO/CLOSED NETWORKS		INTERNET OF THINGS		
	Endpoints	Simple Hubs	Integrating Hubs	Enhanced Services
Optimize			GE Software Predix and other industrial platforms for interconnecting analytics engines and business operations Large-scale digital city systems like those under development at MIT and in Barcelona	
Adapt	Stand-alone GPS navigation devices	Progressive Snapshot and other auto insurance telematics systems Smartphone apps that use location tracking	Apple HomeKit and other protocol-based platforms allowing diverse devices in a building to interconnect to one another and the Internet	Emerging systems for setting insurance rates based on health and driving behavior
Control	Motion- or light-responsive alarms and controls	Google Nest and other Internet-connected systems for heating, cooling, and ventilation Estimote Beacon, iBeacon, and other Bluetooth-enabled object identification sensor systems	WeMo and other systems for controlling lights and appliances through remote or mobile devices	Potential connected-car traffic management systems
Monitor	Simple thermostats and motion sensors	Jawbone UP, Fitbit, and other fitness activity sensors and hub systems	BodyGuardian and other medical wearables that feed data to online diagnostic platforms	

Source: Strategy&

home heating activity. It also allows utility companies to offer incentives for using less power at peak times or to offer additional services.

Similarly, the Jawbone UP, a personal activity monitor worn around the wrist, automatically establishes a Bluetooth connection to a smartphone running the UP app—creating what’s called a “proximity network”—and provides detailed information on exercise levels, sleep patterns, and food consumption. Through the Internet, Jawbone’s users can reach a variety of fitness and nutrition services with their UP app, enabling them to analyze their levels of activity and overall health. For these devices and many others, the greatest potential value of

the IoT lies in that connection to the Internet, and to the many integrated services offered there (*see Exhibit 1*).

Technologies of the IoT

To deliver these products and services requires a combination of five major types of technological offerings. As you progress up the technology “stack,” the devices become more complex and their connectivity increases.

1. Endpoints are the single-function sensors and actuators that reach out and touch the world around them, monitoring for changes and providing feedback to adjust to those changes. Their connectivity enables

THE DIGITAL CITY CONCEPT WOULD INSTALL INTEGRATING HUBS AT A NEIGHBORHOOD SCALE TO CONTROL MASS TRANSIT, TRAFFIC, AND STREETLIGHTS.

two key capabilities: gathering and analyzing data from the environment, and reaching out through the Internet to control objects.

2. Simple hubs are the devices that connect endpoints to broader networks. When integrated into products such as vehicle engines; washing machines; or home heating, venting, and air conditioning (HVAC) systems, the computing intelligence and storage embedded in a simple hub allows these products to adapt over time to the user's behavior and to optimize for efficiency. The Nest is a good example of a simple hub. It acts as a joining point for a relatively small number of sensors and actuators, typically located near one another.

A single building might have several simple hubs, each controlling one function: HVAC, electricity, lighting, water, entertainment, communications, or security. Each of these simple hubs might be connected to the Internet. For example, electricity hubs that monitor usage and cost can feed data to electric power utilities, which can then suggest the best times to use power-hungry appliances. Lighting hubs can pick up information from multiple window sensors about the amount of sunlight, and adjust the brightness of the artificial lighting accordingly.

3. Integrating hubs that connect simple hubs and outside connections are relatively complex devices providing a diverse array of services that fit more or less seamlessly together. In May 2014, Apple introduced one of the first truly integrating hub offerings. Called the HomeKit, this platform is designed to bring together simple hubs from different vendors and present all of them in a single user interface on a smartphone or tablet. A HomeKit hub might integrate functions such as electric power (SolarGuard solar power systems),

security (Goji smart locks and Leviton motion and video monitors), HVAC (the Nest), appliances (LG smart refrigerators), window shades (QMotion's electric shading systems), entertainment (Roku audio and video streamers, which use set-top boxes as hubs), and personalized lighting (Hue). A family member might press the "bedtime" button on his or her iPhone, and the service would then dim or turn off certain lights, lock the doors, set the security system, close the garage door, and lower the thermostat, all at the same time.

Apple's role here isn't to provide the underlying HVAC or lighting service, but rather to offer the software development kit—much like the guidelines and tools it publishes for developers of iPhone and iPad apps—that developers can use to connect their services with the HomeKit platform. The company also debuted what it calls the HealthKit, designed to integrate all the simple hubs being developed for the quantified self.

Several other major companies have begun to develop integrating hubs. Google recently introduced a collection of standards for the Nest that will connect to a wide range of home services from other companies. Oracle has a sophisticated integrating hub, which it may or may not offer commercially, but which has already helped win the America's Cup yacht race, in October 2013. The Oracle-sponsored foiling catamaran that won the race was equipped with more than 300 sensors and video cameras that monitored position, wind direction, boat speed, pressure on the wingsail, and more. While the boat was sailing, the team's technology specialists collected data on more than 3,000 variables per second—a gigabyte of raw data and 200 gigabytes of video daily—and analyzed it on Oracle servers reached through high-speed wireless data connections. The sys-

tem sent the analysis back to the boat's controls to improve its performance almost instantaneously.

Integrating hubs of far greater scope are also under way. The digital city concept, for example, is being developed by the MIT Media Lab, the World Foundation for Smart Communities (based at San Diego State University), and private companies like the LED street-light manufacturer Sensity Systems. It would install integrating hubs with data analytics at a neighborhood or citywide scale to monitor and control mass transit, traffic controls, streetlights, and many other services and systems. Barcelona is teaming with Cisco Systems to develop one such system, which will manage lighting, parking, local Wi-Fi networks, and other critical city functions.

4. Network and cloud services provide the infrastructure of the Internet of Things. They can either be public (accessible to the population at large) or private (protected behind an organization's firewall). These services deliver the seamless and transparent connection to the Internet that hubs require, along with the cloud computing power needed to collect, store, and analyze vast amounts of data from myriad endpoints. They can also provide the infrastructure needed to build or connect to social networks, so that users of the IoT can compare experiences and share data.

Some network and cloud services, like RacoWireless, manage machine-to-machine connectivity. They enable IoT devices to communicate with one another across a variety of transmission channels, including Wi-Fi, cellular, and Bluetooth. They also provide data management services: collecting, moving, tagging, and aggregating information. Other network and cloud services provide software platforms, including high-level

programming languages, that can be used for IoT delivery and development. ThingWorx offers one such platform. It provides endpoint connectivity, networking capabilities, and data storage and analytics, as well as a software development kit used to write apps for customers.

5. Enhanced services is a nascent category, comprising the most technologically sophisticated components of the IoT. Enhanced services will make use of the information collected and analyzed by other platforms and services to deliver broad-based interactive functions. For example, today's single-company telematics systems, like Progressive's Snapshot system, are integrating hubs, connecting monitors on automobiles with software that links insurance rates to driver performance. Enhanced services for automobile-based monitoring could go much further. They could collect data on multiple cars, aggregating it all with historical and actuarial data to create new types of analytics related to overall insights about auto accidents. The insurers themselves might not be involved in the collection of that information, only in making use of it in the services they offer. Enhanced services could also lead to more sophisticated "connected car" applications, in which real-time digital connection enables automobiles to exchange signals with one another and the environment, thereby reducing accident risk or enabling better traffic coordination.

These five technological options, from endpoints to enhanced services, provide a menu of diverse opportunities for companies building IoT businesses. Some might start making stand-alone endpoints, and move up to producing hubs. Others might parlay their expertise at integrating hubs into providing network and cloud services—or vice versa.

With all these possibilities, companies run the risk of moving in too many directions at once—and thus being overwhelmed by more focused competitors with more distinctive IoT-related capabilities. Hence the importance of the three IoT strategic models—Enablers, Engagers, and Enhancers. Few companies can take on more than one of these ways of creating value. The Enablers will focus on the underlying technologies and services, from endpoints to network and cloud services. The Engagers will make use of hubs and network and cloud services to provide market-facing offerings. The Enhancers will focus on value-added enhanced services that extend and enrich customer engagement (*see Exhibit 2*).

Enablers: Building the Technology

Enablers are primarily technology-oriented companies, such as Cisco, Google, HP, IBM, and Intel. They build and maintain the critical IoT infrastructure that allows Engagers to create their own connected services. Their offerings include the endpoint, hub, and network and cloud service technologies: devices, connectivity hardware and infrastructure, computing and data storage systems, software platforms, and more. (See “Kings of the Cloud,” by Olaf Acker, Germar Schröder, and Florian Gröne, *s+b*, Winter 2014.) The market for all these elements of the

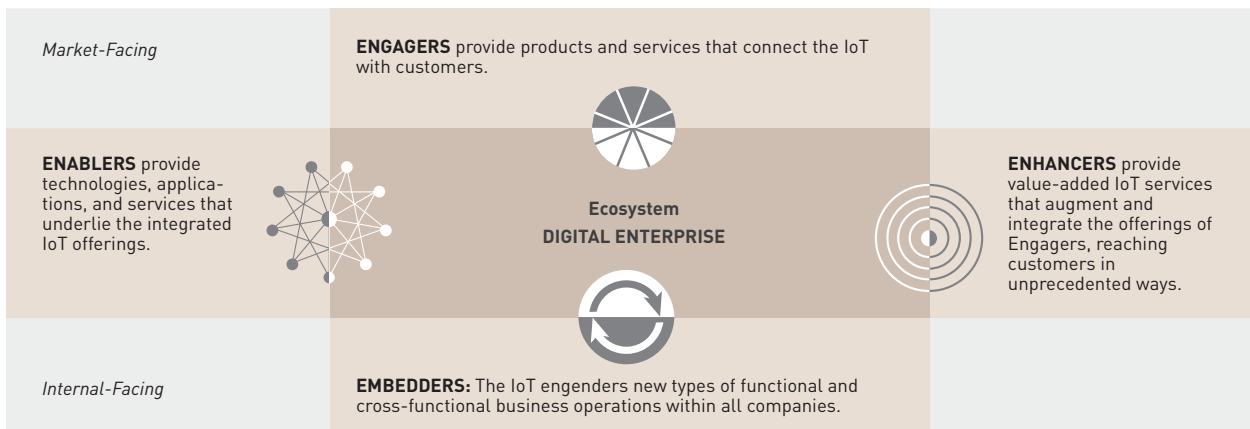
IoT is exploding. According to estimates tracked by Postscapes, the sheer growth in the number of endpoints—expected to reach 50 billion or more by 2020—will push that market from \$6.6 billion in 2013 to almost \$11 billion in 2020. The shift in connectivity and computing intelligence from centrally located servers to intelligent devices on the edge is creating a similar boom in the semiconductor business. Revenues from the chips needed to run intelligent devices are expected to reach more than \$70 billion by 2017.

Many Enablers will remain content with relatively narrow businesses, as suppliers of endpoints to—or partners with—other players that have larger ambitions. Estimote, for example, makes tiny “beacons” that stick to objects and send signals through low-frequency Bluetooth transmissions. These beacons can communicate with enabled devices like smartphones and tablets in environments such as retail stores. It’s up to the Engager companies to develop capabilities in proximity marketing that incorporate the beacons; for example, a retailer might use them to augment sales data with information about what items customers pick up and how long they spend considering a purchase.

The larger Enablers will fight over the enormous opportunities in integration. The systems they produce—intelligent endpoints, hubs, cloud services, and plat-

Exhibit 2: The IoT Ecosystem

The overall IoT market will be divided among Enablers, Engagers, and Enhancers. These three kinds of companies will interact, working together to provide the technology and services needed by all—both to market the IoT and to deploy it for their own operations.



Source: Strategy&

Embedding the IoT in Your Business

by Chris Curran

Some companies may never bring any part of the Internet of Things to market, but their role is just as significant as that of the Enablers, Engagers, and Enhancers. These are the Embedders: companies that apply sensors, monitors, and other devices to improve their

own operations and optimize their own businesses. The idea of embedded things goes back at least 20 years, to Xerox Palo Alto Research Center (the same research lab that produced the graphic user interface and object-oriented programming), where it was originally called “ubiquitous computing.” A current-day example is United Parcel Service’s adoption of sensors and monitors on its trucks and delivery services; it is using the Internet of Things to continually improve its throughput and service levels. Another example is the use of the Internet of Things by

manufacturing companies to monitor throughput and emissions. Sensors and integrated hubs are set up to continually adjust operations, based on the data, to reduce waste, cost, and environmental impact. As the Internet of Things evolves, its embedded use in day-to-day business will be a hallmark of the most successful companies in every industry.

Chris Curran (christopher.b.curran@us.pwc.com) is a PwC principal and chief technologist for the U.S. firm’s advisory practice.

forms—must not just provide connections, but manage and bill for those connections, and allow users to customize and develop their own services. Already, IoT opportunities are driving some hardware companies to expand in unprecedented ways. For example, Intel, traditionally a maker of semiconductors, is developing soup-to-nuts IoT systems that include not just chips but development platforms that will enable others to develop their own IoT services.

Bundles of IoT-related hardware, software, and connectivity may be tailored to specific market segments, such as particular industries. The IoT platform developer Arrayent, for example, focuses on the consumer products industry. It recently teamed with appliance maker Whirlpool to provide the technology needed to connect refrigerators and washing machines to the Internet. Homeowners can be alerted via their smartphones when appliances need maintenance, and they can order new supplies automatically. The key to such deals is the partnership. Whirlpool has limited expertise in connecting its appliances to the Internet, but Arrayent provides the means to do it.

Each Enabler must decide the appropriate scale and scope for its business, based on the capabilities it

can muster. Should it spread its efforts horizontally, becoming a broad-based supplier of IoT technology to all industries? Or should it become the primary Enabler for a specific industry, bringing together the endpoints, hubs, network and cloud services, and enhanced platforms needed in that vertical? If it collaborates with other enterprises, should that be with other Enablers, to broaden their technology platform? Or should the enabling enterprise seek to codevelop a customer-facing offering with the right Engagers and Enhancers?

Every Enabler should base its strategy on the most distinctive capabilities it can offer. Estimote, for example, currently doesn’t have the capabilities needed to move beyond its current endpoint and connectivity products, so it focuses on those. Arrayent has found an appropriate scalable business in providing an IoT-oriented cloud platform for consumer goods. GE develops IoT systems for hospitals and factories because those offerings make use of its well-established capabilities in healthcare and manufacturing.

Engagers: Connecting to Customers

These companies provide the direct link between the IoT and the market. They use the endpoint, hub, plat-

form, and service offerings created by the Enablers to produce services for consumers and businesses. Though most of them did not begin as IoT companies, and many come from non-IT industries—appliance manufacturers, automakers, insurance companies, and retailers are prominent among them—they expect enormous opportunities as the IoT gains traction.

Engagers tend to be most active in hubs and connected services. Systems like the Nest and Apple HomeKit, for instance, provide services to customers, while collecting a rudimentary amount of data on customer usage and maintaining a high degree of customer contact. Other Engager services, based on increasingly sophisticated IoT cloud services and platforms, are more complex. Wearable devices such as Google Glass can provide a wealth of location-specific information to users while collecting data about their movements (in the real world and on the Internet), their purchases, and their conversations.

Already, Engagers are competing to control nodes of human activity: the smart home, the quantified self, the connected car, the digital retailer, the intelligent factory, the next-generation hospital, and eventually the city of the future. The winners won't necessarily have the most sophisticated technology or the biggest cloud; they will have the right capabilities. They will know how to gain insight into customer needs and expectations, and how to use human-centered design to develop compelling services that change how customers behave. Apple and Google, for example, are both seeking to apply their existing prowess—in design and consumer insight for Apple, in data gathering and analytics for Google—to create compelling user experiences that will attract people to their integrating hubs.

For Engagers, the benefits of gaining a strong foothold in hubs and connected services include continuous and sustainable relationships with customers. Consider appliance makers like Whirlpool and Haier. In the past, these companies would capture only basic information about the purchaser of a washing machine: his or her name, address, email address, phone number, and perhaps some static demographic data. At most, the companies would then use that information to manage the warranty and send periodic notices about new products. Now, by linking the washing machine to the Internet, the appliance maker captures a wealth of data about how the device is used—how often, at what temperature, and with what kind of soap, as well as what kinds of clothes are washed. It can offer value-added services based on that knowledge, including status reports on the machine's condition, suggestions for saving energy and water, and discount subscriptions for laundry detergent delivered to the home. With that type of information, even tradition-bound manufacturers can become innovators in human-centered design.

If the washing machine can be integrated with the house's hub, the possibilities multiply. The manufacturer could work with the power and water utilities to establish a schedule for washing clothes at the least expensive time, using the house's HVAC system to balance the heat and humidity generated by the washing machine, and programming the entertainment system with a playlist of laundry-day music. The company would move beyond selling products to offering a powerful and attractive customer experience, building loyalty even as it locks customers in through the many services it can offer.

Enhancers: Creating New Value

Like the enhanced services that they often deliver, the Enhancers are just beginning to appear in the IoT ecosystem. They provide integrated services that reframe and repack the products and services of the Engagers. They succeed by finding new ways of creating and extracting value from the data, relationships, and insights generated from IoT activity.

The insurance industry offers a good example. Several companies, including MetLife, are developing ways to gather data on health-related behavior to help design their rate schedules and offerings. By and large, insurance companies will not want to create their own version of the quantified self. Instead, they will work with services that already exist: the Fitbit, which measures physical activity; emerging systems that monitor heart rate, blood pressure, blood sugar, weight, and other health-related metrics; and nutrition tracking devices (set up to receive automated signals from the refrigerator and restaurants).

Once these health-tracking technologies are gathered into a hub, combined with data from additional apps and services such as Strava's fitness-oriented social network, and integrated into an overarching service, the insurance company can build and package value-added services personalized to each individual. A health insurer already keeps comprehensive data on its customers' health status and past medical treatments and expenses. It could augment that with individual electronic health records—with customers' permission, of course. It could then combine that information with its own actuarial data, supplemented with data from drug companies, market research firms, school lunch programs, and the government.

Exhibit 3: IoT E-Health Offerings, 2014

Although there are many e-health offerings, they are all emergent. The space is ripe for transformation by an Enhancer that can turn information from connected health services and outside data providers into new, value-added services. For Enhancers, partnering successfully with a variety of companies will be a key capability.

Endpoints and Simple Hubs

Tracking devices

- Fitness trackers like Fitbit, Jawbone UP, ActiveLink
- Nutrition trackers like Weight Watchers, MyFitness Pal
- Insulin trackers like Lilly Diabetes monitors
- Internet-connected refrigerators from LG, Haier, and Whirlpool

Integrating Hubs

Quantified self

- Wearable multipurpose devices like Google Glass, Apple Watch
- Smartphone apps for fitness and activity tracking

Social Media (via Network and Cloud Services)

Online communities

- Athletic communities like Strava Social
- Health and weight-loss communities like MyNetDiary

Enhanced Systems

E-health payors

- Aetna and other health insurance companies offering online support

Source: Strategy&

By aggregating all this information, a health insurer could start building new services. It could offer health insurance with coverage tailored to individuals' needs, and premiums based on their fitness habits. Customers might receive regular health and nutrition status updates tagged to their individual medical needs, along with reminders for scheduling regular exams and remote consultations that take advantage of their past data. There is also the possibility of teaming with other healthcare companies to offer products and services catering to people's specific health needs and interests (*see Exhibit 3*).

GIVEN YOUR CAPABILITIES, ARE YOU BEST SUITED TO BE AN ENABLER, ENGAGER, OR ENHANCER?

The Enhancers emerging today will develop new types of services, many of which will undoubtedly disrupt or leapfrog past today's business models. Companies with the potential to act as Enhancers would do well to begin planning for that future now. They can position themselves by focusing attention on the experience they provide their customers. They should start looking into technological and business issues, such as how to share data with existing hubs and services, and how to structure business partnerships. They will also need to develop a strong innovation capability, oriented around developing and continually updating their suite of services connected to the Internet of Things.

Your Company's IoT Strategy

A wealth of opportunities exist for each of the three types of IoT strategy models: Enablers, Engagers, and Enhancers. Entering the fray, however, should not be undertaken lightly. The IoT market's newness and heterogeneity will make it difficult to negotiate, even by those companies with the strongest capabilities and the clearest, most compelling value propositions.

Many challenging issues remain. Customer demands and expectations are still hard to discern, and the hardware and software standards for the IoT are still evolving. Billions of endpoints and intelligent devices must be integrated. The data they produce must be managed and analyzed. This is no small task, especially given increasing concerns about security and reliability. Consumers are coming to expect greater control over their personal data, issues surrounding the privacy of tracked information and sensitive data (such as e-health records) are ongoing, and it is unclear how vulnerable many of the devices and clouds that make up the IoT

are to hackers and malicious code. We expect some companies, and perhaps some entire industries, to be reluctant to share data with other enterprises in an IoT context, especially given these unknowns about stability and security.

If your company wants to stake a claim with the Internet of Things, you first need to develop a distinctive "way to play"—a clear value proposition that you can offer customers. This should be consistent with your enterprise's overall capabilities system: the things you do best when you go to market, aligned with most or all of the products and services you sell.

With those elements in place, if you tread carefully and methodically, the time is right. To develop a strategy for the IoT, you could proceed by addressing, in order:

1. Your own role in the IoT. Given your existing value proposition and capabilities, are you best suited to be an Enabler, Engager, or Enhancer?

2. Industries and markets. Assess how your business environment is being (or could be) transformed by the IoT. If you are an Engager or Enhancer, what endpoints, hubs, and services are already being sold in your market? How are they expected to combine? What sense do you have of the demand for them? The more IoT activity that already exists in your industry, as it does in healthcare, automotive, manufacturing, and home-related sectors, the more rapidly you will have to move.

3. Customer or business engagement. Because value in the IoT will be created through the transformation of customer experience, you need strong capabilities in experience design. Even if you are an Enabler, without direct customer contact, or if opportunities for engagement appear limited in your industry, the IoT could eventually transform your business. What capabilities

do you already have in this area, and what will you need to develop?

4. Connected products and services. Assess your current lineup of offerings to determine which can be enhanced through IoT connectivity, and what new ones could be developed expressly for the IoT. For new launches and innovations, take into account how connectivity will be established, how your company will analyze and use the resulting data, and which other companies you might collaborate with—all set against the proposed revenue model and income stream.

5. An enhanced connection. Most Engagers will deploy an initial wave of basic connected devices and services. Then they will build further services by using analytics to gain insights from the wealth of new data that the IoT provides them. As these deployments unfold, Engagers will look for ways to increase value. This is where Enhancers will come in. What new business models might emerge? Would you want to develop any of them, or do you want to partner with other companies that can help serve this need?

6. Your organization's capabilities. Your company will need to distinguish itself in this space. What will you do that no other company does as well (or at all)? What improvements and investments will you need to make? Where will the necessary time, money, and attention come from; what activities will you need to divest or downplay so their resources can move here?

You may also need to develop some “table stakes” capabilities that all IoT companies must have. These include the ability to manage and analyze huge quantities of data, to integrate diverse portfolios of services, and to build business relationships with other IoT-related companies, some of which may have very different cul-

tures. You probably already have innovation processes in place, but they may not be customer-centric enough. You may also need to foster more opportunities for people in your company to experiment and learn rapidly about what works and what doesn't.

One virtue of the IoT is the degree to which companies lacking in technological expertise can lean on the devices and platforms that others build. Even so, the creation and delivery of IoT services will require you to design and prototype their new services, to manage them once implemented, and to analyze the resulting wealth of data.

As new and challenging as today's IoT is, it offers a large and wide-open playing field. The companies that gain the right to win in this sphere will be those that understand just how disruptive the IoT will be, and that create a value proposition to take advantage of the opportunities. +

Reprint No. 00294

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