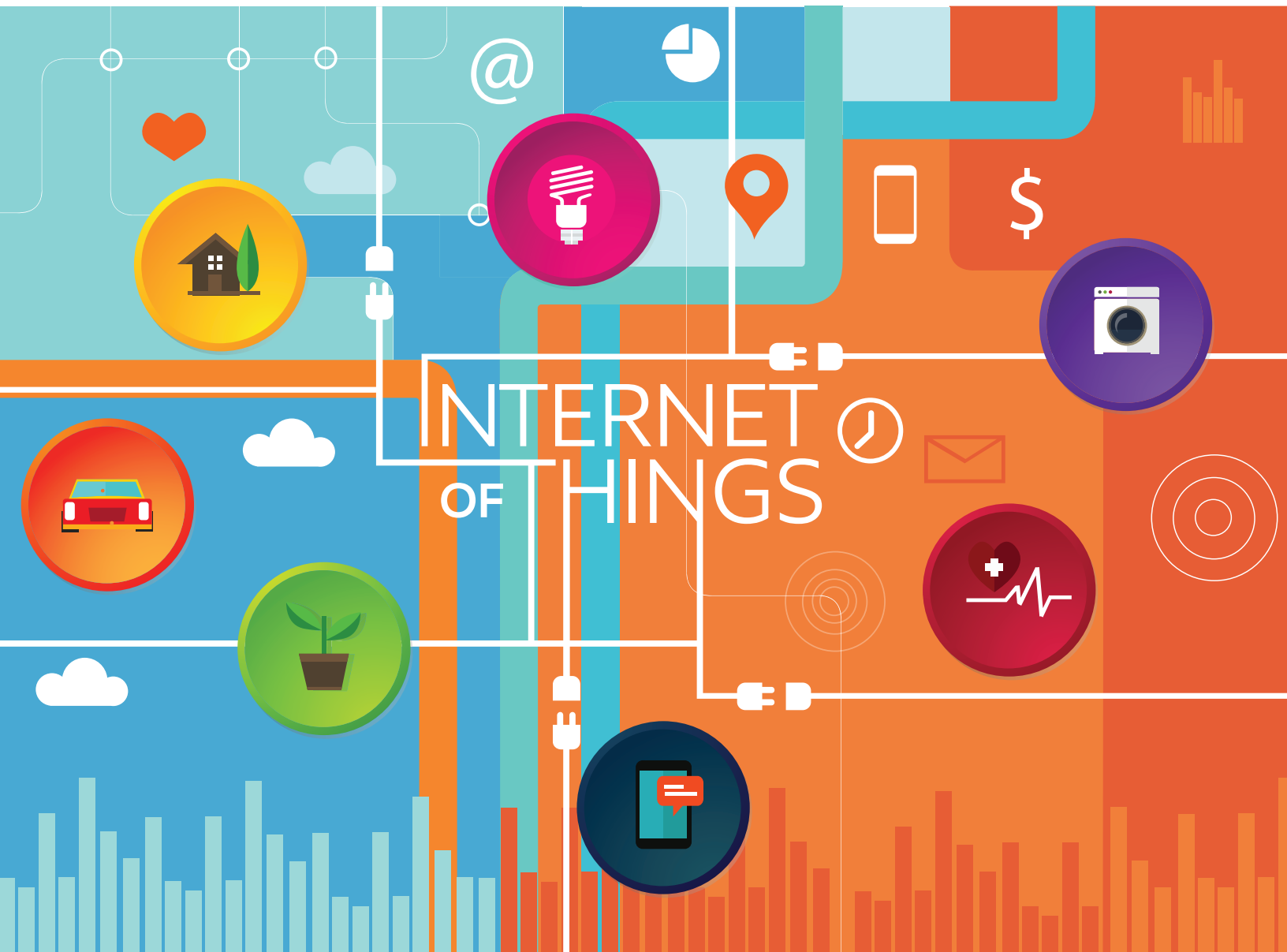K@W

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Leveraging the Internet of Things for Competitive Advantage

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Leveraging the Internet of Things for Competitive Advantage

The Internet of Things (IoT) is the next frontier in the digital revolution. It can help companies increase productivity, cut costs, offer new products and services and deploy new business models. But IoT can require extensive integration and skilled staff for implementation. It also often creates new demands around security and interoperability — the capacity for varied computer systems and applications to "talk" with each other. In this paper, experts from Wharton and NTT DATA examine why companies nevertheless cannot afford to ignore IoT in the digital age to gain a competitive advantage.

Across the world, everyday devices are getting connected to the Internet — thermostats, water meters, home alarms, kitchen gadgets, medical equipment, factory machinery and even cars. Collectively, this ecosystem represents the next frontier in the digital revolution — the Internet of Things or IoT. And unlike the simple automation of machinery, IoT is also mobile and virtual, and features a continuous Internet connection.

The IoT ecosystem consists of data sensors, networks, cloud storage, applications and devices, all working together to help companies and consumers manage their digital lives in a smarter way.

"By converting all passive things around us to active things that share information about themselves, IoT enables us to understand them better than ever before and thereby helps us to bring about huge improvements in everything we do," says Raman Sapra, vice president and global head of NTT DATA. IoT will also drive the next level of digital adoption across consumer industries, manufacturing,
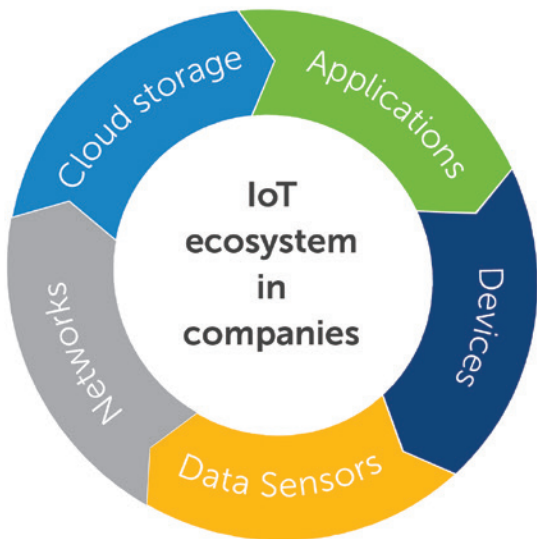
supply chain and other areas. "This in turn will result in operational excellence, new revenue models, enhanced employee engagement and a superior customer experience," he adds.

What does an IoT-enhanced operation look like? In a smart factory, for instance, IoT could lead to better inventory management, improved production processes and faster delivery times. Sensors on the factory floor would constantly transmit data at every step of the manufacturing process to provide operators with information they need to produce a better product and ensure on-time delivery. The incoming business intelligence could even enable a company to proactively send a technician to fix a machine before it breaks down — whether it is a simple washer-dryer or complex jet engine.

Today's IoT builds on the machine-to-machine, or M2M, communication of the past. Chethan Gorur, global director of cloud application services at NTT DATA, notes that M2M has been around for a couple of decades. A vending machine can message the distributor

> *The first step of the IoT journey for companies is to identify a clear and realistic business outcome.*
>
> **— Chethan Gorur, global director of cloud application services at NTT DATA**

IoT ecosystem in companies

- Cloud storage
- Applications
- Devices
- Data Sensors
- Networks

when a particular item is running low to signal a need for restocking, for example. But IoT goes beyond M2M, leveraging powerful analytics tools to compile and transmit a lot of data so operators can glean the most relevant bits. And the result is deeper insights than had been previously possible that can be used to transform a business.

John Deere offers a case in point. The company has been making steel ploughs since 1837 and the name brand is synonymous with farming and tractors in the U.S. But beginning in 2012, John Deere embedded new sensors in its products and marketed connectivity as a key product benefit. Today, those sensors provide farms with decision-support information on where to plow, what crops to plant and when to plant. That information is potentially more valuable over time than the tractor pulling the plow.
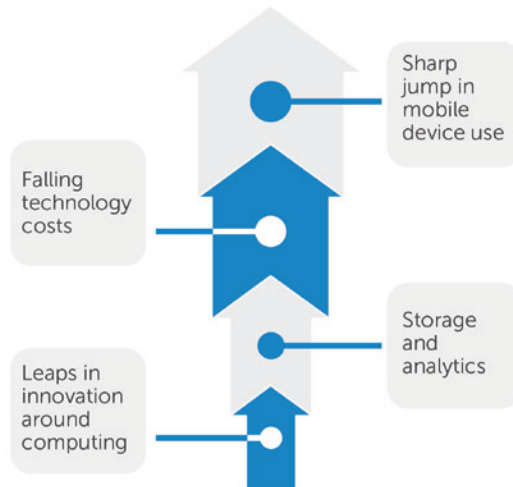
So unlike in the past, when the amount of data was limited, general in nature and often used simply to detect anomalies on the production line, IoT works in real time to provide massive amounts of data with fine-grain precision if needed. What's more, it can help synchronize connectivity when it gets integrated into an

organization's enterprise systems, such as enterprise resource planning (ERP), customer relationship management (CRM) and product lifecycle management (PLM).

At a Tipping Point

The implementation of IoT is growing exponentially as a result of several simultaneous new developments: leaps in innovation around computing, storage and analytics; falling technology costs; and a sharp jump in mobile device use. By 2020, there should be 28 billion connected units globally and the market for IoT solutions would top $7.1 trillion, according to IDC. Propelling the growth is enterprise IoT, rather than consumer IoT such as digital clothing, smart watches and other wearables. "Any large-scale consumer IoT initiative has to flow from enterprise IoT," adds Gorur.

Reasons for IoT's rapid growth

- Sharp jump in mobile device use
- Falling technology costs
- Storage and analytics
- Leaps in innovation around computing

Kartik Hosanagar, a Wharton professor of operations, information and decisions, says "IoT will clearly be a transformative technology" but cautions against "getting caught up in a buzz cycle." IoT is mainly about two things — using

sensors to collect extra information and then channeling that to guide better decisions and actions. Still, "it's important for businesses to ask what kind of information they would want from devices and what can be done with the information," he says.

Hosanagar believes the near-term business case for IoT should center on operational efficiencies — better asset use, improved productivity and reduced costs. "The operational benefits that IoT will afford cannot be ignored by companies — especially in sectors such as manufacturing and energy. In the longer term, the ability to build interesting applications on top of the data that will be captured may well be strategic. And even if it isn't strategic, that doesn't mean it won't be critical," he adds.

For vendors, Hosanagar says, IoT is "absolutely strategic" even in the near term. "Companies that are able to establish themselves as leaders in IoT — for instance, by playing a leading role in standards development — will be seen as thought leaders. It will absolutely impact market share dynamics in many device markets."

Beyond Operational Benefits

Ajay Jasti, practice leader of IoT at NTT DATA, agrees that IoT will result in "new products, new services, new business models and enhanced customer experience." The white goods industry — consumer durables such as air conditioners and refrigerators that used to be painted mainly in white — is one area ripe for revolution.

In the past, a washing machine manufacturer was almost solely interested in selling machines, with little interest in end-users. At most, manufacturers might offer a warranty

and some after-sales service. But now, they are building smart, connected products that can communicate with consumers' home ecosystems, accept external inputs like weather and transmit the data to their enterprise business intelligence systems.

Such functionality will enable manufacturers to closely monitor product performance and manage them remotely, as well as allow proactive service offerings, says Jasti. For instance, if the washing machine is connected to other gadgets in the home, IoT connectivity could monitor the electrical load being drawn by other appliances and thereby avoid an overload, or it could help take advantage of shifting electrical costs when there is intra-day dynamic pricing. For machines where clothes are only semi-dried and then hung out for full drying (the case in many developing countries), a connection to Internet weather reports could allow automatic changes in dryer settings based on the outside conditions.

While pointing out that IoT devices could "suggest ways to optimize energy consumption or, by combining real time analytics with historical data, do predictive maintenance," Jasti further notes that better understanding customer needs and product use patterns could potentially upend basic value propositions, as was the case with John Deere. "In the future, customers may well get the household appliances free and pay the manufacturers a monthly service fee instead."

Where is IoT likely to be most impactful? Manufacturing, transportation and health care, says Hosanagar. "Within manufacturing, one interesting area of activity will focus on energy efficiency and automation — for instance, when to use machines based on energy costs, needs, and so on." In transportation, sensors,

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along with more automation, could cut energy use and reduce accidents. Hosanagar thinks health care has potential as well but "there are significant privacy and compliance issues to be overcome."
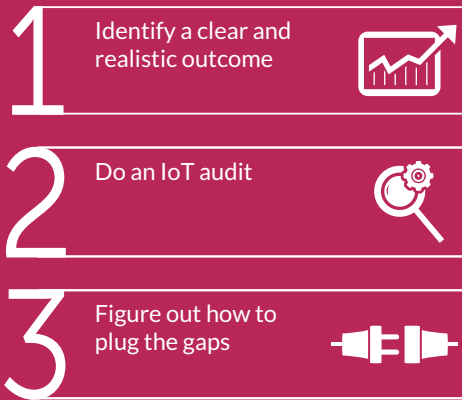
Some industries, such as manufacturing, transportation, and oil and gas, already have been big users of information technology in the last 30 to 40 years. They have systems in place and are thus well poised to leverage IoT, Jasti notes. By simply adding a few more sensors, companies in these industries could get precise data in real time to enable speedy decision-making.

An Effective Approach

But IoT implementation requires skilled staff and complex integration of computer systems, software applications, networks, operating systems and the like. "IoT starts with sensors and ends with engaging either an enterprise-consumer or a commercial-consumer, and appears to be simple," says Jasti. But it requires coordinating "different service providers, different manufacturers, all of whom have their own standards. There is a lot of complex architecture and technology involved."

According to both Jasti and Gorur, the first step of the IoT journey for companies is to identify a clear and realistic business outcome. For a hotel, for example, the aim could be improving service rather than a product. Guest recognition might be a place to start. Based on the sensors in the hotel and connectivity through a guest's mobile phone, the hotel would know when a particular guest arrives — even before he signs in. Thus, hotel staff could greet the guest by name as soon as he enters the building, thereby offering a more personalized customer experience.

Successful IoT Journey

1 Identify a clear and realistic outcome

2 Do an IoT audit

3 Figure out how to plug the gaps

For a health care provider, the advantage might be remote diagnosis. This would entail getting the relevant patient information such as heart rate, calories burnt and blood pressure through a wearable device, sending this information to the doctor, and then sending an e-prescription from the doctor to the patient on a mobile device. This would result in faster diagnosis and better health management, especially if the remote diagnosis happens using real time data transmitted over long distances.

In step two, organizations should do an IoT audit. Does the firm already have some IoT systems, processes and technologies within the organization and how ready is it for an IoT implementation? For instance, does it have devices that communicate? Can it provide real-time insights based on data? Is the data connected to its enterprise systems, and so on? The company then needs to map its current level of IoT maturity — or readiness level — and the level of technological skill needed to hit the business goals.

Next, the organization needs to figure out how to plug the gaps. What does it need by

way of skilled staffing, technology, hardware, software, and integration know-how? Thereafter, the organization should start with a pilot. "Ideally, the pilot must show results within eight to 10 weeks. Based on the outcome, the company must decide on the next course of action," says Jasti.

The ROI

How does one assess the return on investment (ROI) in an IoT implementation? Citing results from the field service industry, Gorur says some ROI metrics could include fewer field visits and shorter customer service calls, for example. These would automatically boost service efficiency and result in savings for the organization, the consumer or both.

A German manufacturer of optical microscopes, for example, saved more than $500,000 annually by avoiding 400 on-site visits using an IoT model. Predictive maintenance, meanwhile, can mean fewer claims on warranties, while less downtime for customers means improved customer satisfaction, leading to repeat business.

Gorur notes that typically IoT investments are required across the organization and need to be mapped to its level of readiness. The first level of investment, for example, turns passive devices into active devices. The next level of investment manages these active devices. Thereafter, investments are needed to integrate the data from the devices to the organization's enterprise systems and so on. On top of the technology investments, firms need the right people and organizational set up. "It's very important for organizations to have the technology and organization roadmap to fully realize the benefits of their investments. The

best way is to do it piece by piece, prove each layer and then move forward."

In the initial stages, however, including the pilot, a company need not invest heavily, adds Jasti. It can work with its existing infrastructure and resources with some minor additions, like increasing the number of sensors in use. Indeed, most organizations are looking at IoT to cut down operational costs and "even small benefits can result in big savings," Jasti says.
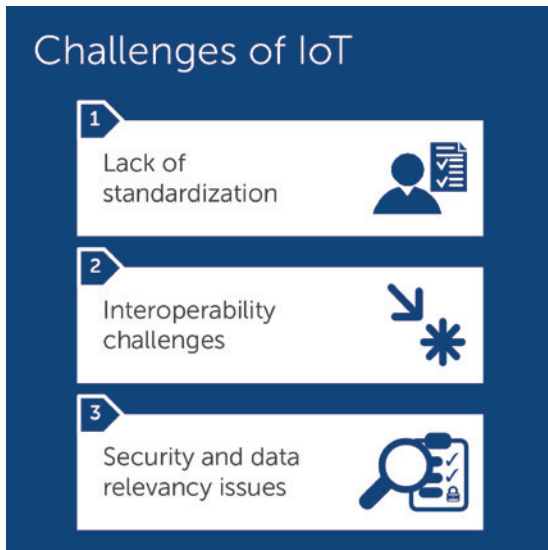
Take a luxury hotel that has major heating, ventilating and air conditioning (HVAC) expenses. It can cut costs by regulating the air conditioning and heating based on the number of people in any given part of the hotel — data that sensors can easily provide. In one IoT pilot, it was found that making HVAC systems more efficient that way could save a hotel around $60,000 a year in one location alone. "Hotels are usually part of a large chain and have multiple properties. Even a 1% reduction in their air conditioning and heating costs across multiple locations can result in substantial savings," says Jasti.

Inherent Challenges

As with any new technology, IoT arrives with challenges. Hosanagar lists lack of standardization at the top that results in interoperability challenges. "Different vendors have their own proprietary platforms and solutions and these are usually not interoperable. This means that the costs are higher, and the buyers and users bear a lot of risk." There is also the risk of potential redundancy. "You might adopt a technology that eventually loses to an alternative" and have to "redo everything," he says.

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Challenges of IoT

1 Lack of standardization

2 Interoperability challenges

3 Security and data relevancy issues

Adds Jasti: "IoT is basically IT (information technology), comprising anything from the cloud and beyond, plus OT (operational technology) which is everything before the cloud, for example, the manufacturing process. These two are entirely different animals; they have their own, different, standards and they don't talk to each other. Integrating them is a huge challenge."

But the biggest risk in IoT is security, Jasti says. In manufacturing, for example, if the process control systems are hacked, entire factories could be shut down. In July 2015, Fiat Chrysler recalled 1.4 million vehicles in the U.S. after security researchers hacked a Jeep Cherokee through its entertainment system, which was

connected to the Internet. In another incident in 2014, cyber criminals hacked more than 100,000 Internet-connected consumer gadgets, including home-networking routers, TVs and a refrigerator to send out 750,000 malicious emails. The more devices are connected to the Internet, "the more vulnerable one is to these devices and the associated data being hacked or sabotaged," Hosanagar points out.

There are other issues too, around data. For instance, what is relevant data? How can it be used most effectively? Who does the data belong to? How can its misuse be prevented? "The value from IoT is very much there but [one needs to] understand all the risks before adopting it. It is important for companies to tread the waters cautiously and not get caught up in a hype cycle," Hosanager adds.

Gorur agrees that companies must avoid the trap of "doing a marathon Silicon Valley visit and talking to every company which has a cool device." Understanding the level of IoT readiness along with a gradual approach "can help organizations cut through the hype." He adds: "A lot of the conversation at present is on the plumbing side — around the IoT infrastructure and how it can be implemented. This is important in order to layout the framework, but going forward, we need to move the conversation upstream to business benefits and return on investment." ■

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