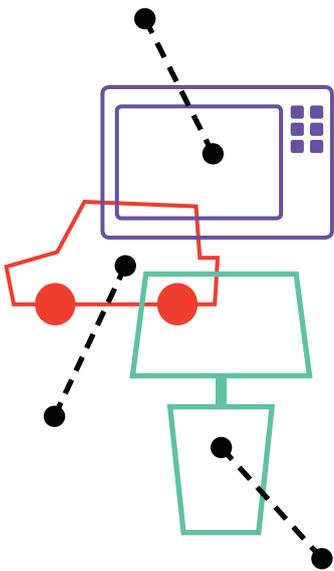


Translating Ideas for IoT Initiatives into Dollars and Cents



Internet of Things (IoT) technologies present businesses with unprecedented opportunities. The IoT enables companies to embed digital technology into the products they sell, creating new value streams and new after-markets. It drives supply chains that turn components into products and bring them to market, creating new top- and bottom-line efficiencies. It can track and reveal consumer preferences and behaviors, generating new insights and improved digital customer experiences that produce loyalty and new revenue. And that just scratches the surface.

IoT technologies are increasingly found in products ranging from refrigerators to aircraft engines; small digital cameras attached to the inside and outside of buildings (think of retail stores and amusement parks); digital bracelets that customers wear and which let a company know where the customer is on its premises (such as at a theme park). IoT technologies allow companies to:

- Understand how their products are performing. By analyzing usage data, companies can improve product performance, and predict when they need service (before they break down), allowing companies to offer new services that customers can depend upon.
- Track the movement and actions of customers on the company's premises and enhance their experience by, for example, reorganizing queues and offering add-on services that will ease access to high-traffic areas.

IoT is an enabler of what we call Business 4.0: the modern state of business in which firms can use abundant data, agile approaches to business, automation technologies and computing resources to drive their enterprises.

- Monitor employees and their interactions with customers so that, for example, retail workers and managers can brainstorm to slash wait times at checkout.

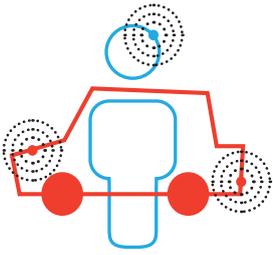
These capabilities exemplify a “closed loop” system in which a company can combine the performance data it collects from the field with data from its other systems—ERP, supply chain, financial, CRM systems and more—to better serve customers. A closed loop system moves a company from static and reactive to dynamic and proactive; from relying on historic information to basing decisions on real-time data. Thus, the IoT is an enabler of what we call Business 4.0: the modern state of business in which firms can use abundant data, agile approaches to business, automation technologies and computing resources to drive their enterprises.

With the realization that the IoT delivers value while enriching customer experiences, many companies have been spending big money on IoT initiatives... all with the best intentions and hopes that they are pursuing the highest-value opportunities. Worldwide spending on Internet of Things projects will reach an estimated \$772 billion in 2018, up 14.6 percent from 2017, with investment forecast to reach \$1.1 trillion in 2021, according to International Data Corp.¹

But we think many of these investments will prove to be suboptimal—not because IoT technologies aren’t transformative (they are) but rather because its opportunities are so varied and numerous it’s hard to know where to begin. And many businesses begin in the wrong places.

To turn IoT technologies into a profitable strategic initiative means not only understanding how these systems can transform business models, it also means building a business case that takes best advantage of the technology to deliver benefits to a company’s customers so both they and the company profit.

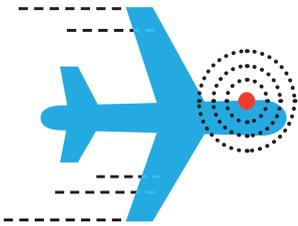
¹ IDC, “IDC Forecasts Worldwide Spending on the Internet of Things to Reach \$772 Billion in 2018,” December 7, 2017, accessed at: <https://www.idc.com/getdoc.jsp?containerId=prUS43295217>



The Useful Use Case: Monitoring the Business and the Customer

Executives confronting the question of which IoT opportunities to pursue (and in what order) should start by identifying a broad range of applications and use cases for deploying sensors and collecting data for analysis. With more use cases to evaluate, the task becomes rank-ordering which initiatives will generate the greatest business value.

We have found an effective evaluation method classifies IoT use cases into four types:



1. Product monitoring. Aircraft engine manufacturers such as GE and Rolls Royce have been embedding sensors in their products for years to report on their performance. Samsung has introduced a smart refrigerator with internal cameras producing images accessible via a smartphone app so that a shopper at the grocery store can see if there's milk in his refrigerator or whether he needs to pick up a half-gallon.²

Value: Product monitoring can create "servitization" business models, transforming companies from product sellers to service providers that rent their products while earning continuing revenue from the product and the service. For example, a pump manufacturer can offer a zero-downtime guarantee after installing sensors in its equipment to detect problems and fix them before a breakdown occurs.



2. Customer monitoring. Vacationers at the Disney World Resort, in Orlando, Fla., wear "MagicBand" bracelets that unlock hotel rooms, pay for food and merchandise and allow guests to gain access to attractions³ (a system which represented a reported \$1 billion investment⁴). Similarly, Carnival Corp. has introduced an electronic medallion personalized for cruise ship guests to buy services during their trip.⁵

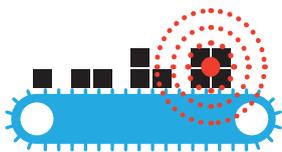
Value: Customer monitoring enables firms to gauge interest in their product and service offerings in real-time, shift resources dynamically and quickly in response to shifts in demand, identify ways to enhance the customer experience, and offer add-on services.

² Mashable, "Samsung fridge lets you check what's inside while you're at the grocery," January 5, 2016, accessible at: <https://mashable.com/2016/01/05/samsung-fridge-amazon-alexa/#uokeak8n08qt>

³ Disney, MagicBands FAQ, accessed at: <https://disneyworld.disney.go.com/faq/bands-cards/understanding-magic-band/>

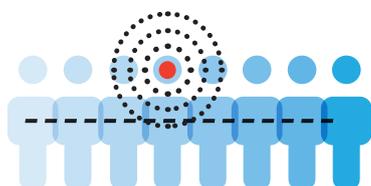
⁴ Wired, "Disney's \$1 Billion Bet on a Magical Wristband," March 10, 2015, accessed at: <https://www.wired.com/2015/03/disney-magicband/>.

⁵ Digital Trends, "How Carnival's small, wearable Medallion crafts a cruise just for you," January 10, 2017, accessed at: <https://www.digitaltrends.com/wearables/carnival-ocean-medallion-how-it-works/>



3. Supply chain monitoring. Embedding digital sensors and cameras in manufacturing, warehousing and distribution operations enables companies to track the flow of raw materials, parts and products. Manufacturers of all kinds, from pharmaceuticals to automotive parts to food and consumer products, can implement “track and trace” projects to identify supply chain problems and opportunities for improvement while mitigating risks and finding cost-savings.

Value: Analysis of IoT generated data brings real-time intelligence to even the most extended and complicated supply chains. In an increasingly globalized world, that data and capability is not a nice-to-have, it is a must-have.



4. Premises monitoring. Retailers and fast-food restaurants increasingly are installing digital sensors and cameras to track their customers’ movement and actions to shorten lines and improve their experience. Security firms monitor facilities or homes to mitigate risks. Monitoring can also be used for energy optimization in manufacturing, homes, office buildings, and so on.

Value: Analysis of premises data provides insights on space utilization and reveals opportunities for improving traffic flow or capturing customers’ attention.

Many initiatives like these have generated big returns. However, if companies keep their IoT initiatives siloed within these four areas, they will be putting the technology (and their businesses) in a straight-jacket. Companies need to identify and size the opportunities that *bridge* those four silos to create larger opportunities.

For example, how could an IoT initiative at an electric utility company connect product, customer, supply chain and premises monitoring? If the utility sells solar power systems to homeowners and businesses, it could combine product monitoring, premises monitoring and customer monitoring in combination by:

- Installing digital sensors in the solar systems to track their energy production (product monitoring)
- Tracking the production at the location of each solar customer (premises monitoring)

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- Determining difference between solar energy produced and electricity used at individual customer sites (customer monitoring)
- Predicting how much energy could be sold to other customers on the grid based on analysis of solar energy production and customer consumption patterns.

The IoT devices in this scenario would enable the utility to go far beyond simply metering its services; it would be able to establish (and manage) a cloud-based energy marketplace that enables its customers to sell power to one other, creating a closed loop system, and a virtuous (and profitable) circle.

Utilities can create still greater value by combining real-time data from multiple IoT systems to their enterprise systems to produce a connected digital enterprise. This could provide consumers with benchmarks of their energy consumption compared to similar consumers, advising them via analytics how to optimize their energy use. This would also allow the utility to plan grid load management proactively and predictively.



How to Tap Even Greater Value from the IoT

When companies build bridges across siloes, and combine those connections with the products of analytics, they can generate new kinds of business value. We have seen companies realize this value in five ways:

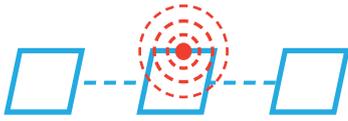
- 1. The customer complexity reducer.** By installing sensors in a place of business and connecting them to devices that customers hold, companies can use IoT technologies to remove the friction that customers face when they conduct business on a company's premises.

For example, the Amazon Go store that opened in Seattle in 2018 uses digital cameras in the store, artificial intelligence, a smartphone app and other technologies that eliminate the need for cashiers or checkout stations (and checkout lines). Customers just pick up the items they want, put them in bags and carry them out. The store's systems track what they remove from shelves and charge their account accordingly.⁶

Amazon's system combines customer monitoring, product monitoring, and premises monitoring to eliminate transactional friction, improve the customer experience, and differentiate itself in the marketplace—a powerful strategy.

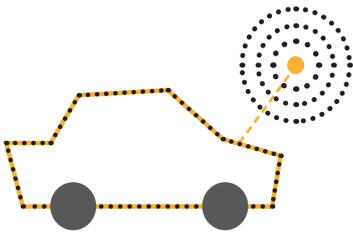


⁶ Wall Street Journal, "Amazon's Cashierless 'Go' Convenience Store Set to Open," January 21, 2018, accessed at: <https://www.wsj.com/articles/amazons-cashierless-go-convenience-store-set-to-open-1516546801>.



- 2. The operations enhancer.** By monitoring supply chains and tracking on-premise events, companies can identify (and eliminate) costly inefficiencies while preventing stockouts or shutdowns that can lead to lost revenue.

For example, oil refineries that depend upon consistent up-time save millions by combining supply chain with premises surveillance to avoid shutdowns. The same business value principle applies to factories that can track incoming supplies and outgoing products while monitoring their warehouses.



- 3. The product differentiator.** By tracking the performance of a product in real time after a customer purchases it, a manufacturer can do predictive maintenance and also offer add-on services.

For example, the company offers a performance guarantee for the product because it has real-time tracking data for it and can offer other performance-related services (such as free product optimization service) that help customers get better value. The arrangement also enables a manufacturer to differentiate its product from others in the marketplace, as Tesla has done with its streaming upgrades offered on a tiered subscription basis.⁷ This combines product monitoring with customer usage monitoring, enabled by analytics.



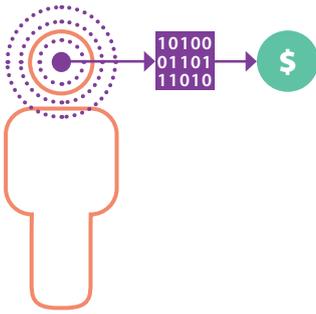
- 4. The servitization enabler.** A growing number of manufacturers are selling connected products and thus making it possible to turn those products into services, generating recurring revenue from products that are rented rather than marginal profit from items sold. GE and Rolls Royce are doing this with aircraft engines: selling power by the hour to some customers. Michelin is doing it with truck tires: renting its tires by the mile driven.⁸ Kaeser Kompressoren, a century-old machinery manufacturer based in Coburg, Germany, sells air compressors as a service using IoT after developing a predictive maintenance program for its machines.⁹

As the compressor illustration suggests, data analytics is central to the servitization model that combines product performance and customer usage monitoring. A manufacturer can install sensors in its products, and monitor customer use, but without quality analytics to gain real-time intelligence into performance—to close the loop with the customer—the service is likely to flounder.

⁷ Teslarati, "Tesla to offer 'Premium Connectivity' internet package," June 23, 2018, accessed at: <https://www.teslarati.com/tesla-premium-connectivity-internet-package-july-1/>

⁸ Michelin Fleet Solutions, accessed at: <https://www.michelintruck.com/services-and-programs/michelin-fleet-solutions/>.

⁹ Digitalist Magazine, "How Can You Sell Air? As a Service, of Course," May 9, 2016, accessed at: <https://www.digitalistmag.com/iot/2016/05/09/how-can-you-sell-air-as-a-service-04192752>.

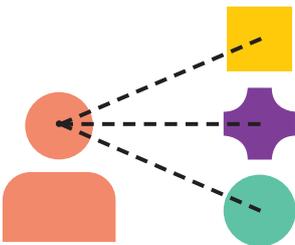


5. The data monetizer. By capturing data, and analyzing customer usage patterns, companies can look to sell it to third parties (abiding by terms of service agreements with customers).

The data monetizer also can be an internally focused business model. For example, a manufacturer of power generation equipment, or an electrical utility that demonstrates superior efficiencies, could sell data it compiles about its performance to other utilities looking for lessons on optimizing their own operations.

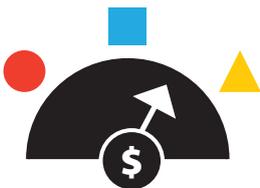
Determining Your IoT Opportunities

We recommend executives create their IoT opportunity roadmap by following these four steps that narrow the wide range of options to those that will have the best chance to deliver meaningful returns.



1. Identify relevant use cases. Examine business operations: from supply chain to sales to after-sale service. Look at the kinds of products the company sells: whether they have sensors in them now, whether they can be so equipped, whether customers' smartphones represent existing or untapped connections. Take inventory of the company's data analytics capabilities: the kinds of data it collects and the gaps that may exist; how well the company uses analytics now and whether its capabilities can be improved.

After examining these criteria with all five IoT opportunity areas in mind, make a list of potential areas where IoT could deliver value.



2. Estimate the costs and benefits of each option. This step should include research with business stakeholders (including customers) to corroborate the use case details. Test original assumptions. Specify investments required for each use case. Estimate the returns on each investment.



3. Prioritize the list of opportunities based on clear criteria. For each potential initiative, specify the ROI, the risks involved, estimated time to completion, the feasibility of the project (both technical and cultural) and any other factors that business stakeholders identify.



4. Determine the key requirements for executing each initiative. This includes not only the data required to make the initiative a reality but also the latency of that data—how close to “real-time” the data must be for

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the use case to be profitable. For example, if the latency required is low, a company will need to have the capabilities to provide near-real-time data to analyze a product's performance, or a customer's use of a product.

Other factors include the skills needed to design, test, implement and refine the system; the technologies needed (such as the sensors, applications, analytics and IoT architecture to support the initiative), and training that employees (or customers) will require.

Executives going through this checklist would be wise to pay special attention to their current analytics capabilities. Like any initiative involving analytics, a successful IoT program will require strong data management processes. Common data access roadblocks that must be overcome include missing data, data locked up in old infrastructures and proprietary systems, as well as unusable unstructured data. Of course, companies must ensure the security of data they include in IoT systems.

Channeling Ideas In Profitable Directions

Companies don't fail with IoT because they lack ideas; they fail when they pursue too many initiatives in an uncoordinated way so that the highest-value opportunities do not get the appropriate resources. This problem is exacerbated when data is siloed, hampering the organization's ability to marshal all its resources to move IoT innovations beyond the proof-of-concept stage.

Companies need an IoT business strategy that determines which of the five business values of IoT makes most sense to them: customer complexity reducer, operations enhancer, product differentiator, servitization enabler and/or data monetizer. One only hits the bullseye if that's all one sees, and all one aims at.

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