



WHITE PAPER

IoT and Digital Transformation: A Tale of Four Industries

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SITUATION OVERVIEW

There is a familiar refrain among CEOs today, perhaps best captured by the CEO of a major global financial institution who said, "We are no longer a bank, but a technology company in the financial services industry." IDC has accumulated dozens of similar quotes from executives across all industry segments. Digital transformation is at the heart of business strategies.

Digital transformation begins with the executive mandate, but it is essentially a commitment by organizations to innovate on the experience they offer their customers. There is a strong sense of urgency among executives as the threat of digitally enabled competitors remains high on the list of concerns. In fact, our research shows that 33% of industry leaders will be disrupted in this way by 2018.

The starting point is innovating the experience, which adds pressure to fundamentally change the operating models that companies use. Organizations are transitioning from mass-market operating models to consumer-centric models. This operating model transformation is essential to delivering on the promise represented by the new experiences being created.

The technology underpinning the Internet of Things (IoT) – acquiring, analyzing, and activating data – is an essential element of generating innovative experiences and transforming operating models (see Figure 1). According to IDC's 2015 *Global IoT Decision Maker Survey*, 58% of organizations worldwide see the Internet of Things as strategic to their business. Another 24% of organizations see IoT as transformational to their business.

FIGURE 1

Digitally Transform or Be Left Behind

IoT is essential to create innovative experiences and to execute operating model transformation



Source: IDC's *Global IoT Decision Maker Survey*, August 2015

A Business Perspective on IoT

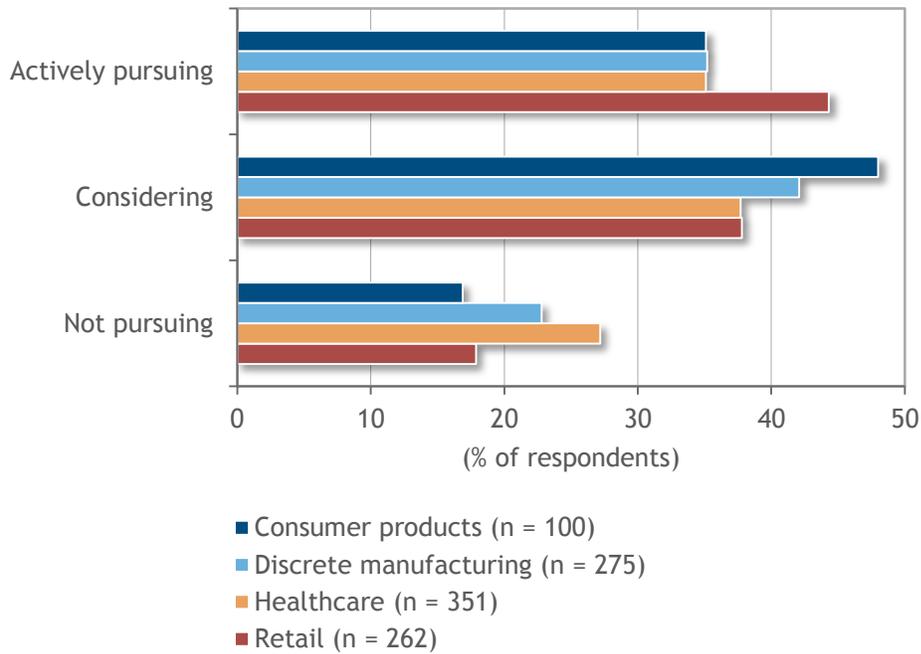
IoT will be part of several initiatives related to digital transformation, but these initiatives will not be IoT projects. Rather, they will be specific industry use cases that deliver specific value. For the purposes of this white paper, we have categorized compelling current and future use cases into three broad groupings:

- **Strategic asset management:** Monitor the status, location, and movement of physical assets owned by the organization to increase performance, efficiency, safety, security, and throughput of individual assets and groups of assets. Assets may be maintained and managed; the focus is on the asset, including risk management and security of that asset.
- **Consumer/customer experience:** Provide a contextualized and personalized consumer/customer experience based on information collected about the customer, consumer, or employee. This relationship is B2C when the end user is a consumer and B2B when the end user is a business customer. The focus is on the customer experience, including physical safety and security.
- **Product and service experience:** Enhance a product or deliver a service based on an IoT-enabled product. This involves collaboration and shared systems and extends from the product inbound supply chain to the ongoing delivery of the product or service. Information flow can be machine to machine or machine to human. This use case may be B2B or B2C. Although the focus is on the product (or delivery of service using the product), the impact could improve the customer experience.

While all initiatives fit in each of these broad categories, they manifest differently based on the context of each industry. To better understand and articulate these industry initiatives, IDC recently conducted four industry focus groups – one each for consumer products, discrete manufacturing, healthcare, and retail. Figure 2 outlines the various adoption intentions for the industry segments examined in our focus group research.

FIGURE 2

IoT Momentum Is Both Tangible and Quantifiable



Source: IDC’s *Vertical IT and Communications Survey*, February 2015

IOT IN HEALTHCARE – IT’S THE INTERNET OF EVERYTHING

IoT means different things to different people within a healthcare organization, including the IT staff. For most, it means some form of connectivity, typically wireless, that connects things *and* people across the healthcare ecosystem to acquire, aggregate, and analyze data in order to glean actionable insights. The more common use cases in healthcare involve connecting people – consumers, clinicians, and caregivers. Consequently, most healthcare organizations do not use the term *IoT* when they refer to initiatives such as remote health monitoring, fitness and activity tracking, medication adherence, or personal emergency response to monitor patients who are a fall risk. Instead, members of the healthcare focus group reported that telehealth is the term they use more frequently than even connected health. Even when describing initiatives to track and trace physical things, such as medical equipment or supply levels, the term *IoT* is not used frequently by IT or line-of-business (LOB) staff.

Once Embraced, IoT Will Be a Disruptive Force in Healthcare

Although the healthcare industry is not yet prepared for IoT and digital transformation, IDC sees evidence of progress. Healthcare organizations have piloted connected health projects aimed at improving

consumer engagement. While a demonstrable return on investment (ROI) has often been elusive, qualitative benefits such as improving patient outcomes have been well documented. The ability to connect with consumers and affect their behavior will encourage them to make healthier decisions, which in turn will lead to better outcomes and lower healthcare costs.

The ability to monitor consumers remotely or conduct a virtual visit via video is transforming how care is delivered. Providers have discovered that it can be more cost effective to send a patient home with a tablet and remote health monitoring device to detect complications before they become so serious that the patient must be readmitted, thus avoiding 30-day readmission penalties for certain conditions.

IoT Will Become Mainstream in Healthcare by 2020

Most members of the healthcare focus group thought that IoT in healthcare would become mainstream by 2020 and beyond. This finding is consistent with findings from other studies conducted by IDC Health Insights. Population health and consumer engagement initiatives that are under way as part of the new care and reimbursement models, along with aligned financial incentives, will play an important role in driving adoption of connected health solutions. IDC Health Insights anticipates that by 2020, 80% of consumer service interactions will use IoT and big data and analytics to improve quality, value, and timeliness of care.

Applying IoT for Digital Transformation in Healthcare

Healthcare organizations across the globe are in the midst of a significant transformation as a result of health reforms, which has led to reimbursement focused on value, not volume. Under this new paradigm, healthcare organizations must become more efficient in how they deliver care. They must also strive to engage consumers to play a more active role in managing their own healthcare because consumer behavior (e.g., diet, exercise, compliance with therapeutic regimens, smoking, and alcohol and substance abuse) influences overall health status.

Healthcare organizations that will successfully make this transition, and digitally transform, will actively embrace connected health technologies, including IoT solutions that connect up the ecosystem and connect clinicians with each other and their patients. Common IoT use cases in healthcare involve monitoring assets, clinicians, and consumers to optimize resources. Sensors have become increasingly smaller and less intrusive, resulting in passive sensors that can be affixed to clothing or skin, embedded in the body, or even ingested. The convergence of advanced miniaturized technology and mobile and social networking further encourages consumer adoption of these connected health or IoT solutions. Real-time location services enable strategic asset management to track medical equipment and supplies, such as wheelchairs, gurneys, and code cards. Tracking and tracing these assets enable hospitals to optimize resource allocation. Using similar technology in employee badges, healthcare organizations can track clinicians and determine whether they have washed their hands after entering a patient's room (thus mitigating the risk of spreading hospital-acquired infections), how many hours they have logged on a shift, or whether they have attended required continuing medical training.

Certain use cases may be considered advanced by some healthcare organizations in the early stages of IoT, even though other healthcare organizations have been using connected health solutions for decades. In many ways, the future of IoT is in healthcare, but it has not been widely distributed across healthcare organizations of all sizes and geographic locations. Health reform initiatives, along with regulatory changes and new reimbursement models, all of which are under way, will accelerate the adoption of IoT in healthcare.

IOT IN CONSUMER PRODUCTS – IT'S ALL ABOUT THE CONSUMER

Consumer products, made up of a number of subsegments such as food and beverage and health and beauty, is a mature and relatively slow-growing industry that occupies the middle ground in terms of technological innovation and thought leadership within the overall manufacturing industry. IT investment is generally consistent, at about a 5% growth rate year on year, with functional areas "bidding" on limited IT dollars to get their projects prioritized and funded. Given their core business, the focus on product innovation and the customer/consumer takes precedence, though areas such as trade promotion management and the supply chain are also important. It is, as yet, unclear whether investments in newer technologies such as analytics and IoT will represent incremental IT investment or a reallocation of existing levels.

Perhaps unsurprisingly, there is no single, unified definition for IoT within the consumer products industry. Although there is broad agreement that it's about collecting data and insights from across the full breadth and depth of the business, wherever it may operate, the manifestation varies. For some companies, IoT is about connecting with consumers and being able to influence their choices (and gain insights from those choices); for others, it's about connected products and the ability to either more efficiently service those products or sell wrapped services, and for still others, it's about efficient operations and the ability to improve demand forecasting and resulting service levels.

The Vision of IoT for Consumer Products Manufacturers – More Effective Innovation and Consumer Engagement

The impact of IoT on the consumer products industry is poised to be significant, particularly in terms of how these businesses interact with their customers and, even more significantly, their consumers. It's an old saying in this industry that 80% of new products fail, and while the actual performance is likely better than that, the reality remains that a significant percentage do fail and the sizable associated marketing support costs are lost. If we further postulate the growing desire of consumers for "personalized" products and services, the notion that the innovation process of the future will have to be more productive and effective is a certainty. The company that works out how to reproducibly engage with a large set of consumers as a replacement for the focus group, and as input to the innovation process, stands to revolutionize the industry. The keyword here is "reproducibly." Consumer products companies mine social media data, but it is unreliable. The promise of IoT is that of a quantitatively robust data source to enable 1:1 consumer (and customer) insights.

Two recent predictions from IDC FutureScapes (*IDC FutureScape: Worldwide Manufacturing Supply Chain 2016 Predictions* and *IDC FutureScape: Worldwide Internet of Things 2016 Predictions*) are relevant to consumer products manufacturers for IoT for product innovation and in the supply chain:

- By 2018, proliferation of advanced, purpose-built, analytic applications aligned with the IoT will result in 15% productivity improvements for manufacturers in terms of innovation delivery and supply chain performance.
- By 2018, 60% of Global 1000 companies will integrate IT and operational technology (OT) at the technology, process, security, and organizational levels to fully realize the value of their IoT investments.

These predictions speak to the fact that IoT investments will have an impact across all aspects of the consumer products business. The benefits are many – increased capacity on production lines, easier product customization, more effective and timely innovation, and tighter links between supply and demand – all in the service of driving improved financial performance.

IoT Will Become Mainstream in Consumer Products by 2018

As an aggregate industry, consumer products is neither a leader nor a laggard when it comes to technology adoption; it is more of a fast follower. Clearly, there are individual businesses within the industry that sit at the endpoints – indeed, a couple of notable companies sit at the leading edge – but the overall industry readiness for IoT is at the midpoint. Most of the consumer products companies that IDC Manufacturing Insights speaks with generally rate themselves as neither particularly prepared nor completely unprepared for IoT. Almost all of them say that they are exploring near-term use cases in areas such as the supply chain while attempting to build up analytics capabilities to be ready for bigger and broader efforts with consumers. The challenge essentially is whether to invest in capabilities before mainstream IoT adoption and benefit from early-adopter advantage or invest in capabilities after mainstream IoT adoption. The inability to articulate clear benefits makes this a difficult strategic decision.

The general impression of the consumer products focus group participants was that their industry is generally neutral in terms of being prepared or unprepared for an IoT transformation, though interestingly many felt their company to be slightly ahead of the overall industry.

IoT and Digital Business Transformation

In looking to the future of IoT within the consumer products industry, we see all three of the use case categories articulated in the introduction to this white paper as germane to the industry. In terms of importance, though, it's all about the consumer/customer experience. That's not to say that product and service experience and asset management are unimportant, just that the consumer/customer experience sits at the heart of what this industry is all about. The most compelling use cases for IoT involve engaging with consumers by understanding their shopping and consumption patterns. One potential example could be a dynamic, iterative consumer or customer replenishment model based on actual home-based product usage and experience (shelf = consumer pantry) or directly monitored store shelf status. In the consumer products focus group session, the responses were both positive ("that would be the holy grail for our business if we could do that reliably") and skeptical ("there is no way that we could do that today or in the immediate future either"). Yet we have countless examples in this industry of aspirational goals that were ultimately made possible through the use of modern technologies and persistence on the part of the industry or business. The challenge will ultimately be to proactively articulate the use cases so that IT and business process investments are prioritized over more pressing and definable business priorities.

IOT IN DISCRETE MANUFACTURING – CONNECTED PRODUCTS STAND OUT

Discrete manufacturing includes a wide range of segments, such as automotive; aerospace and defense; farm, construction, and industrial machinery; and high tech. Not surprisingly, manufacturers in this industry have many different business priorities that impact how they adopt IoT and where they apply it first – to connected supply chains, assets, or products. Companies that own their manufacturing facilities are more likely to be early adopters of IoT in the plant, and those that have long product life cycles are likely to use IoT to change their products and services. Along these lines, participants in the discrete manufacturers focus group were most interested in how IoT is impacting their products and eventually their services, with strong representation from engineering, innovation, and R&D.

They also emphasized an IT connection, including complementary technologies, in the IoT-enabled solution. For example, one manufacturer said, "For us, IoT is about connecting people and vehicles together with the cloud." Connecting products and people was a common theme throughout the discussion. Another participant said, "We don't call it Internet of Things; we call it connectivity." More IT knowledgeable participants talked about how IoT is changing IT – in terms of how the IT organization serves the business and the demands IoT places on the underlying IT systems and resources.

The Vision of IoT for Discrete Manufacturers – More Competitive Products and Processes

Across discrete manufacturing today, IoT is making its way into products *and* processes. Leaders in the industry will be able to create significant business value to enhance their position in the market through connected products and IoT-enabled services. Furthermore, manufacturers will be able to increase the efficiency and effectiveness of their operations. But manufacturers will first need to consider how IoT fits with other technology investments and their business strategy. IoT-related investment in discrete manufacturing is accelerating rapidly.

Two recent predictions from IDC FutureScapes (*IDC FutureScope: Worldwide Manufacturing Product and Service Innovation 2016 Predictions* and *IDC FutureScope: Worldwide Internet of Things 2016 Predictions*) are very relevant to discrete manufacturers for IoT for product and service innovation and in the plant:

- By 2017, 60% of global manufacturers will use analytics to sense and analyze data from connected products and manufacturing and optimize increasingly complex portfolios of products.
- By 2018, 60% of Global 1000 companies will integrate IT and OT at the technology, process, security, and organizational levels to fully realize the value of their IoT investments.

These predictions speak to the fact that IoT investments are in all aspects of the business, in products and operations, and in how integrated IT and OT will become in the next few years. The benefits are many – increased capacity on production lines, easier product customization, and tighter links between supply and demand, to name just a few, not to mention the impact on companies' financial performance.

IoT Becomes Mainstream in Discrete Manufacturing Now (or Very Soon)

The participants in the discrete manufacturers focus group were knowledgeable about the use of IoT in their companies and felt that their companies were prepared or very prepared to apply IoT and more prepared than the industry in general. We found an even split between participants who believe that IoT is already mainstream, with many of them influenced by the connected vehicle of today, and the rest believing that IoT will be mainstream in 2018 or later. They echoed challenges we've heard from many others – funding projects, building a business case, overcoming security concerns, and mastering the data and analytics requirements. But we don't expect those concerns to hold them back for long. IDC's 2015 *Vertical IT and Communications Survey* (conducted by IDC's Global Technology and Industry Research Organization) reveals that manufacturing segments such as automotive and high tech are well above the average for IoT projects in pilot or in production. Discrete manufacturers with IoT projects in pilot or in production have increased from 26% to 32% over the past year.

From IoT to Digital Transformation in Discrete Manufacturing

It's important to note that most manufacturers aren't looking to invest in IoT in and of itself; they want IoT-enabled solutions and ultimately digital business transformation. We do see many companies starting with investments that can evolve over time. For example, most manufacturers begin with

simpler expectations regarding visibility or tracking and eventually progressing to more sophisticated processes that require automated or predictive workflows and responses and provide a level of resource or outcome optimization.

IoT-enabled change through connected products is here or very close for most discrete manufacturers – to collect and analyze actual product performance data, influence future product development, improve service delivery, and increase customer satisfaction. Similarly, the integration of IT assets and information with operational technology in the plant and the supply chain is also on the road map or already started. The most successful investments will create significant business advantage and digital transformation.

IOT IN RETAIL – FOCUS ON THE CUSTOMER AND CONSUMER EXPERIENCE

For most retailers, IoT refers to some form of connectivity, typically wireless, that connects things *and* people across the retail ecosystem to acquire, aggregate, and analyze data in order to glean actionable insights and execute more efficiently. The more common use cases in retail involve connecting people (consumers, associates, and service providers) to products and product information and collecting data about consumer journeys to drive better planning (assortment, demand, and workforce), placement, and marketing. Consequently, most retail organizations refer to initiatives such as wayfinding, consumer journey heat mapping, asset tracking, sensor-enabled inventory management, or personalized interaction rather than referring to IoT. Instead, members of the retail focus group reported that digital engagement and connected customer experience are the terms they use more frequently.

Once Embraced, IoT Will Be a Disruptive Force in Retail

The future of connected retail in 2020 and beyond can be envisioned by most retailers, and the leaders have already tested, deployed, and established long-term IoT strategies. The digital consumer of the future, and to some degree the digital consumer of the present, requires that retailers provide engaging tactile and digital experiences, but predicated on solid data foundations and analytics-driven personalized and contextualized experiences and well-placed merchandise and fulfillment capabilities.

The store is everywhere the customer is, and intuitive frictionless interactions with products and interconnected technologies will happen everywhere. Digital natives want self-service and richer, more intelligent, and more authentic interactions. The "store" needs to enable both. Consumers will be able to shop online by just talking to a connected device (of any sort), and they'll be able to visualize products in 3D and customize them and try things on virtually while engaging with dashboards where they can get opinions from friends and see reviews from perfect strangers.

Importantly, younger shoppers crave this magical world of engagement where they have physical and digital experiences that not only enable the discovery and acquisition of goods but also wow them with frictionless ease throughout the journey. Consumers will have personal digital assistants that are with them every waking hour to remind them to do things, remind them to order dinner, tell them about upcoming events they may want to attend, curate the news, and make shopping lists and create menu plans. These are just a few of the myriad of capabilities that they will have.

Retail organizations have piloted many connected consumer and inventory management-related projects, mainly aimed at improving consumer engagement. While a demonstrable ROI has often been documented, retailers claim that each use case is different, predicated on product assortment, consumer/retailer-specific expectations, and of course the extent of deployments because many do not reach every store, every consumer, or every product. One of the key benefits is increasing the value of

each customer relationship and each transaction over time. Just as critical is improving productivity of all assets – floor space, employees, and inventory. The ability to orchestrate consumer shopping to connect consumers with the products and offers that will resonate best supports improvements on both points.

When Will IoT Become Mainstream in Retail?

There was an obvious bifurcation among the members of the retail focus group. Half of the participants were engaged in various but disparate IoT-related initiatives, and the other half were interested in and excited about the opportunity but are not quite there yet. Furthermore, among retailers that have deployed IoT, 50% believe they have deployed best-in-class capabilities and are ahead of their peers. Broadly, retail leads other industries in terms of IoT maturity; according to IDC's 2015 *Global IoT Decision Maker Survey*, 59.6% of retailers believe IoT is strategic to their future success. Most members of the retail focus group thought that IoT would become mainstream in 2020 and beyond. This finding is consistent with findings from other studies conducted by IDC Retail Insights.

Retail Leaders Transform to Survive and Then Thrive

There is no going back to growing retail through organic growth strategies. Disruptors are finding ways to create retail experiences that lure customers to find and buy products and services that they didn't even know they needed (e.g., Under Armour connected fitness tracking and goods, Warby Parker eyewear). Retailers need to focus on driving rapid innovation to fuel growth, and in order to achieve big leaps, they need to apply a test-and-learn approach that starts with design thinking and is supported by iterative development.

Today, roughly 25% of retail IT spending is directed at innovation rather than keeping the lights on, and retailers are redirecting capital spending into IT, including IoT. One retailer commented during the focus group that "keeping the lights on is engaging consumers differently," and this is being accomplished by innovating store and business models, enabling omni-channel and engaging the customer in whole new ways. The retail IoT use cases that are garnering the most investment right now improve asset tracking, asset control, inventory management, security, payments, and consumer engagement.

Retail winners will be the tastemakers, not the followers. The shift to omni-channel experiences and the shift to frictionless digital engagement will be major drivers of IoT and the adoption of connected consumer and retail technologies. Consumer engagement as part of digital transformation will continue to drive greater personalization and contextualization of experiences, which will require sensors and big data and analytics to improve product assortments, placement, and attractiveness.

The future is already here. Consumers are connected, and the challenge for retailers is maintaining the key role in the consumers' ecosystem of product and service providers. The retailer advantage is in physical-digital converged and enriched experiences with the help of digital, mobile, sensor-enabled, and social engagement.

IOT AND INDUSTRY: INNOVATIVE APPROACHES ON THE PATH TO DIGITAL BUSINESS TRANSFORMATION

As we noted previously in this white paper, though a clearly demonstrable ROI from use and business cases for IoT remains elusive, there are no limits on the imagination when it comes to potential applications and benefits. It is also apparent that when considering either existing or potential use cases, there is significant industry overlap – with an opportunity to strengthen the relationship among industries/value chains and an ability to learn from those industries. Table 1 includes some of

the use cases that were envisioned and validated both in the focus group discussions and in engagements that IDC has had with companies in these industries.

TABLE 1

IoT Industry Use Cases

<p>Strategic asset management: Focus on physical assets</p>	<ul style="list-style-type: none"> ▪ Assets include finished goods and components; electrical and mechanical systems; IT and operational assets, including fleets; rental goods and equipment; medical equipment and supplies (e.g., wheelchairs, gurneys, crash charts); and larger systems of assets, such as a network of plants, facilities, stores, or warehouses. ▪ For healthcare: Combining connected vehicle technology with a real-time location system (RTLS) to enable equipment and supplies to "come when called" or sense when needed based on data collected from other devices or systems ▪ For discrete and consumer products manufacturing: Preventive and predictive maintenance in the plant and supply chain; the ability to dynamically reroute or optimize real-time supply and demand trade-offs; ensuring process safety and security objectives are intact ▪ For consumer products and retail: Sensor technology to track and geo-position promotional end aisle displays to ensure that the displays are in the correct place and fully stocked
<p>Consumer/customer experience: Focus on customers, including consumer, employee, patient, or shopper</p>	<ul style="list-style-type: none"> ▪ Influencing the experience of the customer/consumer/employee in the context of multiple environments, including healthcare centers, retail stores, and any operational facilities, as well as in customer-specific locations ▪ For healthcare: Monitoring medication adherence with escalating reminders and alerts for refills; ingestible sensors to track consumption, combined with mobile health apps and remote health monitoring devices to evaluate drug and care efficacy; using sensor-enabled clinician badges to track handwashing, hours logged on a shift, movement through the facility, and training attendance; remote health monitoring, wearable activity, and wellness trackers ▪ For discrete and consumer products manufacturing: Controlled access to location, equipment, or equipment capabilities based on operator role; direct monitoring/input of user preferences for the product innovation process based on actual usage and buy/no-buy selections ▪ For consumer products and retail: Consumer insights, interactions, and marketing in-store based on consumer location and product in proximity; dynamic replenishment model based on actual product usage or store shelf status ▪ For retail: Determining optimal product positioning, digital fitting rooms, and augmented reality fitting ▪ For retail and healthcare: Personal lifestyle planners and purchasing assistants (based on contextualized dietary, exercise, and health requirements)
<p>Product and service experience: Focus on the product and service delivery using connected products</p>	<ul style="list-style-type: none"> ▪ Most applicable to discrete and consumer products manufacturing ▪ Adaptable product-enabled services (personalized, prepared, and finished products) ▪ Remote condition or location monitoring and preventive maintenance ▪ Automated replenishment of consumables ▪ Warranty and service contract compliance and delivery ▪ Source of actual product performance in customer environment ▪ Input for future product innovation and development of services and new customer experiences ▪ Tracking and traceability information from all suppliers and contract manufacturing and owned factory locations to maintain product quality and product-related compliance objectives

Source: IDC, 2016

Approaching IoT Across Strategy-Process-People-Technology Requirements

As companies and organizations evaluate the impact of IoT on their enterprises, customers, and IT departments and begin to develop their IoT strategy, a number of key questions need to be addressed regarding strategy, people, process, and technology.

Strategy

First and foremost, companies and organizations should determine why they are pursuing an IoT strategy. Forward-thinking companies recognize that IoT is strategically important in achieving cost efficiency and consumer centricity. For early movers, the objective is to create a competitive advantage or differentiate themselves in the marketplace. Enterprises should focus on understanding the strategy and business drivers, determining who will own the strategy, and developing a business case for IoT.

People

Enterprises should evaluate whether they are appropriately staffed to execute their IoT strategy. IT organizations are generally stretched thin and lack the resources to tackle new projects. Do IT and the LOB staff charged with the IoT strategy have the appropriate skills to envision how IoT can be used effectively by their organization? Key skills include data management and analytics. What impact will IoT have on the organizational structure and culture of enterprises? IoT in operational processes may require organizations to shift responsibility for technology governance to operational leadership while maintaining fidelity to corporate IT standards and guidelines.

Process

Many industries are still encumbered by a manual, paper-based process. This represents fertile ground for modernization to use IoT to make significant process changes by automating workflows and manual tasks. Enterprises should examine current processes and then determine how they can be reengineered to leverage IoT solutions effectively. These process changes will require people to do things differently from how they have always done them. For some individuals, these changes will be problematic, creating a natural resistance to the IoT project. Consequently, change management will play an important role in digital transformation.

Technology

Enterprises are beginning to shift from traditional IT architecture to cloud-based and mobile solutions and are making significant investments in big data and analytics, all of which are cornerstones of IoT solutions. Combining data from IoT solutions and enterprise systems will provide a more holistic view of customers, consumers, products, and partners. However, data integration will not be without its challenges. Cloud services, open source software, and standards will make integration easier going forward.

NEXT STEPS FOR IOT AND ITS CONTRIBUTION TO DIGITAL BUSINESS TRANSFORMATION

Although many companies and organizations have already begun to benefit from their IoT investments, it's clear that understanding IoT from a technical perspective and its contribution to the business is an educational process. To move forward, companies and organizations must continue to educate customers, consumers, and business leadership; workers in IT, the store, the clinic, the warehouse, or the plant; and other stakeholders including partners and suppliers. "*Imagine the future, but don't wait for it*" is one of the

most important things companies must keep in mind. IoT, along with other new technologies and innovation accelerators, is essential to the success of organizations and how well they serve their customers. As companies and organizations get ready for IoT and digital business transformation, they should consider the following recommendations:

- **Review your IT readiness.** Review the capabilities of your connectivity and network infrastructure for the IoT foundation. If you haven't started already, define a security strategy that crosses IT and OT. And determine how IoT-related data will interact or integrate with other data sources and systems.
- **Leverage the convergence of new technology investments, including mobile, social, cloud, and an IoT foundation.** Think about building an IoT foundation, even if many of your IoT projects today are executed independently. New hardware, software, and services are becoming available that support a platform approach. In addition to strategic technology investments in sensor/IoT foundations, consider other investments that can help maximize the value of IoT. Mobile, social, and cloud will be part of the solution to gathering, sharing, and analyzing sensor data and taking advantage of new workflows.
- **Exploit big data and analytics to derive insights from the data tsunami.** We can't state enough just how critical data management and analytics are to IoT-enabled solutions. Determine how you will turn data into information and insights as well as the possibility of monetizing the data itself. Develop analytical resources and eliminate the analytics gap to move up the IoT adoption maturity curve, keeping your options open to analytics as a service and other new possibilities.
- **Transform business processes and create business value.** Link IoT investments to your business needs, whether those are for products or for processes. Don't just patch IoT into an existing process; look for transformative capabilities. Apply design thinking and a test-and-learn approach, and consider an innovation center to identify the best use cases for your business. This will also help you understand the utilization and value of many of these new systems and more accurately predict ROI.
- **Improve the customer experience.** Time and time again, companies tell us that the projects that are most likely to receive funding are those that are directly connected to how they serve their customers, whether improving the health of a patient, maximizing a manufactured product's value to a business customer with new capabilities or services, or engaging with consumers to increase their loyalty to a brand. It's all about the customer.

Conclusion

With the abundance of cloud, big data and analytics, social business, and mobile resources – often called the 3rd Platform – there is a surge to bridge digital technologies with operational, organizational, and business models. This link, where *digital transformation* is the objective, allows the business process to run more efficiently while reducing its costs. Digital transformation increases customer satisfaction through better product and service quality while expanding the ways to engage customers (omni-channel, etc.).

However, one of the most important parts of the digital transformation is to be able to connect the many devices that make up its business ecosystem. Connecting the unconnected enables information across the whole supply chain to be gathered and fed into an analytics process to gain insights into as many facets of the business as needed. *This is the Internet of Things.* Business value is created by combining the IoT device data, brokered with environmental, social, and enterprise data, while increasing the original value of the device manyfold. As a result, IoT-based solutions form an integral part of a business' operational model and therefore should be viewed as an integral part of a digital transformation strategy.

From this point forward, businesses will be able to use IoT-based outcomes to feed innovations in new digital areas such as robotics, augmented reality, next-generation security, and cognitive computing.

The focus groups in this study confirmed that the business benefits from IoT will be realized at different speeds and on different scales. Healthcare will continue to cautiously dip its toe into the IoT water, ensuring that patient privacy is never compromised; discrete manufacturing will try to unlock the vast fortune of information in its increasingly connected devices; and consumer products, true to the name, will look to engage in new and compelling ways with digital consumers. Meanwhile, the connected consumer will spur retailers to be aggressive adopters of IoT solutions.

About IDC

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