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The IoT Imperative for Consumer Industries

IN THIS WHITE PAPER

Consumer industries are facing once in a lifetime changes in the way they engage and interact with their customers and consumers. Whether consumer products, retail, or wholesale, there are two broadly unifying trends. First, consumers have both heightened influence and increased expectations. Second, several largely untapped digital technologies have the potential to enable new capabilities to better satisfy customer needs. For the key consumer industries of agribusiness, consumer products, life sciences, retail, and wholesale, the Internet of Things (IoT) will enable many new opportunities. These industries have a shared goal and challenge: to be able to create and offer engaging end-consumer and/or customer experiences at scale. Part of the way that companies will achieve this goal and respond to this challenge is by developing digital transformation (DX) strategies. Such strategies enable new and potentially disruptive capabilities with a broad range of technologies. IoT — defined as a network of networks of uniquely identifiable endpoints (or “things”) that communicate without human interaction using IP connectivity — is a foundational technology for DX. This IDC white paper examines current and future potential for IoT in the consumer industry. In addition, this white paper examines a set of IoT scenarios that are either available today or possible in the future.

Key Takeaways

- Consumer industries can no longer dictate to customers the products and services they offer. Individual consumers now drive the market, and companies must follow their lead. To meet evolving customer requirements at scale, deeper insights powered by the IoT are mandatory.
- Companies must look to new engagement models and rethink key business processes. New IoT technologies and applications must be deployed to both support business needs and maximize the value of existing IT assets.

- There are compelling scenarios for leveraging the IoT to support engagement with digitally savvy customers and consumers. This relationship is B2C when the end user is a consumer and B2B when the end user is a business customer. These engagements are generating business value. Sitting on the sidelines is not a productive approach for companies. They must start implementing IoT technologies now.
- At IDC, we have identified four major IoT scenario categories to generate business value for consumer industries: asset effectiveness, process automation, new revenue models, and consumer/customer engagement.
- Real-time data collected from customers, suppliers, operating sites, retail stores and even consumers must power the development of new products and services. Consumer industry companies are turning to connected devices as well as cloud and analytics technologies to make real-time data collection possible.

Guidance

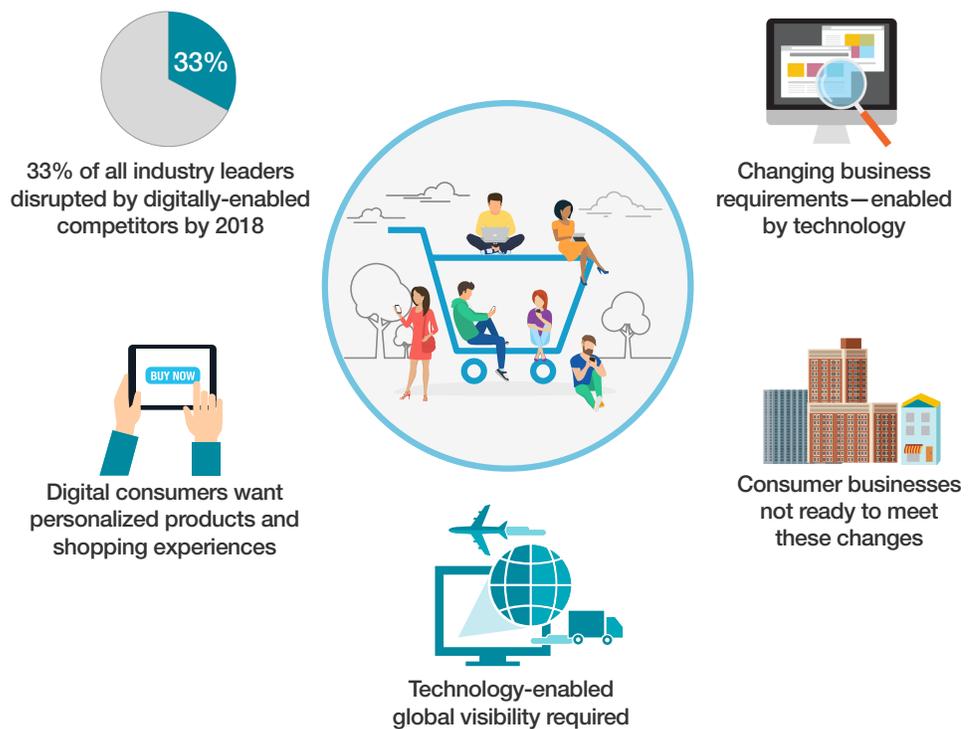
Most of the growth in the consumer industry — 90% over the next decade — will be captured by those companies that participate in a direct-to-consumer model. This participation will occur either directly or through extended value networks. Whether we like it or not, the consumer rules the world — he or she is ubiquitously connected, craves individuality and personalization, and is intolerant of complexity and latency. It is imperative that consumer industry businesses focus on the consumer experience. IoT-enabled DX is poised to dramatically affect consumer and customer engagement. Companies need to prepare themselves to capitalize on new business models and innovative approaches. New business value and new sources of business growth will result when companies leverage core competencies and brand position to deliver unique and personalized consumer and customer engagement.

Companies should aggressively move forward with IoT. Sitting on the sidelines is a poor strategy given all the initiatives forward-looking companies are pursuing today. Consider that by 2018, nearly one-third of industry leaders will be disrupted by digitally-enabled competitors. While not all companies can be leaders, all companies must understand the implications of IoT for their business. Companies must also grasp the underlying capabilities the IoT enables for their strategic positioning in the industry. Technology may not be a core focus of consumer companies, so partnering early with an IoT platform vendor is a smart move.

SITUATION OVERVIEW

New consumer and customer expectations in consumer industries require that companies identify new opportunities for growth, productivity, and profitability. These opportunities are often realized only by making dramatic shifts in business models, strategy and processes. As companies strive to provide engagement that is both seamless and scalable, significant shifts in technology strategies are required. The reality is that today's business performance, even best in class, is unlikely to be good enough in the future (see Figure 1).

FIGURE 1 Transform or Be Left Behind



Source: IDC, 2017

Interconnected and intelligent technologies will enable intentional yet seemingly natural experiences that engage consumers everywhere. The journey may start online or on another digital device, where clickstreams tell a story and one-click engagement is enabled. Or the journey may start in a physical space — a store, a mall, an entertainment complex, a hospital, or a doctor's office — or at an event; and WiFi, beacons, and other sensors will enable rich experiences. Most importantly, more data will drive better contextualized engagement strategies.

One-click self-service and richer, more intelligent, and more authentic interactions will be the basis for experiences that grow the companies' loyal base, amplifying business performance in the process. Consumers want everything now — one-click sensor-enabled buttons, schedule and fulfillment info, discount opportunities, consumer care assistance, support, and so on. Consumer businesses will need to enlist capabilities that create frictionless, intuitive, convenient, and easy pathways that enable this immediacy. The underlying technologies include mobility, IoT, cloud, and big data–based systems.

Business Drivers in Consumer Industries

At a time when expectations are rising and consumers and customers are more digitally savvy than ever before, companies must be prepared to make the necessary investments to meet expectations for ease, convenience, and speed.

IDC identified the drivers that will have the greatest influence on technology buying in 2017:

- **DX: Technology-centric transformation altering business and society.** Consumer industries of every variety and size face potential disruption enabled by major technological shifts and reinforced by changing consumer buying patterns, new competitors, and new ecosystems. Organizations dealing with legacy, disconnected, and siloed systems have latencies and speeds that cannot support modern consumer business, nor do most of the legacy systems allow organizations to quickly launch the types of services that customers today expect.
- **New funding models: Accelerating disruption and innovation.** Consumer industries will overcome challenges to funding innovation by identifying new ways to reduce capital outlays. Among the top ways to reduce costs are considering cloud and development collaborations and increasing efficiency through asset and head count redeployments. Companies will also leverage capital saved from rebalancing real estate property investments and by increasing investments in technology that reduce the fixed asset cost of doing business. New capital flows will enable higher levels of technology investment.
- **Everything, everywhere: The rise of artificial intelligence (AI) and machine learning.** Technologies that augment human intelligence and drive smarter decision processes, workflows, and engagement strategies improve business outcomes. Consumer industries must understand and capitalize on the opportunities presented by AI. A big focus area is engaging consumers everywhere in a personalized way with well-calculated precision. Consumer journeys with hyperconnected, real-time interactive engagement facilitated by advanced analytics will become best practice.

- **Disruptive fault lines: Security, privacy, and regulation.** Consumer industries are very vulnerable to disruptions and challenges related to security, privacy, and regulation. Digital security initiatives need to evaluate and mitigate this new array of risks while ensuring privacy, confidentiality, integrity, and availability.

Key Capabilities for Consumer Industries

The ability to create and offer engaging end-consumer and customer experiences that are both personalized and timely is the digital mission IDC broadly defines for the consumer industry. It is not enough to meet the needs of broad consumer segments; it is also necessary to meet and exceed the needs of individual consumers. Innovation excellence is paramount — the success of new products, the number of new products introduced, and the ability of the supply chain to manage different engagement models will be the focus of innovation initiatives. Consumer and customer expectations in the consumer industry segments will make personalized strategies mandatory. Implementation success and efficacy will determine profitability and competitive differentiation.

IoT is becoming an increasingly relevant strategy for running a consumer business. IoT-enabled business models are designed to both engage consumers effectively through every aspect of the journey they take and improve the underlying capabilities that underpin their journey.

Over the next decade, 90% of growth in the consumer-facing industry will be captured by companies that successfully engage directly with consumers. Consumers today are in the driver's seat. Those companies that figure out how to best engage with these consumers and customers will be the ones that realize more than their fair share of growth. And, as more traditional older consumers give way to digital natives, the “problem” just gets worse because these newer consumers are better able to leverage new technologies and approaches.

IDC views IoT as a continuum. Some IoT-enabled capabilities are evolutionary in that they result in better efficiency or effectiveness. Examples include the ability to collect asset status data in real-time, or to move inventory from freezer cabinets/vending machines. Other IoT developments are revolutionary — they can contribute to a company reimagining its core business or the way in which it engages with consumers. Examples of this might be offering experiential services from instrumented products or engaging with consumers in real time in their homes or places of work. Either way, IoT is poised to dramatically change the way in which consumer industries and their customers and consumers interact.

The IoT Imperative

IoT is enabling organizations to reinvent how they engage with their customers and consumers, helping accelerate the speed at which they deliver their products and services. Thus, IoT is reinventing existing industry processes. IDC predicts that the worldwide IoT will represent upwards of \$1.3 trillion in 2020, supporting 30 billion connected endpoints.

The IoT is a key element driving DX. At the heart of IoT-enabled DX is the generation, analysis, and response from data that delivers meaningful intelligence across the business — data that is derived from the use of connected devices. Today, leading consumer- and customer-facing companies recognize the importance of DX to their ongoing survival and future success, with IoT emerging as a key component of DX.

Consumer industry companies are employing connected devices as well as cloud and analytics technologies to collect real-time data from suppliers, factories, products and customers. This data facilitates the monitoring of critical assets, equipment, processes, and product parameters. Companies are also using the IoT to create connected supply networks that keep track of inbound and outbound shipments for location-related information and in-transit factors. Such tracking simplifies logistics as well as the routing of vehicles.

For retail companies, collecting IoT-generated data from customer interactions, purchase histories, and locations within stores enable the delivery of personalized products and services. Retailers also use the IoT to gain real-time access to inventory, production, and shipment histories and to mitigate manual errors and enhance quality assurance procedures. Even the agricultural industry is employing IoT to markedly improve operations. Agriculture companies are tracking livestock, forecasting crop yields, monitoring soil parameters, and streamlining production processes.

As more businesses begin to explore the ways in which the IoT can transform their operating models, functional areas, or even specific business processes, IT and line-of-business executives will act on IoT opportunities with urgency. In the longer term, digital transformers will employ vastly different business models and strategies enabled by IoT technologies to gain competitive advantage in their markets.

To successfully implement IoT, businesses need to assess their digital maturity and readiness. This requires rethinking strategies for engaging with end consumers and customers and identifying investment from key stakeholders within the enterprise. These stakeholders from across the executive suite, IT, and lines of business will need to collaborate to define practical scenarios where connected devices and IoT-generated data can help create value. IoT investments will need to be linked to specific business needs — such as products, processes, or customer experience — and should avoid simply being “patched in” in a piecemeal manner.

Value Generation Scenarios

IDC has identified four major IoT scenario categories that can generate business value for consumer-facing businesses: consumer/customer engagement, new revenue models, asset effectiveness, and process automation.

- **Consumer/customer engagement.** Companies seek to provide a contextualized and personalized consumer or customer experience based on information collected about the customer, consumer, or employee. Examples include the personalization of food products based on purchase patterns or the ability to use sensor-based augmented reality for self-service.
- **New revenue models.** This involves enhancing a product or delivering a service based on IoT enablement. Essential to this are collaboration and shared systems enabling collaboration that 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 scenario may be B2B or B2C. Examples include automated replenishment of batteries for power tools or linking fitness or lifestyle apps to propose reorders for items such as clothing or running shoes based on ongoing monitoring of use and wear and tear.
- **Asset effectiveness.** By monitoring the status, location, and movement of physical assets that it owns, an organization can increase the performance, efficiency, safety, security, and throughput of those assets which may be maintained and managed. Examples include predictive maintenance of factory or field assets or the real-time monitoring of freezer cabinets at retail.
- **Process automation.** IoT infrastructure and generated data can be used to automate process and data flows for demand forecasting, trade promotion, store merchandising, order processing/replenishment, or supply chain improvements. This drives efficiency and efficacy and enables new capabilities. Examples include better capture of point-of-sale data, on-shelf availability, or inventory management at wholesale.

Agribusiness Scenarios

Agribusiness is a particularly compelling industry for IoT because of the inherent distributed nature of assets and the need to monitor those assets in real time to drive necessary efficiencies and production yields.

Livestock Monitoring

Value Drivers:

- Reduced stock losses through livestock condition and health monitoring
- Improved efficiencies through real-time asset movement and location data
- Optimized delivery of feed to reduce waste and working capital

IoT is changing how farmers interact with their livestock to improve efficiencies, increase production, minimize fertilizer use, and monitor animal well-being across their vast properties. Farmers can monitor their herds in real time, often over very large geographically dispersed areas, providing real-time insights into the overall health of the herd while helping manage stock levels and reduce stock losses. All of this can be done remotely using sensors, low-power WAN connectivity, and a cloud platform, allowing farmers to observe and analyze each animal, on an as-needed basis.

Product and Portfolio Optimization

Value Drivers:

- Increased yields by monitoring crop health and environmental condition data
- Minimized environmental impact through sensor-based rotation and fertilization application
- Optimized timing and scope of harvesting to maximize overall production yields and quality

Agribusiness is working to minimize the impact of farming on the environment by optimally managing food supply chains. By using sensors to collect data and transferring that data to cloud applications for management and analysis, farmers will be able to make real-time decisions, optimize processes, and create strategies that in turn will improve the efficiencies of their crops and livestock. Examples include precision watering, fertilizer application, targeted harvesting, or preventive healthcare.

Benefits include optimizing processes through real-time decisions, creating strategies to improve efficiencies of crops and livestock, minimizing environmental impact, and improvements in sustainability. We already see sophisticated crop monitoring in the wine industry where accurate designation of grape varieties is a key driver of product quality and appeal.

Life Sciences Scenarios

Cold Chain Supply for Biologics

Value Drivers:

- Improved safety and efficacy of environmentally sensitive drugs
- Reduced theft and lost drugs
- Decreased inventory requirements and incidental spoilage

IoT tracking sensors and networks will help life sciences companies ensure the safety and efficacy of their products in transit and in storage. Investment in cold chain IoT networks will be driven by safety and compliance concerns; these investments will also contribute to savings from lower inventory and spoilage costs. By 2020, more than half of the top-selling drugs are expected to be biopharmaceutical or biologic products requiring temperature-controlled transportation and storage, usually 2–8°C, but sometimes frozen or cryogenic. This requires a huge network of time/temperature sensors in factories, warehouses, trucks, labs, and pharmacies that can monitor and send this information, for both clinical trial supplies and approved products.

Smart Pill

Value Drivers:

- Improved patient compliance and maximized drug effectiveness
- Reduced medical costs due to improper drug usage
- Decreased incidental spoilage and waste in supply chain

The Proteus pill by Proteus Digital Health contains a tiny ingestible sensor that can communicate to a wearable patch on a patient's skin when the pill has reached the patient's stomach. The patch then communicates status to a mobile device. The technology can be helpful for conditions where adherence to taking prescriptions has traditionally been poor. Related technology includes "smart" pill bottles that can send signals to portable devices when opened or altered, thereby improving safety and reducing fraud.

Benefits include real-time location and deployment of drugs, ensuring the safety and efficacy of products in transit and storage, and improvements in tamper resistance. Cold chain monitoring also has direct applicability for consumer products and retail, both of which manufacture, move, and sell a large range of refrigerated or frozen products. We already see the use of sensors to monitor the removal and use of drugs in hospitals to ensure proper accounting of consumption.

Retail Scenarios

Retailers are particularly interested in IoT now because it is both driving pragmatic improvements in asset and inventory management and providing the connective tissue for enriched consumer experiences. IoT will be a critical enabler of the shopper experience in retail, whether improving the ability to find the right product, understand how products might better work together, or expedite the checkout process.

Connected Customers (or Consumers)

Value Drivers:

- Improved customer satisfaction, enhanced loyalty, creation of larger transactions, and support for more frequent visits
- Increased product sell-through, reduced markdowns, and improved profitability
- Enhanced personalized marketing driving higher conversion rates and better sales performance

IoT improves the customer (consumer) experience experientially, largely because information quality is improved as is engagement. Using IoT to connect people (consumers, associates, and service providers) to products and product information underpins visibility to, and availability of, product. The improved inventory accuracy that is the result of IoT-enabled inventory management processes provides a solid foundation for all inventory tasks, whether conducted by consumer, associate or service provider/partner. The inaccuracies common in inventory systems today are the root cause of abandoned order carts, dissatisfaction, and brand switching.

The omni-channel “store front” needs to enable both self-service and richer, more intelligent, and more authentic interactions, which drive loyalty, preference and frequency. Analytics and IoT combined enable organizations to extend offers and to inspire purchases anywhere and

anytime — at home or out of home, and in physical or digital outlets. Whether connecting through personal, business, or borrowed (as in the case of self-shopping) devices, interactions are completed in context of individualized buying history, current needs, and customer (consumer) purchase stage.

Product Availability

Value Drivers:

- Increased incremental sales through improved on-shelf product availability
- Accelerated inventory turns and reduced overall inventory safety stocks
- Increased efficiency in replenishment actions due to status and inventory data collected and sent to retail decision-makers in real time
- Reduced shrinkage via better inventory management

Last-mile logistics and perpetual inventory problems have plagued retailers and adversely affected on-shelf performance. Although the instrumented shelf is a possibility in the future as a feedback mechanism for product availability, the more near-term applications for IoT involve better tracking of products as they move in and out of the back room of the store.

Benefits include the improvement of the customer experience through creating seamless customer journeys, while also increasing business productivity and efficiency through more effective use of inventory and higher on-shelf availability. While the “smart shelf” remains elusive, the use of sensors to ensure the proper positioning of promotional displays is in use across many retail chains.

Consumer Products Scenarios

The consumer products industry is in flux. Much of the growth is coming from new, peripheral competitors that employ different business models and different ways of demonstrating value to the consumer. Some of these engagement models are built on IoT capabilities. While this industry has been actively engaging in consumer IoT pilots and leverages IoT already in the supply chain and manufacturing, broader consumer engagement implementations are still uncommon. This must change if established companies are going to find new ways of engaging with consumers.

Connected Demand and Supply

Value Drivers:

- Improved demand forecasting to reduce working capital and waste
- Enhanced balancing of inventory and plant capacity to improve efficiency
- Reduced stock outs via real-time in stock monitoring

Maintaining and managing accurate demand forecasts and aligning those forecasts to optimize production capacity to meet forecast demand are critical challenges. Although demand data feeds are becoming more common, they are incomplete, are not typically in real or near real time, and fail to adequately predict future demand. Instrumenting demand signals from customers creates a more accurate and usable representation of real-time demand in the replenishment process. This data will also enable real-time monitoring of available inventory, inventory in transit, and inventory on shelf and send a signal when supply has dropped below a certain preset threshold.

Intelligent Asset Fulfillment

Value Drivers:

- Improved remote asset utilization and condition
- Increased sales via improved product quality and consumer experience
- Reduced waste via spoilage
- Enhanced monitoring and control of field assets in real time ensuring that temperature-sensitive products are presented in the best possible condition

Many consumer products companies that sell refrigerated and frozen foods often own and manage branded freezers, coolers, and other refrigeration (i.e., cooling) units that they place in various retail locations. These cooling units represent a significant ongoing investment in assets, maintenance, and inventory. Further, the improper operation of these assets may adversely affect the consumer experience (i.e., refrozen ice cream). It is essential that these assets are placed and operated correctly within the retail environment.

Benefits include meeting demand appropriately while minimizing spoilage, improving quality control and the consumer experience through real-time asset monitoring, maximizing equipment uptime, and reducing losses due to theft or damage. Consumer products companies are already using sensors to monitor ice-cream cabinets, as well as enabling customization of beverages (i.e., the Coca-Cola Freestyle machine).

Wholesale Scenarios

Almost exclusively operating in a B2B environment, wholesalers have been less affected by the rapid pace of consumer-driven technology adoption than their counterparts in consumer products and retail. Regardless, IoT adoption appears to be quite robust. The wholesale business has changed dramatically over the past decade due to the emergence of new competitors like Amazon and Alibaba. IDC sees wholesalers pursuing many new initiatives that employ digital technologies like 3D printing and IoT to enable new product offerings and service capabilities for their customers.

Real-Time Inventory Management

Value Drivers:

- Reduced inventory levels and fewer unsalables via improved visibility
- Improved service performance while lowering costs

Wholesale deals with high SKU counts and poor inventory visibility and flexibility (often replete with “unsalables”). The opportunity here is to reduce the overall dollar value of the inventory while improving its ability to meet demand and buffer needs. There also is a capability to extend visibility into inventory movement and demand back to consumer products companies. This addresses the issue of losing visibility to inventory distribution and consumer demand once the wholesaler takes ownership of the product.

Intelligent MRO

Value Drivers:

- Increased customer asset uptime and reduced cost by predictive maintenance before asset failure
- Enhanced effectiveness and reduced cost of remote service and parts delivery
- Improved customer satisfaction by decreasing issue response time

The ability to quickly address and assess customer maintenance, repair, and operations requirements is both a service challenge and an inventory challenge. In the field, real-time awareness of asset condition — through dense deployment of wireless and wired sensors — will enable wholesalers to better understand where to deploy spare parts and repair services. Instrumented assets would include factory and warehouse assets as well as remotely installed commerce assets (i.e., coolers and refrigerators).

Smart Vending Machine

Value Drivers:

- Increased sales via proactive replenishment in real time
- Enhanced service performance while maintaining lower inventories
- Reduced customer asset downtime response time and costs

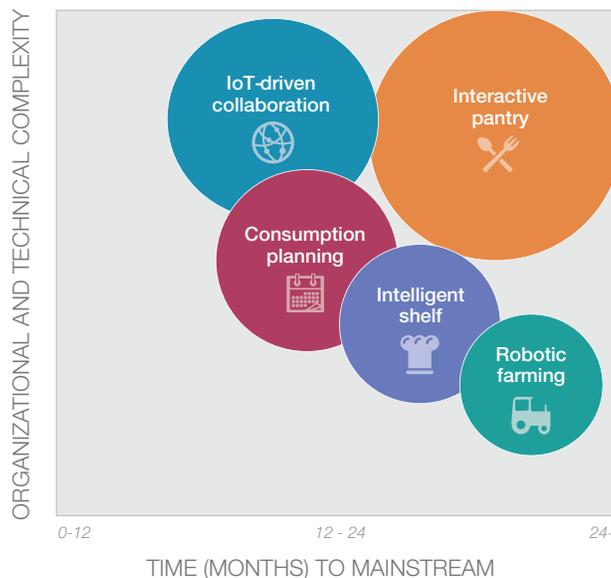
Perhaps the most common current IoT scenarios in wholesale is the ability for a supplier (in this case, the wholesaler) to maintain an inventory of items within a customer location that has instrumented inventory monitoring. When an item is removed, a signal is sent to the wholesaler that can then auto-replenish inventory based on preset thresholds to ensure that items are available as needed.

Benefits include real-time awareness of assets and facilities intelligent MRO, and improved ability to maintain inventory levels at customer locations. Real-time inventory management is certainly applicable beyond wholesale to any consumer-facing businesses or intermediaries that maintain inventories of finished products. Smart vending machines are already in place in some industries such as aerospace.

Future-Looking Scenarios

It is also instructive to look to the future to see what's possible — and potentially disruptive. In Figure 2, we highlight a few examples

FIGURE 2 Future Scenarios

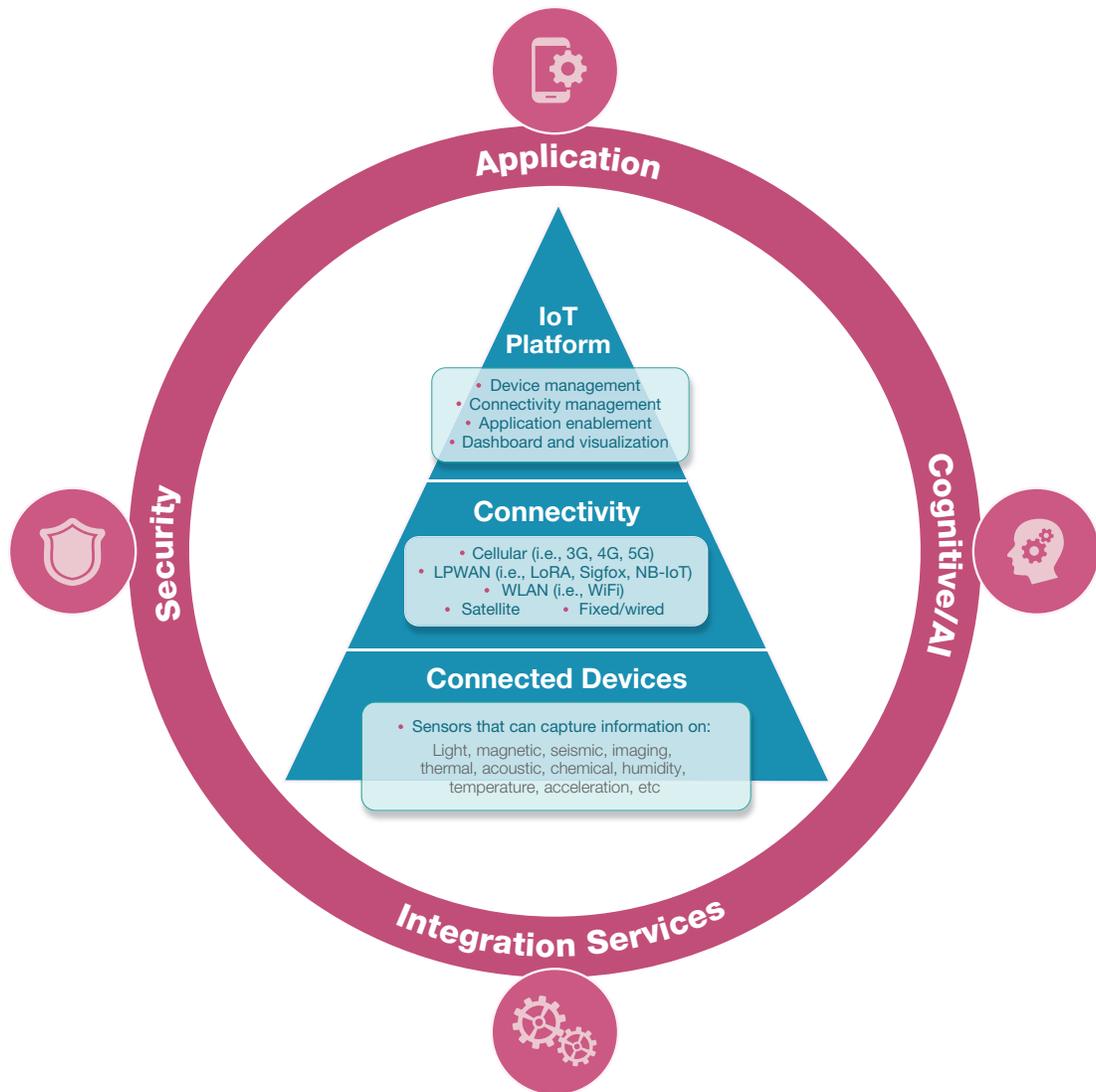


- **Robotic farming** leverages deployed sensor networks to monitor assets or conditions in real time with drone- or robot-based intervention capabilities. The network of “things” could interact both with human beings as well as among themselves in a system-wide, coordinated and scalable way.
- **An interactive pantry** could finally fulfill the promise of the “smart fridge” by enabling sensor-driven interactions with consumers. These interactions could include offering suggestions based on items selected, developing e-shopping lists, or linking with personal nutrition data. The consumer could also cede certain shopping responsibilities directly to the interactive pantry, enabling it to place online orders automatically once certain thresholds are reached.
- **Consumption planning** becomes feasible as supply chain visibility improves and IoT-sourced real-time data becomes the norm. Mature supply chains may be able to do deployment (or consumption)-based replenishment rather than forecast-based replenishment. A cognitive/AI system then acts as an automated alternative to the traditional short-term forecasting, with the opportunity to dramatically reduce forecasting error and improve service performance. It’s conceivable that automated short-term forecasting could lead to automated adjustments to production plans and then even automated changes to planned materials procurement.
- **Intelligent shelves** have been piloted for some years, yet the ability to deploy material within retail stores has not yet been achieved. This is where the sensor-driven smart shelf comes in.

The Underlying Role of Technology

For an IoT project to come together, the coalescence of several different technology elements, including hardware, software, and connectivity, is required. In most cases, the cloud and analytics play the biggest role because they allow scalability and interpretation of the data, respectively (see Figure 3).

FIGURE 3 IoT Changes the Paradigm across the Business Organization



Source: IDC, 2017

Simply put, the IoT encompasses the attributes of the 3rd Platform — big data, cloud, social, and mobile. Big data enables real-time decision making and provides the engine for powering new data sources. The cloud allows for variable workloads from connected endpoints as well as the scalability and flexibility that are crucial for the deluge of data expected from the numerous IoT endpoints. Mobile enhances field processes and connects endpoints from a variety of (often remote) locations, and social provides an outlet for automated responses from the connected endpoints to interested end users or decision makers.

CONCLUSION

The impact of IoT on the consumer industries is poised to be significant, particularly in terms of how these businesses interact with their customers and, even more significantly, their consumers. Given the growing desire among consumers for “personalized” experiences that include both products and services, it’s clear that the innovation process will need to be more productive and effective in the future. Forget about focus groups. The companies that figure out how to engage with a large set of consumers and use those interactions as input into the innovation process stand to revolutionize the industry. Consumer engagement must happen in a way that meets the evolving needs of consumers over time.

Consumer companies’ use and adoption of technology for IoT varies. To date, life sciences has been more aggressive and wholesale has been less aggressive. In our discussions with companies in these industries, most indicate that they are exploring near-term scenarios in areas like the supply chain.

The reality is that IoT is happening now, and there are many scenarios that can be adopted. The key is for companies to prepare. Whether a scenario can be implemented today or is speculative, it’s important to have the technology and IT infrastructure in place. With preparation, companies can be ready to adopt IoT rapidly.

Companies need to be ruthlessly objective in self-assessing their digital preparedness. IDC recommends companies do the following:

- First, conduct a risk-benefit assessment to define strategic and tactical goals, including a high-level benchmark against key industry competitors, both traditional and emerging. Align efforts with customer needs, key business goals, and the likelihood of market disruptions.
- Second, begin/continue the process of systems and business process modernization — be “digital ready.”
- Last, identify the ecosystem of partners that can help get started with IoT and proceed on the path toward digital transformation.

Glossary of Key Terms

- Asset tracking: The ability to know where assets are at all times
- Digital transformation (DX): Use of 3rd Platform technologies — big data, analytics, social, and mobile — to create value and competitive advantage through new offerings, new business models, and new relationships
- Internet of Things (IoT): A network of networks of uniquely identifiable endpoints or “things” that communicate bidirectionally without human interaction using IP connectivity
- Omni-channel store: The concept of providing customers/consumers the place and time of their choosing — whether physical or online — to purchase products or services
- Sensor-enabled inventory management: The instrumentation of inventory to know exactly what inventory is in which location

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