The Business of Things

Designing business models to win in the cognitive IoT

IBM Institute for Business Value

Transforming businesses as the Internet of Things expands

As a global electronics company, IBM understands the issues facing the high-tech industry and the continuous transformation required to thrive. Companies are turning their attention to a new generation of connected devices that will transform not just the electronics industry, but many others. The IBM Global Electronics practice uniquely combines IBM and partner services, hardware, software and research into integrated solutions that can help you deliver innovation, create differentiated customer experiences and optimize your global operations. Please visit http://www-935.ibm.com/industries/electronics/ and http://www.ibm.com/internet-of-things/.

Succeeding in the changing Business of Things

As the Internet of Things (IoT) becomes ubiquitous and the cost of embedding connectivity and intelligence gets cheaper, companies are now focusing on how to successfully compete in the IoT. The new "Business of Things" is moving beyond selling connected, intelligent products and beyond selling new services. It is expanding to deliver compelling experiences over the life of a product.

Throughout the electronics industry, executives need to focus on IoT strategies and business models that: enable "things as agents" to create more valuable experiences; co-operate through the complexity of evolving ecosystems to deliver these experiences; and establish a new order of business that aligns the organization with an IoT strategy.

Executive summary

Few inventions have affected society as profoundly and universally as electricity. When Edison invented the electric light bulb, he saw electricity as a "field of fields," giving the opportunity to "reorganize the life of the world."[1] Indeed, it was more than just electric lights replacing gas lights. As electricity gained economies of scale and became commercially available, "things" from streetlights to stovetops became plugged in. The commoditization of electricity spawned many countless industries and businesses that would otherwise be inconceivable and electricity became fundamental to life in the 20th century.

Still in its infancy, the IoT is similarly at the threshold of another tremendous, transformational opportunity. Connecting things with unique IP addresses has been possible for over a decade, but the commoditization of sensors, processors and memory now make it commercially viable to make everyday things significantly intelligent and not just connected.

Across industries, the IoT is making it possible for companies to move far beyond merely selling connected, intelligent products and services. They are expanding their offerings to deliver compelling experiences over the life of their products: It's what we refer to as the new Business of Things.

To explore how businesses can be successful in this new era, we conducted the 52-hour IBM Business of Things Jam in mid-October 2015. The online event garnered over 38,000 page views. More than 1,900 registrants in 70 countries engaged in online polls and over 1,100 discussion threads. One hundred eighty-three C-level executives engaged in this exploration of the challenges related to monetizing the IoT (see "About our research" sidebar on page 17 for more details).

The **convergence of IoT maturity and cognitive device intelligence** offers unprecedented opportunity to **create value** and **build stronger customer relationships**.

As the **electronics industry expands** and **new ecosystems emerge**, it will become more important for devices to **orchestrate seamlessly across open, cross-industry platforms**.

Organizational challenges rank higher than technology challenges in implementing IoT strategy as companies **reinvent their identities** in the IoT.

Our analysis of Jam findings led to this executive report, which is the fourth in the IoT thought leadership series from the IBM Institute for Business Value. This report qualitatively and quantitatively addresses how companies, especially those in the electronics industry, can build their business model strategies to create and deliver value in the fast-changing business of smart devices. We highlight some of the challenges ahead, as well as explore three key insights to guide executives in strengthening and adapting their organizations to best engage in the Business of Things.

Arguably, some of the greatest inventions became invisible, like electricity and the Internet. If the Business of Things becomes so pervasive that it is the normal course of business, the IoT will have reorganized the world once again.

Challenges ahead

We are entering an era of billions of connected devices. Analysts estimate there will be over 30 billion connected devices by 2020.[2] Yet many companies are very early in their IoT strategic planning and a number of challenges must be addressed. These include:

Early stages. Seventy-five percent of Jam poll respondents indicated that their organizations' IoT solutions are not developed or only slightly developed. This suggests that most companies are beginning to connect their devices and collect data, but are not using insights to generate value.

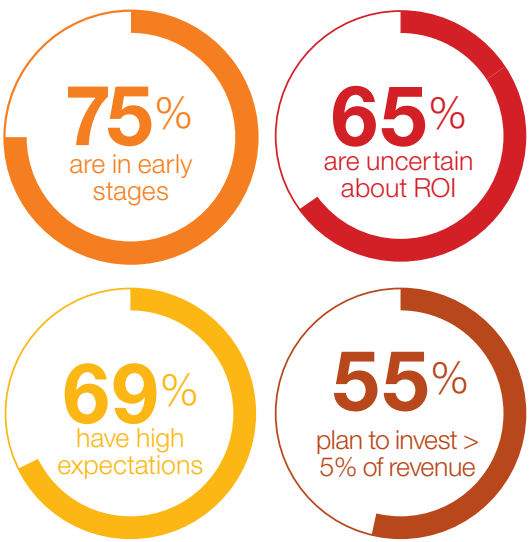
Growing investments. Our research shows that investments in the IoT are largely less than 1 percent of revenue now, but growing rapidly. Fifty-five percent of companies in the Jam expect to increase such investments to more than 5 percent of revenue in the next five years. This outlook is validated by forecasts for a leading USD 20 billion home entertainment device manufacturer over a five-year period.[3]

High expectations. Expectations are high, especially for new business models. Sixty-nine percent of Jam poll respondents said that the IoT can help improve their line of business through new business models and revenue streams. Across the electronics industry, new business models continue to emerge. As an example, in the current evolution from broadcast TV to on-demand TV, TP Vision offers a "pay as you go" platform-as-a-service priced at a fraction of a dollar per year per connected device, thus growing its market to over 6 million connected TVs.[4]

Uncertain return on investment (ROI). Despite the growth in investment and the promise of value, profits in the IoT remain elusive. Sixty-five percent of Jam participants indicated they are unsure about how they can monetize the IoT. Industry sentiment suggests there is uncertainty in approaches to achieving ROI and it is a "difficult and confusing" problem (see Figure 1).

Figure 1

Four challenges of the evolving IoT landscape



Key insights from the Business of Things Jam

Three key insights from Jam findings can help executives develop business models to improve their competitiveness in the Business of Things:

Things as agents. Shifting trends in product ownership and management suggest that companies must begin to focus on creating valuable experiences. As things become capable of learning and adapting to their users, they can begin to act like *"agents"* on behalf of the user. Cognitive intelligence in devices can help enhance experiences by discovering new insights and creating stronger relationships with users.

Co-operating through complexity. The IoT is reshaping the electronics industry, making it more complex and heterogeneous than ever before. Industry boundaries are expanding and requirements to support multiple ecosystems are increasing. Collectively, these forces are driving the need for platforms that can manage this complexity by orchestrating devices and services seamlessly.

A new order of business. As the IoT ecosystem continues to expand, companies are reinventing their identities. When it comes to implementing IoT strategy, organizational challenges are even more pressing than technology challenges. Aligning the organization with the company's IoT strategy will necessarily change the way companies lead, learn and prepare their workforces as the IoT permeates organizations through an expanded Chief Technology Officer (CTO) mission.

Things as agents

Unlike mobile devices such as smartphones and tablets, things in the IoT have much greater longevity and opportunity for sustained customer relationships. Our research suggests that as more things become connected and intelligent, companies need to pay attention to shifting trends in product ownership and management, and their impact on business models over the life of these products (see Figure 2).These impacts include:

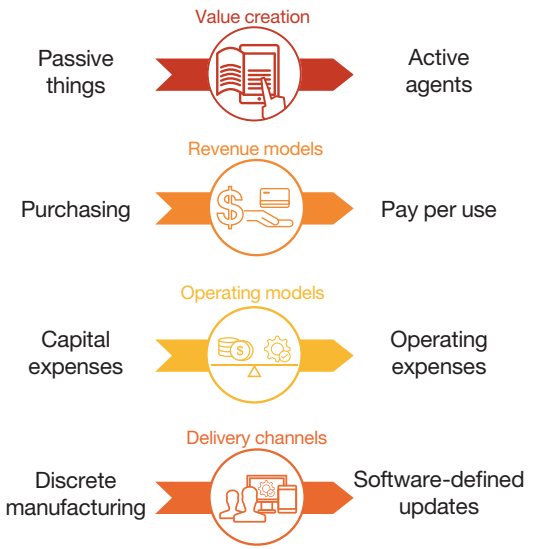
Value creation. Enabled with machine learned user models and natural language user interfaces, the next generation of smart devices will enhance even the most complex user experiences. As things in the IoT become capable of learning, adapting to end-user needs and interacting via natural language, they will begin to behave like agents, significantly simplifying the experience and increasing the core value of the product.

Acting as agents on behalf of the user, these devices can learn and become more intelligent over the life of the device, and communicate in natural language with a high degree of confidence and context. They can also discover new insights based on user behavior that can be used to build a stronger relationship with the end user.

Revenue models. Ownership could soon become supplanted by alternate acquisition models. Access based consumption and payment – where consumers want access to goods and prefer to pay for the experience of temporarily accessing them rather than owning them – is becoming more popular.[5] IoT-based digital tracking and contract reinforcement also reduces risk in lending, making leasing of high-value assets possible while increasing their utilization and economic value.[6]

Figure 2

The Business of Things will change the fundamental building blocks of an organization's business model



"As the IoT accelerates, not only will we have more data and more 'access' to data, we will need to detect new patterns in order to unlock new value. Different from computer programming, pattern recognition becomes a skill that can enhance not only product design but also new methods of user interaction and experience."

Sarah Miller Caldicott, CEO, Power Patterns
(Great grand-niece of Thomas Edison)

Operating models. Analogous to cloud computing, IoT allows the opportunity to spread large capital investments to ongoing operating expenses and revenue-generating activities. As the distribution of investment shifts, the economics of the IoT offer the potential to reduce overall risk to companies. For manufacturers of new products in the IoT, heavy capex models with redundant infrastructure are giving way to more flexible continuous engineering approaches.

Delivery channels. Discrete manufacturing to enable new product features is being complemented by software-defined methods. To future-proof products from fitness trackers to cars, new features to improve product capabilities are becoming available via over-the-air updates.[7] Even sales and advertising models are transforming to simply advice the customer on a replacement product when repairs are no longer cost-effective.

These shifts indicate that the strategic direction of companies in the Business of Things must extend from just selling products and services to create compelling experiences over the life of a product.

Invisible or intuitive

Even as these shifts begin to take shape, the number of connected devices is rapidly increasing. Our research indicates that in five years, the number of users with over 20 connected devices will increase 44 percent and 83 percent users will own at least 10 devices, and most physical products will be transformed into digital experiences.[8]

At this scale of transformation, many machine-to-machine interactions will need to become invisible and machine-to-human interactions will need to become more simple and intuitive (see Figure 3).

Figure 3
IoT interactions will need to become either invisible or intuitive

The future of IoT is cognitive

Essential to achieving this simplicity and intuition will be the evolution of natural language processing and cognitive systems. The market for natural language interfaces alone is expected to grow to USD 13.4 billion by 2020.[9] Simultaneously, device intelligence is evolving from basic descriptive and predictive capabilities to more sophisticated prescriptive and cognitive interaction (see sidebar, "The evolution of a cognitive washing machine").

Evolution of a cognitive washing machine

Descriptive: Notifies user when wash cycle is done.

Predictive: Diagnoses impending failure of a part.

Prescriptive: Orders a required part and verifies payment if not under warranty.

Cognitive: Recognizes usage patterns that indicate excessive energy consumption and high probability of future part failures. It could:

a. Optimize utilization based on color, fabric, weather and calendar, and adapt settings to load size and contents

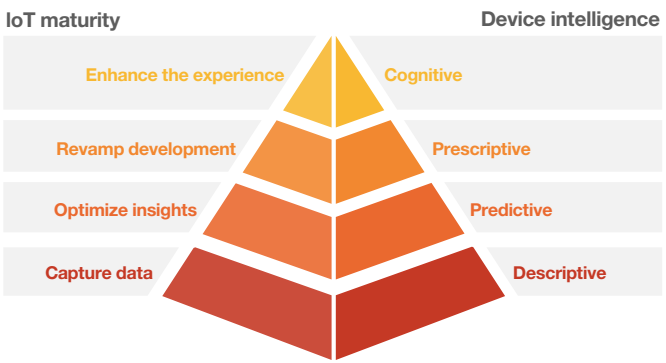
b. Identify and download new features that address these failures with software-defined updates

c. If options (a) and (b) are no longer feasible, advise on a replacement model with low probability of these failures.

In the IBM CORE maturity model, leaders in the electronics industry extend the value of a product by enhancing the user experience.[10] The convergence of IoT maturity and cognitive device intelligence at the top of the CORE pyramid represents the future of how users will interact with and experience products and offers unprecedented opportunity for companies to gain competitive advantage using insights to build stronger customer relationships (see Figure 4).

Figure 4

The top of the CORE pyramid represents the convergence of IoT maturity and cognitive device intelligence



- *Capture data.* Gain new insights through collecting and standardizing data.
- *Optimize insights.* Further deepen the insight by applying intelligence to collected customer and business information.
- *Revamp development.* Increase credibility in the marketplace through the introduction of more intuitive and relevant products and services.
- *Enhance the experience.* Extend the value of the product via introduction of new value added services.

Co-operating through complexity

Things in the IoT are not discrete entities anymore. The electronics industry is witnessing its biggest opportunity, as nearly every passive thing turns into an active device and point of experience. To successfully deliver this value, it is becoming increasingly important to recognize how devices enabled by the electronics industry will interact, and which industries are likely to become logical extensions of electronics markets, ecosystems and end users.

Expanding boundaries. Our analysis suggests that the automotive and healthcare industries will be the first logical extensions to the electronics industry in the IoT transformation. Together, our Jam results show that they constitute 82 percent of industries impacting the IoT. Also, analysis of Jam insights suggest that almost 50 percent of this transformation is expected to happen outside North America. The expanding electronics industry will be challenged to address the needs of countries and regions with multiple languages, diverse use-cases, and enable greater customization and personalization.

Multiple ecosystems. Each industry is struggling with its own set of technology platforms, protocols, operating systems and compliance standards. The electronics industry has the additional challenge of supporting not just its own ecosystem, but also those of adjacent industries (see sidebar, "The challenge of integrating multiple ecosystems"). This has resulted in an explosion of requirements on the electronics industry.

Managing complexity

The various permutations in the "wheel of complexity" are making it harder for electronics products to interact (see Figure 5). In the Business of Things Jam, interoperability stood out as the biggest challenge to IoT adoption. It requires open, extensible cross-industry platforms that can anticipate and accommodate high levels of complexity. Experience platforms that bridge devices and services across vertical applications can greatly help manage the complexity of the IoT and increase consumer adoption.

The challenge of integrating multiple ecosystems

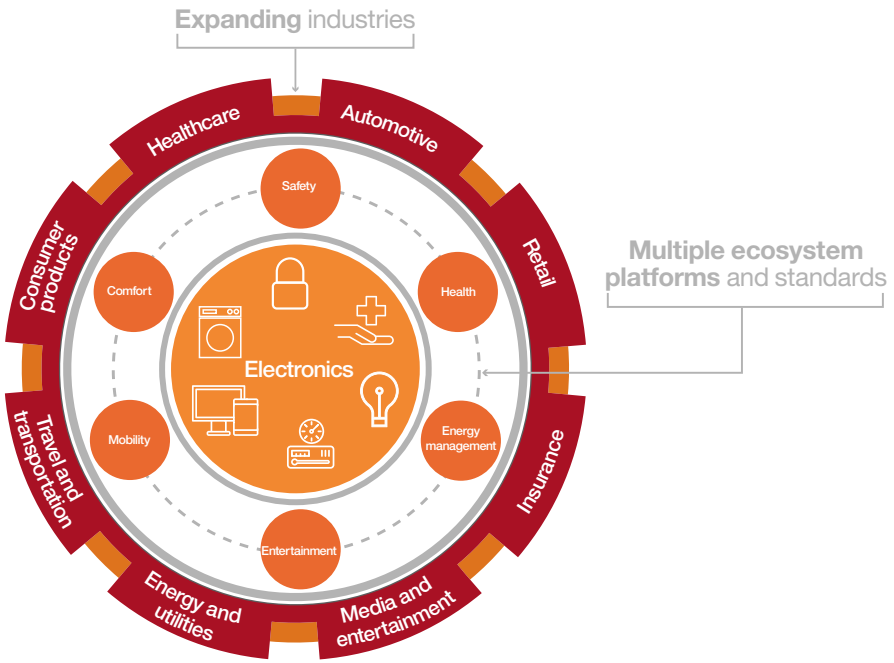
Today, many applications focus just on a single device in a single ecosystem. However, devices in the expanding Business of Things will need to collaborate across multiple ecosystems. For instance, smart windows and doors will need to collaborate with HVAC systems for comfort and energy management, with garage doors and video cameras for the security system and with cars for complete mobility solutions.

"Innovation and expansion are hallmarks of the electronics industry and as our industry changes, so must we. The consumer sector has grown to engage almost every major industry segment, touching almost every part of consumers' lives."

Gary Shapiro, President and CEO
Consumer Technology Association (formerly Consumer Electronics Association)

Figure 5

The permutations of ecosystems and industries that electronics devices have to support are making interoperability the biggest challenge in the IoT



Open platforms that can support virtually any device in any ecosystem from any industry have the opportunity to extend current "sell and push-based" business models with "publish and pull" models that enable companies to participate in other industries' markets, attract new customer segments and create new revenue opportunities.

Following interoperability, security emerged as the next biggest challenge to IoT adoption. Security also emerged as the "most debatable" topic in the Business of Things Jam. As in the early days of electricity when ensuring safety was necessary to connect objects to the grid and Underwriters Laboratory (UL) emerged as an independent, global body for safety standards and certifications, the opportunity exists now for UL-like security standards for IoT devices.[11]

Strategic industry alliances and associations are pushing the "state of the art" among member companies and serving as an "aggregation point" for common requirements, government regulation and driving local standards but we are still far from devices seamlessly co-operating through this complexity.

Despite the complexity and chaos of an ecosystem early in its expansion, the industry is hopeful. Sixty-eight percent of Jam poll respondents said a common IoT platform is possible and 81 percent said a global IoT service like the Internet, not controlled or owned by one company, will emerge. Sixty-six percent even stated that the IoT will be more disruptive than the Internet.

"The IEEE is working on standards. My fear is that it is not fast enough to meet the needs of this industry."

Lee Stogner, IEEE Internet of Things Initiative

Figure 6
Organizational challenges in the IoT will drive a new order of business

A new order of business

As organizations evaluate their roles in the expanding IoT ecosystem, new identities are emerging. Ninety-one percent of Jam poll respondents in the Business of Things Jam said the IoT will reshape their organization's brand identity. (see Figure 6) Even the most recognizable brands are reinventing themselves: Ford is no longer just about making vehicles; but is focusing on innovative solutions for global mobility.[12] Some apparel companies are taking on the challenge of the next generation of wearables rather than waiting for technology companies to invent them.[13]

As companies begin to embrace new identities in the IoT, aligning their organizations will be an even bigger challenge. Sixty-three percent of Jam poll respondents ranked organizational challenges such as skills and executive support over technology challenges to be successful in implementing an IoT strategy.

Evaluate your company's role

The journey to build a successful IoT organization begins with identifying the company's role in the IoT including evaluating core competencies and opportunities for differentiation. Building the right leadership and skills follows, while creating a culture that is continuously improving and innovating. Successful IoT leaders will monitor success and drive changes more rapidly than ever.

Create an IoT mission

Also critical to building a successful IoT organization is executive leadership. Akin to the early days of electricity when companies had Chief Electricity Officers responsible for transforming their operations, there is now a plethora of C-suite roles around data, analytics and security. Our research suggests that in this expanding digital C-suite, the CTO can play a critical and expanded role in connecting various organizational functions, bringing technology and operations closer together, and driving a new order of business.

This new order of business around an expanded CTO mission will require co-owning development of a technology solution and getting it to market, connecting the back office to the front office in real-time in unprecedented ways.

Prepare your workforce

Our research shows that it will become necessary to "future-skill" the workforce – to build new skills to design, build, sell, deliver and support smart products over their lifetime. The IoT will also change the way we learn, how skills are acquired and how the workforce is (re)trained. A new generation of digital assistants is emerging that can provide real-time coaching to enhance employees' decision-making, productivity and quality of service.

In addition to sensors that can perform remote diagnosis and automation to improve productivity, bringing advanced cognitive capabilities to smart products can fundamentally change what skills and jobs are required in the future. Sixty-eight percent of Jam poll respondents said the IoT will impact employment by creating high-skilled jobs. The combined power of machines assisting humans can create new roles and opportunities and a more empowered workforce than would otherwise be possible.[14]

"Shifting your strategy is hard enough. Aligning your organization is yet more challenging. Most such alignment efforts take multiple years and many fail."

Kaihan Krippendorff, Author, *Outthink the Competition*

"Innovation requires resilience to failure. In general, each company balances two fears: the fear of the new/untried, and the fear of being left behind. Some cultures are not only resilient to failure but crave (fast) failure as a way to establish lessons."

Dr. Richard Soley, Executive Director, Industrial Internet Consortium

Define culture

As the IoT rapidly shrinks the gap between the front office and back office, companies must begin to think like start-ups to be successful in the rapidly changing IoT environment. In the Business of Things Jam, participants said they expect 88 percent of the influence in shaping the IoT to come from consumers and entrepreneurs, compared to just 9 percent from C-level executives and 1 percent from policymakers. To successfully compete in the IoT, it will be essential to function with the speed and agility of a start-up, and engage end-users to continuously experiment and improve products.

Accelerate innovation

Various types of innovation are emerging in the industry as IoT companies begin to differentiate themselves: corporate accelerators, strategic partnerships, acquisitions and corporate reorganizations. Rethinking traditional risk models and embracing these outside-in approaches with resilience to failure will be essential to accelerating innovation in the IoT.

Monitor success

As companies reinvent their identities and align their workforce and organizational culture, continuously monitoring success and re-evaluating the company's position in the IoT will be important to staying competitive. Ninety-eight percent of our Jam poll respondents said new measures of success will emerge in the IoT that will replace standard enterprise metrics. Already, sensor-based KPIs provide prescriptive ways of measuring and improving business performance in real time.[15]

Winning in the new Business of Things

Based on our analysis of insights from the Business of Things Jam, we recommend the following actions for organizations developing their business model strategies for the IoT.

Focus on the experience

- Move from discrete, fixed engineering to continuous engineering
- Future-proof your devices with software-driven feature updates
- Consider higher value business models that can shift capital expenses to operating expenses
- Open the lens of product development teams to use design thinking to better understand end-user personas
- Build stronger relationships with end users by applying cognitive learning technologies to improve product services and experiences.

Orchestrate, not control

- Embrace and experiment with new ecosystems of relationships
- Evaluate common, open approaches versus proprietary solutions
- Think and solve for security – not just at the device level, but all the way up the stack
- Take action to manage cross-industry complexity via open experience platforms
- Be active with industry alliances and participate in the dialog on interoperability and best practices.

Align as you reinvent

- Build an IoT strategy at the highest level of your company and verify that it permeates the organization
- Reshape your organization so an empowered business unit is responsible for implementing IoT strategy
- Identify and acquire skills that are needed from inside and outside the company
- Unify technology and operations to enable more cognitive decision making
- Look at new opportunities, including acquisitions, as a big part of how your company evolves.

Are you ready to compete in the Business of Things?

Companies in the electronics industry must evaluate their roles in the new Business of Things and prepare to compete in the new landscape. These questions identify useful steps that executives across the industry can take:

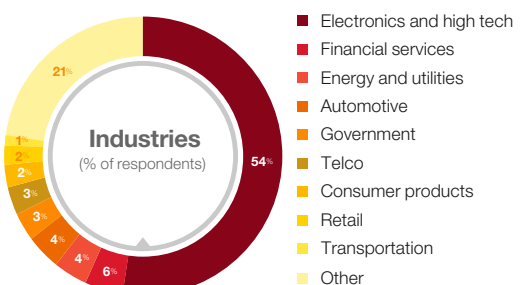
- What is your company offering that enhances the end-user experience?
- How can your products and services continuously learn about and adapt to the needs of the end user?
- What is your plan for products and services to interoperate well with other players in the IoT ecosystem?
- How are you engaging with industry alliances on standards?
- What is your company's role in the Business of Things?
- In what ways are your executive leadership and workforce aligned with your company's identity in the IoT?

About the research

Primary research for the study included the Business of Things Jam – a global, online discussion on challenges in monetizing the Internet of Things. Hosted by the IBM Jam Program Office in partnership with leading industry associations and consortia, the Business of Things Jam brought together business leaders and visionaries across industries and countries to debate operational, organizational and industry models for the IoT (see Figure 7).[16] Contents of the Jam were analyzed using STAT, SPSS Modeler and IBM Watson Content Analytics for emerging themes, concurrence and sentiment and validated with clients in the electronics industry.

Figure 7

The Business of Things Jam featured almost 2000 business leaders, over half from the electronics and high tech industry from 70 countries



About the authors

Veena Pureswaran is the Global Electronics Industry Leader in the IBM Institute for Business Value. In her current role, she is responsible for leading thought leadership research for the electronics industry. She has managed global IBV research studies on technology strategy and economic impact of 3D printing and the Internet of Things, and has presented IBV research findings in major industry conferences in Asia, Europe and North America. Veena can be reached at vpures@us.ibm.com.

Scott Burnett is Director, Global Consumer Electronics and Member of the IBM Industry Academy. He is responsible for leading IBM strategy and business development, leveraging Internet of Things and Cognitive capabilities for product and service innovation. Scott has served in numerous executive roles in consulting, research and business development. Scott is a member of the Consumer Technology Association, Board of Industry Leaders and Board of Trustees for the CTA Foundation. Scott can be reached at burnetts@us.ibm.com.

Bruce Anderson is IBM General Manager, Global Electronics Industry Leader and Member of the IBM Industry Academy. He is responsible for the IBM electronics industry business worldwide, including consumer electronics, medical devices, semiconductor, and office, industrial and network equipment segments. He has over 25 years of experience helping companies gain competitive advantage through innovative strategies and transformation. Bruce previously led the Industrial Sector supply chain practice as a Partner and Vice President for IBM Global Business Services. Bruce can be reached at baanders@us.ibm.com.

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Read the first three reports in our IoT series

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