The Internet of Everything is Now.

Now what?

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A busy doctor receives a notification that her patient’s blood glucose levels have been extraordinarily high the past few days. The driverless car automatically reroutes, sensing an accident up ahead. The milk carton tells the refrigerator its contents have gone bad, and the fridge updates the shopping list on the smartphone. The connected home keeps the coffee from burning, powers down when you leave, and makes smarter use of energy.

While the connected devices, as described above, are the first wave of always on, always available information, imagine the impact on both public and private sectors, such as:
- The connected city adjusts to parking needs, pollution levels, traffic, and utility usage
- The connected manufacturing plant builds products at lightning speed with little to no human intervention and has the ability to automatically predict and prevent quality issues before they occur
- Even the connected farming supply chain knows which cows to milk, how and when to fertilize down to the plant level, and how to control every environmental aspect of the greenhouse.

Whereas the Internet of Things (IoT) is the connection of physical devices to the Internet, the Internet of Everything (IoE) goes beyond this and takes it to a new level, including the capability of connected devices to take autonomous actions based on real-time data, processes, and information.

KPMG LLP’s perspective is that it is the network of all networks, bringing together people, processes, data and physical devices to transform the wealth of structured and unstructured data into real-time insights, richer experiences, autonomous behavior, and real, tangible business value. This is the “Internet of Everything” and it has the potential to transform how we do business.
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Figure 1: The IoE

More Connections than People

With the introduction of the personal computer, the number of active Internet connections swelled into the millions. Then, along came the second wave as smartphones and tablets were introduced and quickly adopted, and all of a sudden a single person could have multiple connected devices. We are now at the beginning of the third wave that will become a tsunami as wearable devices (fitness bands, watches, eyeglasses), automobiles, appliances, and sensors of all kinds connect to the Internet, bringing the number into the tens of billions. This rapid growth is being driven by steep declines in prices of components, including Radio Frequency Identification (RFID) chips, and the increasing ubiquity of broadband access (see Figure 2).
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Other than lots of connected devices, what does all this mean? For businesses, it can mean quite a lot. According to Cisco, “...from 2013 through 2022, $19 trillion of value (net profit) will be ‘up for grabs’ for private sector businesses globally.” Cisco goes on to say that not only will the Internet of Everything create new value, but it will also redistribute it as well. Some liken it to the transformations we have made throughout the industrial revolution, from large-scale industrialization, to the assembly line, to the disintermediation of the Internet, and now to an almost prescient ecosystem of things and communities that:

- Seek and maintain vast quantities of information
- Update, diagnose, and correct conditions for themselves and others
- Alert, notify, and provide valuable insight without the need for data mining and other queries
- Are connected to individual consumers in more personal, predictive, and social ways.

1 The Internet of Everything, Cisco IoE Value Index Study, Frequently Asked Questions, Cisco Inc., 2013

Source: Cisco and Broad River Partners, LLC estimates

Figure 2: Growth is Driven by Rapidly Falling Prices

Radio Frequency Identification (RFID) Cost Decay vs. Growth of Active Internet Device Connections
As the Internet makes machines smarter, will we become smarter as well? It depends on how we view and manage the avalanche of data that is becoming available and turn it into information we can act on.

**IoE Value Drivers**
So where does all of this value come from? Opportunities to capture value from the IoE can be found in four major categories:

- **Efficiency** – Machines and factories become more efficient as the IoE leads to smarter, autonomous machines that can adjust on the fly to changes in customer demand, energy rates, raw material inventory, and other inputs leading to reduction in errors and waste.

- **Productivity** – Remote sensors and video conferencing enable healthcare workers to treat patients remotely, eliminating travel and allowing them to treat more patients in less time. Appliances diagnose problems, order replacement parts, and schedule service calls, cutting in half the number of trips it typically takes to diagnose and repair a malfunction.

- **Customer Satisfaction** – Collecting and analyzing large amounts of data from individuals clickstreams, ordering history, and social networking posts enables sellers to customize products and services for each customer while engagement through social media builds customer loyalty.

- **Innovation** – Considerable opportunities exist in creating new business models, new products and services, and reduced time to value like the Nest thermostat and smoke detector (see box at right), or self-driving automobiles.

These are just a few examples of the kind of value waiting to be extracted as the IoE expands and matures, but these value opportunities are not distributed equally across industries. Different industries are in different places when it comes to dealing with social, mobile, big data and analytics, and cloud adoption, which all, in some way or another, underpin IoE. As these elements are critical to achieving a larger piece of the IoE pie, some industries and companies have more potential than others moving forward, such as those that have adopted and implemented other disruptive technologies (i.e., cloud). As a result, we can probably expect some industries to become leaders while others are slower to adopt.

Based on KPMG’s perspective, industries that have been early adopters include manufacturing using smart factory and supply chain applications, utilities using smart grid applications, retailers using customer optimization applications, and healthcare utilizing telemedicine (remote monitoring and remote delivery).

**The IoE is About New Opportunities**
At KPMG, we believe the common path to the future is information and insight. When everything around is sensor enabled and network aware the explosion in data will redefine “big data.” Harnessing all of this data and converting it to information and, eventually insight, creates opportunities for disruption. Consequently, the IoE is set to impact the strategy and investments of every leader in the organization, whether he or she is a CIO, CTO, or CMO. The question that KPMG wants to help answer is how will these dynamic changes impact your organization’s thoughts around deploying connectivity and technology? What should organizations be doing to remain agile, keep up with this new wave, and be positioned to capture some of this $19 trillion in value that the IoE will create?
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As organizations scramble to exploit these opportunities, business models, ideas, and products change radically. Not only will things change, but they will also change quickly. The quest for innovation and the search for R&D funding will once again become not only differentiating but also defining as successful leaders envision new products, create new organizations, and build vastly different business models to support them. **The biggest disruption will occur as products become services.**

Traditionally not-overly-exciting durables become interesting when put under the IoE future microscope. Today’s washing machines, HVACs, and ovens might be considered “smart” as they can sense minor things like temperature, time, and speed and even be controlled from an iPad or smartphone. It has been fun to go from dials to digital displays, but other than incremental change, it is pretty much the same. But what if we completely transformed the model for these durables to a service model? The washing machine comes complete from the factory connected and intelligent. It not only knows when energy is most efficient to run the cycle, but it also knows to run a self-diagnostic every week while it is new, every month after it is broken in, and more often again towards the end of its life. In the meantime, if service is required, it asks you when it would be convenient to have the certified repair person show up with the right diagnostic information and the right parts—all part of the original or lease purchase price. Take this even further and imagine that you pay nothing for this washing machine, instead you pay by the load. The product is no longer a washing machine, it is a service delivering clean laundry.

**Challenges for CIOs and CTOs: Operationalizing the IoE**

Data is everywhere, telling us a million things all at once. Organizations already have a multitude of physical devices (or things) scattered across their data centers, warehouses, plant floors, and supply chains that have the ability to be plugged into the IoE. Why then do organizations struggle with the idea of testing the IoE waters and capturing the untapped value these connections and data can bring? What is keeping them at bay and how can they bridge the gap?

**IoE and Automobiles**

The BMW iDrive and ConnectedDrive technologies allow drivers to be constantly fed information like weather, changing traffic conditions, news, and e-mail. In addition, smartphone integration allows for useful features like sending route and destination data directly to the car’s navigation system.

In chasing the dream of the driverless car, OEMs across the world are currently developing sensor-based solutions to increase vehicle safety. Known as Advanced Driver Assist Systems (ADAS), these systems use a combination of advanced sensors, like stereo cameras and RADAR technology, combined with actuators, control units, and integrating software, to enable cars to monitor and respond to their surroundings. Some ADAS solutions, such as lane-keeping and warning systems, are available today, and many others will likely be available in the near future. 

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There is no denying that extracting value from the IoE will present significant challenges for CIOs as technology, products, business models, connections, and interactions will change dramatically and quickly. However, organizations need to realize that in spite of the numbers predicting billions or trillions of connected devices, processes, and data, the IoE is here today and is flexible to organizational appetites for transformation and risk. Starting small and using an incremental approach to transformation is a real and viable option. Starting with a business strategy, organizations will have to make decisions about what opportunities to pursue and how that impacts the status quo.

KPMG recommends that clients utilize a seven-layer framework to think through these implications and operationalize the IoE to begin capturing value (see Figure 4). Key questions must be answered.

Figure 3: The IoE: Barriers to Entry

- **Separating the signal from the noise**
  - There is a lot of hype and noise associated with IoE which is challenging for organizations to wade through
  - Most coverage and guidance focuses on the consumer technology space and much of is not novel or actionable

- **Articulating a clear business case**
  - IT leadership is often challenged with identifying clear-use cases for IoE and the associated business case and ROI
  - IoE is still viewed as “bleeding edge” technology with many associated risks including security and privacy, and many organizations don’t believe they are ready to test the waters

- **How should I eat the elephant?**
  - With the massive amounts of data being generated, organizations are challenged with where to start.
  - How can organizations manage incremental change vs. disruption?

- **Lack of an overall framework to operationalize**
  - Organizations struggle with balancing the innovation of IoE with the need to simultaneously drive cost competitiveness and increase value-add to the business
  - How do organizations seamlessly link strategy to execution?
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Business strategy and alignment – The first step is to formulate the strategy. What opportunities exist, which ones are likely to have the highest returns? What are the key business drivers? How does the target operating model have to change? How do we leverage the IoE to move from having information, to providing insight?

Governance – What are the principle processes and the organizational structures, required to ensure integrity and the continuous alignment of information to the business needs? Who has the decision rights and accountabilities for committing resources? How will the changes in technology and process impact people?

Performance management process and reporting – How do you plan and forecast for something so new? What are the appropriate KPIs and reporting requirements to measure performance and define success or failure?

Integrated information management – What is the information content and data model required to support emerging business requirements? Where are the value creation opportunities in standardization of master data? How do we move up the information value maturity curve?

**Figure 4: Operationalizing the IoE**

Business Strategy alignment

- Business Strategy alignment
  - Business Alignment
  - Governance
  - Performance Management Process and Reporting
  - Integrated Information Management
  - Business Intelligence (BI) Platform Standardization
  - Infrastructure
  - Industry and Regulatory Standards

**Source:** KPMG

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Business intelligence platform – The IoE will spawn massive amounts of data, as well as a massive amount of “noise.” What is the right application to support information delivery, financial consolidation, supply chain, planning, and performance management? How can the organization succeed in capturing, analyzing, and delivering information for competitive advantage and value to the business?

Infrastructure – What will all of this mean for an organization’s technical infrastructure? Who owns the technical infrastructure of the IoE? As more of the technology spend shifts to marketing and other customer touch points, does the CIO become more of an integrator and enabler rather than the owner of the IT function? How do you ensure security, access, resiliency, and performance of the solution? What role does cloud play or is cloud the only play in this new IoE paradigm?

Industry and regulatory standards – Although it is the IoE, this does not mean that it is wide open for everyone to access everything. As the data expands, what does it mean for security, privacy, and risk? Risk and compliance will need to widen their scope to accommodate longer, larger, and more complicated supply chains that last throughout a product’s entire life cycle. What may have been compliant in 2017 may require a part change in 2019 to be compliant with newer standards for energy efficiency, EPA, or new hazards; and, of course, the inevitability of changing tax situations will need to be constantly monitored.

How KPMG Can Help

We at KPMG have supported many of our clients in various industries through an end-to-end, agile process to transform an organization into an intelligent enterprise by identifying, enabling, and realizing business value from enhanced capabilities the IoE brings to organizations.

As demonstrated in the framework above, KPMG’s approach begins with designing the enterprise-wide information strategy first and deploying it in phases. The phased deployment approach allows your organization to secure organization-wide buy-in and distributes transformational expense. We leverage a holistic approach to transforming your business, bringing together a complete set of methods and tools focused on five key areas:

People – While a lot of focus tends to be on the technology, KPMG’s people and change methodology focuses on promoting understanding and confidence among stakeholders so they take collective action in support of the technology, business processes, and organizational changes needed to leverage the power of the IoE. Proactively identifying and mitigating people-related risks will be hugely important when beginning to explore the IoE.

Process – We have a strong focus on business process improvement that allows processes to be viewed and designed in an end-to-end fashion to help optimize overall process performance and to integrate the capabilities inherent with IoE. Furthermore, the IoE breaks down functional silos that are often the root cause for business issues and poor performance.
**Technology** – A key challenge for CIOs will be to guide their business partners and demonstrate the value of leveraging the IoE. KPMG’s Technology Business Management (TBM) methodology is a discipline focused on creating collaboration between IT, finance, and business partners. By enabling IT organizations to “Run IT as a Business,” they can gain transparency into the cost, quality, and value of the IoE and utilize the principles of marketplace economics to drive change.

**Data** – The volume and velocity with which data will be generated in the IoE requires organizations to be agile. KPMG’s data and analytics (D&A) methodology helps embed data and analytics into an organization’s strategy, while harnessing the speed in the IoE. There is no longer a “one-size-fits-all” approach to strategy execution. Businesses always need to have number of scenarios and hypotheses on hand to allow them to effectively respond to sudden changes of direction.

**Mobility** – Forward-thinking businesses that take the time to understand and embrace the power of mobile, social collaboration, analytics, and cloud technologies stand to gain great strategic advantage over their competitors and the market. In support of KPMG’s belief that digital and mobile technology is an enabler of business transformation and the IoE, our mobility capabilities help clients fully capitalize on the transformative opportunities of digital and mobile. By combining deep industry perspectives, robust business and technology acumen, and extensive digital and mobile capabilities, KPMG helps companies reimagine customer experiences and integrate digital and mobile technologies across the enterprise, helping them solve their biggest operational and technology challenges inherent in the IoE.

It is not too early to begin thinking seriously about the IoE and how it is likely to impact you, your competitors, and your industry.