White Paper

Internet of Everything (IoE) Value Index

How Much Value Are Private-Sector Firms Capturing from IoE in 2013?

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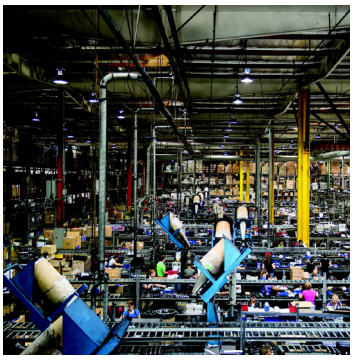


Technology infrastructure and tools are essential, but it's the effective *application of technology* that will separate winners from losers in the IoE Economy.

Key Insights

- **The Internet of Everything is not the Internet of tomorrow, it's the Internet of *today.*** Cisco's IoE Value Index study estimates that IoE is already poised to generate at least $613 billion in global corporate profits during calendar year 2013.
- **Global executives anticipate job growth and wage increases as a result of IoE, along with improvements in information security.** Nearly half of executives surveyed in the study think IoE will lead to higher wages at their companies, and one-third believe it will drive higher employment levels in their firms. In addition, 50 percent feel IoE will make their information more secure.
- **Technology infrastructure and tools are essential, but it's the innovative *application of technology* that will separate winners from losers in the IoE Economy.** Winners will be companies that successfully apply technology to improve the "people" and "process" elements of their business.
- **Data is ubiquitous and no longer a differentiator.** IoE's ability to combine data with people, process, and things will provide competitive advantage for companies that harness its capabilities.

The benefit of IoE is derived from the compound impact of connecting people, process, data, and things, and from the value this increased connectedness creates as "everything" comes online.

A New Era

The broad-based adoption of information technology (IT) – and, in particular, the advent of cloud-based capabilities – has leveled the playing field for firms around the world. Market incumbents are increasingly pressured by disruptive innovators and non-traditional rivals bent on attacking revenue franchises and gaining market share through the innovative application of technology.

In nearly all industries, an accelerating innovation curve – in which market discontinuities arising from video, social, mobile, and cloud-based capabilities unlock new competitive dynamics – is reshaping the business landscape. In this environment, barriers to market entry are falling, customers are demanding new ways of interacting, and margins are compressing. In a world characterized by technology-driven parity and fleeting competitive advantages, many business leaders are asking, "Where will the next wave of value come from for our company?"

The Opportunity

In February 2013, Cisco released a study (http://www.cisco.com/web/about/ac79/docs/innov/IoE_Economy.pdf) predicting that $14.4 trillion of value (net profit) will be at stake globally over the next decade, driven by connecting the unconnected – people-to-people (P2P), machine-to-people (M2P), and machine-to-machine (M2M) – via the Internet of Everything (IoE).

Cisco defines the Internet of Everything as the networked connection of people, process, data, and things. The benefit of IoE is derived from the compound impact of connecting people, process, data, and things, and from the value this increased connectedness creates as "everything" comes online. In this respect, IoE provides a clear answer to the question of future sources of value.

The $14.4 trillion in IoE "Value at Stake" – the potential bottom-line value that can be created, or that will migrate among private-sector companies and industries based on their ability to harness IoE over the next decade – is being driven by five key areas:

- **Asset utilization ($2.5 trillion) –** IoE reduces selling, general, and administrative (SG&A) expenses and cost of goods sold (CoGS) by improving business process execution and capital efficiency.
- **Employee productivity ($2.5 trillion) –** IoE creates labor efficiencies that result in fewer or more productive person-hours.
- **Supply chain and logistics ($2.7 trillion) –** IoE eliminates waste and improves process efficiencies.
- **Customer experience ($3.7 trillion) –** IoE increases customer lifetime value and grows market share by adding more customers.
- **Innovation, including reducing time to market ($3.0 trillion) –** IoE increases the return on R&D investments, reduces time to market, and creates additional revenue streams from new business models and opportunities.

How We Estimated IoE Value Realized

The IoE Value Index incorporates both survey data and market indicators drawn from third parties.

The survey component of the Index is based on a respondent's capabilities in three areas: collaboration, analytics/"Big Data," and the Internet of Things (for example, sensors). These capabilities are representative of the core enablers of the 21 IoE use cases around the world. The survey asked business and IT leaders to provide perceptions of their companies' strengths and weaknesses across these capabilities in order to ascertain the level of progress their companies have made in each area.

The third-party data component of the Index is based on measures of transformational IT investment of a respondent's industry and the levels of innovation productivity and network quality within a respondent's country. By combining these indicators, we created a composite picture from both an industry and geographical perspective.

Using both survey data and third-party market data enabled Cisco to base the Index upon both intra-firm capabilities (as assessed in the survey) and "hard" data on the business environment in which companies operate. Respondents were not asked about IoE per se, but rather about the types of capabilities their organizations possessed in collaboration, analytics/"Big Data," and the Internet of Things; the quality and quantity of information available to them; and their views on the overall connectedness of their business.

To review a complete "Frequently Asked Questions" document on the IoE Value Index, please visit **http://www.internetofeverything.com**

Cisco estimated the IoE Value at Stake by taking a "bottom-up" approach using the sum of the value created by 21 enterprise use cases in the private sector only (consumer and public-sector use cases were excluded) over the next 10 years (2013-2022). IoE Value at Stake is based on net value: for each use case, we considered both the connections benefits and costs.

Cisco's IoE use cases reflect the projected result of a business application of technology – in this case, business transformation driven by the Internet of Everything. Cisco's Value at Stake calculation encompasses both industry-specific and cross-industry use cases.

The IoE Value Index

To help executives capture more value from IoE, Cisco commissioned Global Market Insite (GMI), a division of Lightspeed Research, to conduct an international survey of 7,501 business and IT leaders in 12 of the largest economies globally (Australia, Brazil, Canada, China, France, Germany, India, Japan, Mexico, Russia, United Kingdom, and United States) – nations that represent nearly 70 percent of worldwide gross domestic product (GDP). The goal of the research was to estimate how much of the potential Value at Stake companies are actually realizing in 2013 as a function of their current IoE capabilities. The business and IT leaders in the IoE Value Index study came from both enterprises (2,000 or more employees) and midsize companies (500-1,999 employees) representing a cross-section of industries.

The study showed that companies have the potential to realize $1.2 trillion in value by the end of 2013 as a result of their current IoE-related capabilities. A company can realize value in two ways:

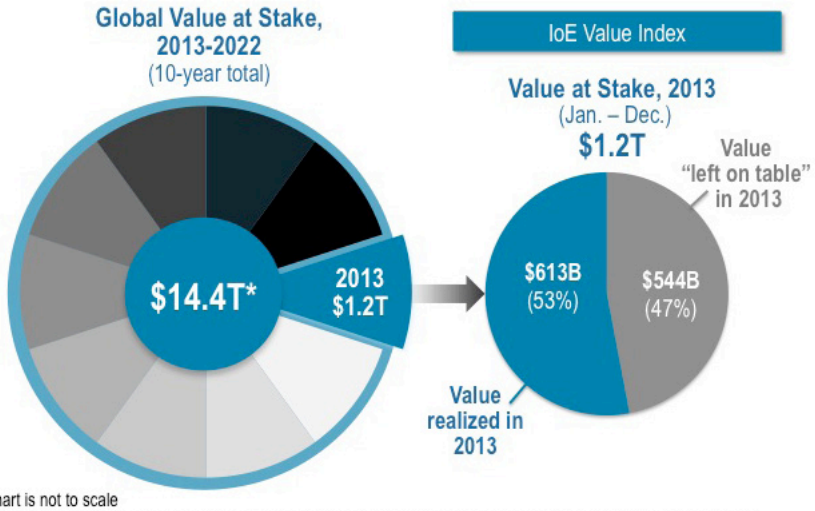
- Capturing new value by connecting the unconnected
- Gaining competitive advantage by taking market share from other companies less able to transform and capitalize on the IoE market transition

Cisco's IoE Value Index estimates that firms are set to realize just $613 billion (53 percent) of the potential $1.2 trillion in value in 2013 (see Figure 1). In other words, companies will fail to capture $544 billion, or 47 percent, of potential IoE Value at Stake this calendar year.

While executives must decide which technology investments and business process changes will help them maximize the value their companies realize from IoE, Cisco noted several key trends that provide clues about how best to proceed. Perhaps the most important implication is that traditional business advantages that have historically insulated companies from competitors are rapidly eroding. Offerings and business models enabled by IoE are allowing smaller companies, as well as those in emerging markets, to compete effectively with larger firms in developed markets.

But while IoE will enable companies to “catch up” to competitors and compete on an equal footing, the companies that win in the long run will be those that use IoE to create unique offerings.

Figure 1. Cisco Estimates that Companies Will Realize 53 Percent of Potential IoE Value at Stake in 2013.



Note: chart is not to scale

* $14.4T is conservative because it is based on a set number (21) of private-sector use cases and discounts future cash flows due to uncertainty around privacy and regulatory issues.

Source: Cisco, 2013

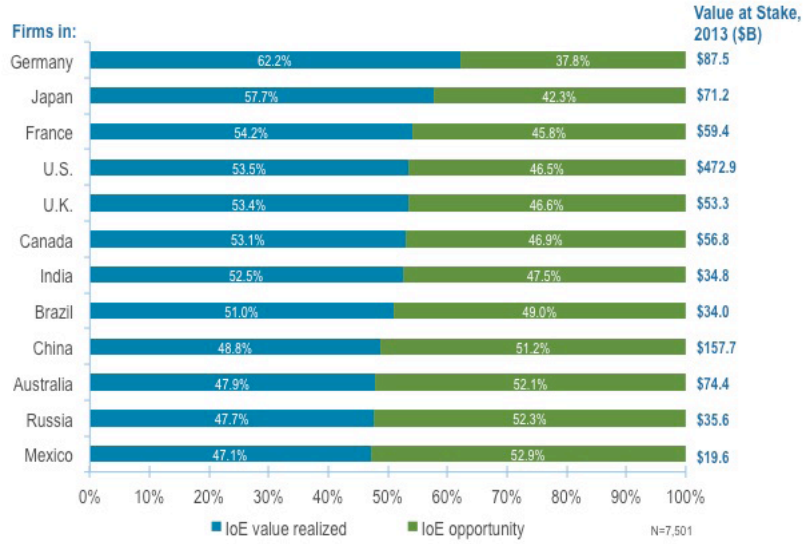
IoE Is Eroding Traditional Advantages, While Enabling ‘Breakaway’ Capabilities

As predicted by Thomas L. Friedman in his iconic book *The World Is Flat: A Brief History of the Twenty-First Century,* the competitive landscape is indeed leveling for companies around the world. This “flatness” is lowering barriers to entry for firms regardless of size, industry, and geographical location. But while IoE will enable companies to “catch up” to competitors and compete on an equal footing, the companies that win in the long run will be those that use IoE to create unique value.

The results of the IoE Value Index suggest that firms in developed markets are currently realizing the greatest share of IoE value (see Figure 2). For example, among the countries studied, German companies are realizing the highest percentage of their potential value (62.2 percent), followed by Japan (57.7 percent). Many companies in developed countries have invested heavily in IT and have extensive experience implementing the types of technologies (such as collaborative tools, industrial automation, sensors, and analytics) that create the foundation for IoE. In contrast, firms in emerging markets are generally realizing a lower percentage of IoE Value at Stake. Companies in Mexico, for instance, are the lowest in the study at 47.1 percent on average. In absolute terms, the United States ($253 billion), China ($76.9 billion), and Germany ($54.4 billion) are leading the world in value realized from IoE in 2013.

Top firms in the Leading country category continually innovate how they develop, produce, sell, and deliver their products and services, largely because they must compete against firms in local markets that place a similar emphasis on technological and business process innovation.

Figure 2. Firms in Developed Countries Are Currently Capturing the Most IoE Value.



Source: Cisco, 2013

Countries studied in the IoE Value Index can be grouped into four high-level categories (see Figure 3): Leading, Performing, Pursuing, and Beginning. It is vital to note that these categories are averages, and do not express the full range of firm-level capabilities within each country. Accordingly, these categories are *aggregates* of firm capabilities, rather than an illustration of connectivity or connectedness in the country itself.

Top firms in the Leading country category continually innovate how they develop, produce, sell, and deliver their products and services, largely because they must compete against firms in local markets that place a similar emphasis on technological and business process innovation. On average, firms in these countries have extensive experience innovating in technology areas such as M2M and mobility. They also operate in environments characterized by robust technology and network infrastructure. As a result, more companies in these countries have gone to market with mature IoE processes and products, contributing to a higher percentage of value realized and a larger share of Value at Stake for 2013. For example, German companies are poised to realize 62.2 percent ($54.4 billion) of the $87.5 billion available to them in 2013.

Companies in the Performing country category, including those in the United States, are characterized by “pockets” of high IoE technology capabilities, but lack the consistent level of IoE infrastructure and innovation of companies in the Leading country category. The path to greater IoE value realized for these Performing companies includes investments in both foundational and cutting-edge IoE technologies, depending on their current capabilities. As with companies in the Leading country category, internal transformation through management best practices — enabled by technology — is an integral part of realizing a greater amount of IoE Value at Stake.

That said, in recent years Pursuing countries have developed sectors of their economies that are among the world's leaders, both in terms of revenue growth and technological capabilities.

Figure 3. Categorizing Countries' Average Firms, Based on IoE Capabilities.

Category	Countries	IoE Characteristics	Path to Greater IoE Value
Leading	Germany, Japan, France	▪ Very strong IT infrastructure and innovation ▪ Longest track record with M2M and mobility ▪ Very high Value at Stake potential for goods and services ▪ Most conservative estimate of current IoE capabilities	▪ Significant investments in cutting-edge technologies ▪ Internal organizational transformation
Performing	United States, Canada, United Kingdom	▪ IoE infrastructure based on best practices often found, but not fully adopted ▪ Higher percentage of goods-producing use cases than firms in Leading country category ▪ Strong IT infrastructure and innovation ▪ Optimistic estimate of current IoE capabilities	▪ Both initial adoption of IoE processes and infrastructure, and cutting-edge investments ▪ Internal organizational transformation
Pursuing	India, China, Brazil	▪ Lower quality of IT infrastructure and lower levels of innovation ▪ Shortest track record with M2M and mobility ▪ Highly enthusiastic about current IoE capabilities and the promise of IoE ▪ Opportunity for "greenfield" innovation	▪ Initial adoption of IoE processes and infrastructure ▪ Potential for outsized gains by leapfrogging to state-of-the-art technologies
Beginning	Australia, Mexico, Russia	▪ Moderate levels of IT infrastructure and innovation ▪ Major industries have less of a track record with IoE (e.g., agriculture, resource extraction) ▪ Lower IoE optimism	▪ Initial adoption of IoE processes and infrastructure ▪ Champions of IoE among business and government leaders

Source: Cisco, 2013

In contrast, firms in the Pursuing country category tend, on average, to have a combination of low value realized and less total Value at Stake compared with firms in both Leading and Performing country categories. Their IT infrastructure and track record of innovation are less robust, and they have less experience using IoE technologies. That said, in recent years Pursuing countries have developed sectors of their economies that are among the world's leaders, both in terms of revenue growth and technological capabilities. India has developed an IT services sector that competes successfully with those of high-tech giants around the world. China has some of the world's newest and most sophisticated factories, and its government is investing $800 million in the "Internet of Things," a subset of IoE that focuses on M2M connections, by 2015.[1] Brazilian firms, meanwhile have increased their IT investments in recent years; global firms are establishing innovation centers of excellence in Brazil, and the Brazilian government is investing in IT start-ups. Their recent emphasis on strategic IT investment and buoyant economies make Pursuing companies confident in their ability to realize IoE value.

[1] http://edition.cnn.com/2012/11/28/business/china-internet-of-things

To realize additional IoE value, these firms must focus on investing in cutting-edge technologies and internal organizational transformation that can foster growth.

Our fourth category, Beginning countries, scored the lowest in terms of realizing IoE value. Generally speaking, firms in Beginning countries have moderate IT infrastructure, but lower levels of innovation compared with Leading and Pursuing countries. Perhaps most important, they have economies that are built largely on industries such as agriculture and resource extraction in which IoE technologies have not gained a significant foothold. In addition, business and IT leaders in Beginning countries typically have less optimism about their ability to gain value from IoE than their counterparts in Pursuing countries. To realize more IoE value, firms in Beginning countries should concentrate on developing IoE processes and infrastructure. They would also benefit from IoE "champions" in government and business who can generate interest around IoE investments.

The IoE Value Index illustrates that the competitive edge held by firms in developed countries is dwindling. For example, Mexican firms will realize 47.1 percent of their available Value at Stake in 2013 — only 15.1 percent less Value at Stake than German firms, pointing to an overall level of parity among firms across geographic boundaries. Many companies in the Leading country category have made significant investments in IoE infrastructure and have already realized much of the IoE value that comes from efficiency, data processing, and web-enabled process improvements. To realize additional IoE value, these firms must focus on investing in cutting-edge technologies and internal organizational transformation that can foster growth.

IoE-enabling infrastructure is now easier to obtain than ever before, thanks to cloud-based IT consumption models that require less capital expenditure than was needed in the past. Firms in Performing and Beginning countries, therefore, have the chance to invest rapidly in less cost-prohibitive IoE technologies that will help them reap the efficiency and process gains that have historically set developed-nation firms apart. In this sense, IoE is creating a business climate of radical equality of opportunity.

It is not a foregone conclusion, however, that companies in Pursuing and Beginning countries will catch up with, or supersede, Leading or Performing countries. The relatively smaller size of their economies and lower levels of IoE maturity combine to give them less IoE Value at Stake to realize. To return to the example of Mexico, while the country's companies are gaining only 15.1 percent less IoE value than German firms, they are competing for a far smaller portion of overall global value — $19.6 billion. The road to parity is shorter than ever before, but is not guaranteed.

In general, however, companies in emerging markets are more optimistic than those in developed countries about their ability to realize IoE value. On a scale of 1-10, where 10 is "extremely confident," executives from emerging-market firms scored a 7.8, in contrast to 6.7 for executives from developed-market firms (see Figure 4).

As IoE proliferates and matures, it will be pivotal for companies in all four categories to continue investing in the latest technologies since state-of-the-art capabilities will quickly become the norm over time. While parity in IoE capabilities will be a moving target, it is critical for companies to focus on combining the people and process components of IoE with things and data to create strategic differentiation and market-disrupting innovation. The companies that win in the era of IoE will be

Midsize firms and companies from emerging economies pose a formidable and growing challenge to market incumbents.

those that use technology to develop unique product and service platforms that are difficult to replicate and deliver higher profit margins. In this sense, IoE can help companies separate themselves from the competition, even as traditional sources of competitive advantage vanish.

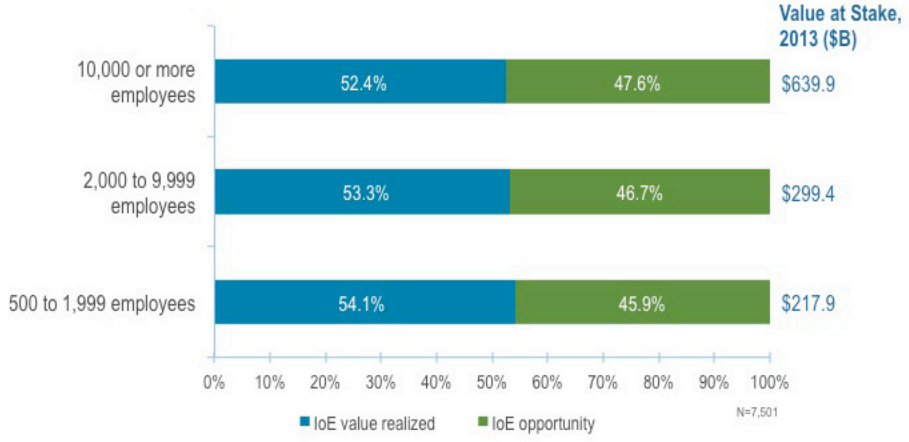
Figure 4. Firms in Developed Countries Are Currently Capturing the Most IoE Value.

Source: Cisco, 2013

Competition Is Intensifying as IoE Evens the Playing Field

Midsize firms and companies from emerging economies pose a formidable and growing challenge to market incumbents. As shown in Figure 5, midsize firms (500–1,999 employees) are actually capturing slightly more Value at Stake on a percentage basis than large enterprises with at least 10,000 employees – 54.1 percent versus 52.4 percent.

Figure 5. Midsize Firms Are Realizing More Value at Stake than Large Enterprises.



Source: Cisco, 2013

In absolute terms, supply chain is driving the most IoE value in 2013 ($158.7 billion), followed by customer experience ($145.2 billion).

IoE Value at Stake is distributed nearly equally across the five IoE value drivers described earlier in the paper: 1) asset utilization, innovation, employee productivity, supply chain, and customer experience (see Figure 6). Asset utilization realized the highest share of Value at Stake in 2013 at 56.4 percent of the $194.5 billion available. Innovation and employee productivity also rank high due to the extensive penetration of collaboration solutions in enterprises worldwide. At the other end of the chart, customer experience and supply chain have the most room for improvement, with each accounting for 51.1 percent of the Value at Stake in 2013. Even so, variation among value drivers is relatively narrow (5.3 percent between the top and bottom of IoE value realized), with progress being made in all areas.

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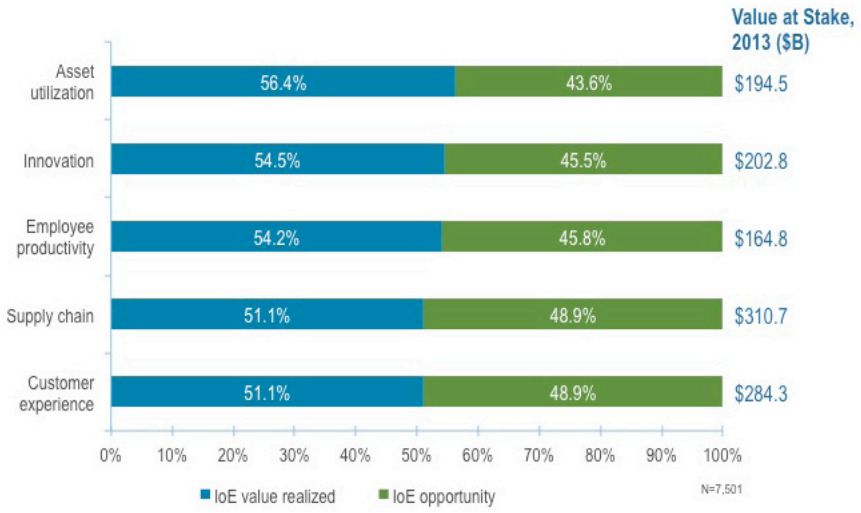
Figure 6. Value Is Distributed Nearly Equally Across Five Key Business Drivers.



Source: Cisco, 2013

Business and IT Leaders See Growing Significance and Impact of IoE

As traditional business advantages dissipate and competition intensifies, executives are looking for ways to realize more value. The results of the IoE Value Index suggest that leaders see growing levels of connectedness within their business, with 79 percent of respondents viewing IoE pervasiveness as having “increased” or “significantly increased” over the past three years, and 84 percent believing IoE pervasiveness will “increase” or “significantly increase” over the next three years.

Executives are, on balance, positive about IoE's potential impact on their businesses in the areas of jobs, wages, and information security.

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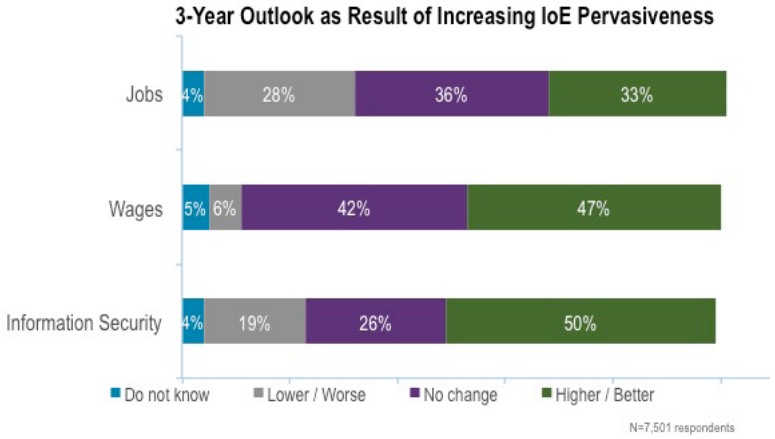
Figure 7. Business and IT Leaders Are Positive About IoE's Potential Impact.



Source: Cisco, 2013

Jobs. Globally, 33 percent of respondents believe IoE will lead to higher employment levels in their firms, versus 28 percent who think job losses are more likely. Perceptions differed to some degree across regions, however. Respondents from emerging markets overwhelmingly associate IoE with job gains, while respondents from developed countries are somewhat more mixed in their assessment of likely employment impacts.

- IoE will benefit job growth by spawning the emergence of entirely new markets and firms that capitalize on connectedness. So-called "infomediaries," for example, will monetize information streams and create new markets that focus on intelligence, optimization, speed of execution, knowledge sharing, co-creation, and so forth.
- The top jobs of tomorrow don't even exist today. IoE will reshape what we define as employment because it will allow businesses to tap into employment resources on demand. In addition, IoE shortens the time required to learn new skills thanks to advances in online education. This reduces the amount of structural unemployment.

Wages. Forty-seven percent of business and IT leaders think IoE will lead to higher wages at their companies, while only 6 percent believe wage declines are likely. This is particularly evident in emerging markets. In developed countries, executives, while still positive, are somewhat more reticent in terms of the prospects for increasing wages.

In addition to the impact on jobs, wages, and information security, executives view IoE positively because it helps them stay ahead of the innovation curve.

Information Security. Executives believe IoE will make their firms more secure. Information and physical security are seen as the primary downsides associated with the increased connectedness that comes with IoE, so there is widespread recognition of the potential threats associated with increased business connectedness. Still, 50 percent of respondents think IoE will make information more secure, while just 19 percent fear it will be less secure.

- IoE provides greater advances in network intelligence that will allow businesses to better detect and handle security attacks.
- Security will benefit from greater use of the cloud to drive consistency, automation, and to extend secured boundaries across the organization (i.e., across the mobile workforce).
- Greater levels of connectedness also enable improved intelligence in operations: capabilities like remote video surveillance of physical locations; remote wipe of virtual desktops when devices are lost or stolen; or pattern-based recognition of emerging security threats through the use of real-time predictive data analytics.

In addition to the impact on jobs, wages, and information security, executives view IoE positively because it helps them stay ahead of the innovation curve. The survey showed that the top three *business drivers* of IoE are: 1) the accelerating pace of innovation, 2) satisfying customer demand for new ways of interaction, and 3) the need to automate business processes.

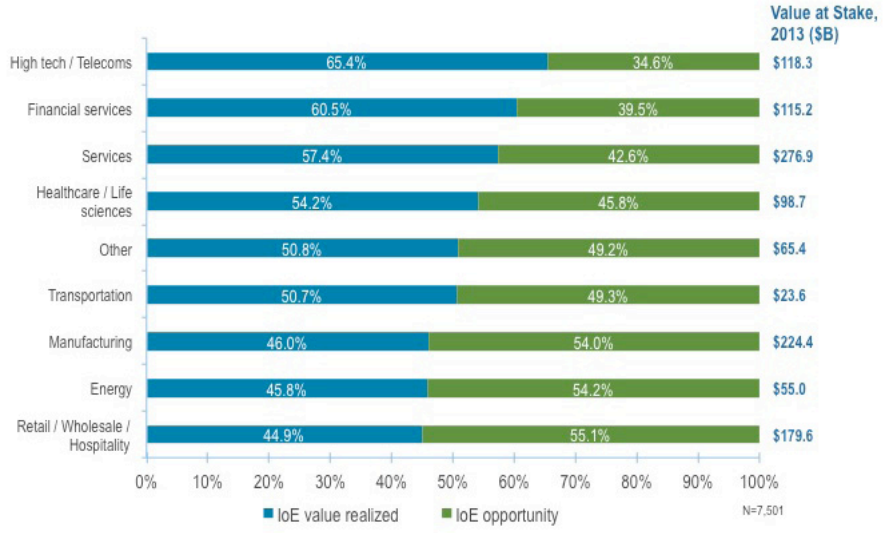
IoE also helps firms thrive amidst exponential growth of devices, data, and technologies. According to the survey, the top three *technology drivers* of IoE are: 1) new types of devices, 2) volume of data generated, and 3) cloud-based technology. While the benefits and potential are significant, when asked about the biggest perceived downsides of increased IoE pervasiveness, respondents' top three concerns were new threats to data and physical security, inability of IT systems to keep pace with change, and regulatory compliance. While many respondents are optimistic about IoE's impacts on information security, this optimism should not be misconstrued as a lack of understanding or awareness of new threats to security posed by greater connectedness.

IT-Intensive Sectors Are Realizing a Higher Percentage of IoE Value

Another key to capturing value from IoE is IT readiness. Firms in IT-intensive industries such as high tech/telecommunications and financial services are realizing a higher percentage of IoE Value at Stake in 2013 than firms in industries that are less IT-intensive (see Figure 8). High tech and telecommunications firms realized 65.4 percent of the $118.3 billion Value at Stake available to them in 2013. Financial services firms were next, realizing 60.5 percent of the $115.2 billion Value at Stake available.

Industries in the Leading category are IT-intensive, both in terms of the types of products and services they deliver and how they are delivered.

Figure 8. IT-Driven Industries Are Capturing the Greatest Share of IoE Value in 2013.



Source: Cisco, 2013

Companies in manufacturing, energy, and retail will realize the smallest share of Value at Stake in 2013, at 46 percent, 45.8 percent, and 44.9 percent, respectively. By virtue of their sheer size as sectors of the economy, services and manufacturing are the two industries with the largest absolute level of value realized.

Like geographies, industries can be similarly grouped into high-level categories (in this case, three rather than four), each with its own characteristics and path to attaining greater IoE value (see Figure 9): Leading, Performing, and Pursuing. Again, it is important to note that these categories are simply industry averages, and that there is a high level of variation within any given industry. These are generalizations, in other words, rather than a judgment on any one company, because the ability of an individual firm to realize IoE value does not flow from membership in one industry or another.

Industries in the Leading category are IT-intensive, both in terms of the types of products and services they deliver and how they are delivered. Their ability to compete depends on consistent technology and process innovation.

To move forward, Peforming industries need to shore up their IoE infrastructure while investing in the right cutting-edge technologies.

Figure 9. Categorizing Industries Based on IoE Capabilities.

Category	Industries	IoE Characteristics	Path to Greater IoE Value
Leading	Financial Services, High Tech and Telecommunications	▪ Information-centric products and services ▪ Highest IT spending on transformative investment ▪ Optimistic estimate of current IoE capabilities ▪ High IT dependence drives use of cutting-edge processes and technologies	▪ Significant investment in cutting-edge technologies ▪ Internal transformation
Performing	Services, Healthcare & Life Sciences, Other	▪ Labor-intensive products and services or scaling of intellectual property ▪ High IT spending on transformative investments ▪ Most conservative estimate of current IoE capabilities ▪ High complexity of people-centric transformation ▪ High dependence on rapidly evolving IT	▪ Both initial adoption of M2M processes and infrastructure, and cutting-edge investments ▪ Harnessing evolving IT ▪ Internal organizational transformation
Pursuing	Energy, Transportation, Retail/Wholesale /Hospitality, Manufacturing	▪ Fixed asset-intensive products and services ▪ Low levels of IT spending on transformative investment ▪ Highly enthusiastic about current IoE capabilities and the promise of IoE	▪ Initial adoption of M2M processes and infrastructure ▪ Potential for outsized gains by leapfrogging to state-of-the-art technologies

Source: Cisco, 2013

As a result, Leading industries are currently the best positioned today to realize IoE value, but also have a stark challenge in the need to innovate and execute at an advanced level in order to create separation from competitors who themselves are likely to be IoE-savvy. Leading industries already have robust IoE technology capabilities and must invest to remain on the edge of innovation while focusing on management best practices to convert IoE technology into differentiating product and service offerings.

Performing industries tend to have complex value chains that produce both unique challenges and opportunities for realizing IoE value. These industries tend also to be very labor-intensive and require a specialized workforce (such as doctors, technicians, or accountants). Increasingly, they also rely on new or rapidly evolving technologies to deliver their products and services.

As a result, the potential for IoE to deliver market-disrupting innovation is high in this category. To move forward, Performing industries need to shore up their IoE infrastructure while investing in the right cutting-edge technologies. Given the fast pace of change, this can be challenging. In addition, these firms must focus on internal organizational transformation that can also be difficult due to the complexity of their organizations and the people-intensive nature of their businesses.

Even so, firms in Pursuing industries that can incorporate IoE into their operations, products, and services have strong "breakaway" potential.

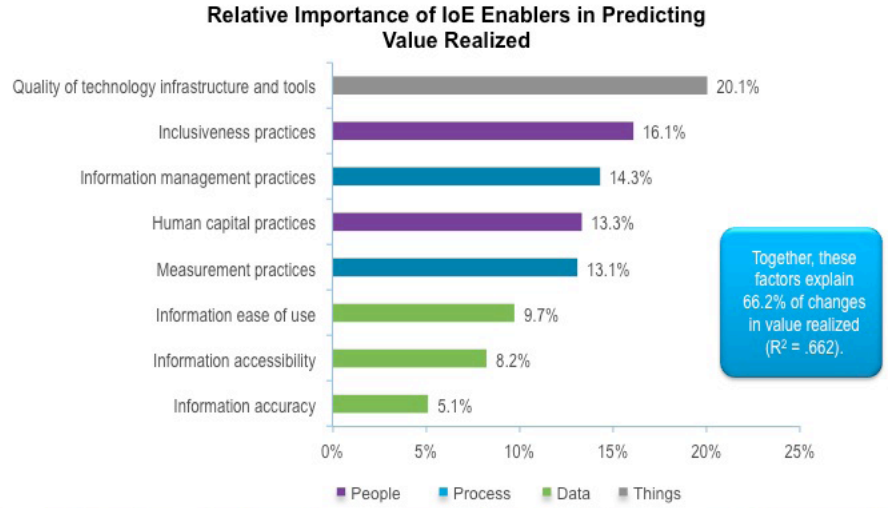
Finally, Pursuing industries are experiencing the most difficulty realizing IoE value. Even so, firms in Pursuing industries that can incorporate IoE into their operations, products, and services have strong "breakaway" potential. Pursuing industries are generally asset-intensive and, therefore, can benefit significantly from M2M connections. Firms from these industries can leapfrog rivals through strategies such as integrating sensor-based technologies and analytics throughout the value chain; creating intelligent and highly differentiated customer experiences; and by technology-enabling products to create annuity-based services.

How To Derive Value from IoE

In addition to knowing how much Value at Stake companies are realizing from IoE, it is important to understand how companies must improve if they are to thrive as IoE drives an ever-larger share of corporate profits. Cisco created a model to determine how the components of IoE — people, process, data, and things — are helping companies realize value. By performing regressions of different enablers against value realized, we learned that technology is the single most important factor in predicting value realized (see Figure 10).

Developing technological capabilities has become easier and more cost effective as mobility, cloud, and other IT service models enable companies to acquire the right technologies, in the right amounts, at a reasonable cost. What counts as a strong technology foundation is in constant flux. Today's bleeding-edge capabilities will quickly become tomorrow's "table stakes." Given this, companies must continue to invest in the innovative technologies that will enable the unique offerings and business models that generate profits from IoE to achieve long-term success.

Figure 10. Relative Importance of IoE Enablers in Predicting Value Realized — Technology Acts as the Foundation and as an Enabler.



Source: Cisco, 2013

When we contrast the contribution that technology and management practices play in realizing IoE value with that of information quality and quantity, it becomes clear that data itself is not a strategic differentiator.

Technology is an essential foundation for realizing IoE profits, but it is not sufficient on its own. By itself, the quality of technology infrastructure and tools predicts just 20 percent of the variation in value realized accounted for in our model. The next four factors, which fall under the category of "management practices," account for more than 50 percent of the change in value realized in Cisco's model. Companies with superior management capabilities are able to envision how technology can be used to improve operations, anticipate market transitions, and bring innovative products and services to market that take advantage of these transitions.

Indeed it is the effective application of technology that will separate winners from losers in the IoE Economy. Winners will be companies that successfully apply technology to improve the "people" (inclusiveness practices, human-capital practices) and "process" (information-management practices, measurement practices) elements of their business.

The management practices that best predict changes in value realized are:

- **Inclusiveness — enabling all employees to contribute and collaborate effectively.** Companies make better decisions and maximize the value of experts located throughout the organization when they are more inclusive. In fact, better collaboration within companies is one of the three areas executives think will benefit most from IoE. According to Cisco's recent "Enterprise Collaboration" study (http://www.cisco.com/web/about/ac79/docs/re/Enterprise-Collaboration_Top-10.pdf), 93 percent of respondents from companies with inclusive business environments indicated that their investments in collaboration solutions outperformed expectations in terms of business value created. By contrast, only 28 percent of respondents from non-inclusive companies felt the same way.
- **Information management — using data strategically to achieve company objectives.** It is not data itself, but how it is managed and used, that determines success in realizing IoE value.
- **Human capital management — managing a company's workforce and developing needed talent.** Having and managing the right mix of employee skill sets is crucial for any company. However, as IoE becomes a bigger contributor to corporate profits, firms will have to evaluate their technical and management expertise continually in order to thrive.
- **Measurement — tracking progress toward company goals or targets.** Companies that measure performance gain a larger share of IoE Value at Stake than competitors that are less "fact-based" in their decision-making processes.

When we contrast the contribution that technology and management practices play in realizing IoE value with that of information quality and quantity, it becomes clear that data itself is not a strategic differentiator. Instead, the value of data depends on the quality of the technology that collects and analyzes it and, perhaps most important, on the ability of management to use it well. There is a growing misperception that companies can correct shortcomings in strategic vision simply by adding Big Data solutions. Our findings show that while analytical capabilities matter,

Together, a strong technology foundation and management prowess are the keys to realizing value from IoE, and to overcoming the challenges companies face in maximizing their opportunities.

it is management excellence, or "Big Judgment," that turns data into insights, and insights into IoE value.

Together, a strong technology foundation and management prowess are the keys to realizing value from IoE, and to overcoming the challenges companies face in maximizing their opportunities. The interdependence of technology and management practices comes into relief when we consider the top challenges respondents say their companies must surmount in the next three years to benefit from IoE (see Figure 11).

Figure 11. Top Challenges Companies Must Overcome in Next Three Years to Benefit from IoE.

Source: Cisco, 2013

Determining the technologies on which a company should bet and understanding how to maintain optimum levels of technology investment are central concerns for executives, especially given the fast rate of IT-driven business innovation. These are not simply "technology" issues, but must be considered carefully by IT and business executives alike. Poor choices can close the door on vital IoE capabilities and make a company unable to compete for available Value at Stake. The fact that investing in new technologies is the top reason cited by business and IT leaders shows how daunting it is to get technology "right." Ultimately, sustainable competitive leadership depends upon an ability to harness innovative technologies for business gain.

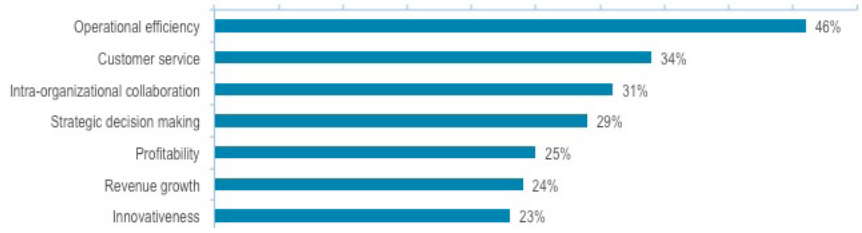
The challenges associated with new technologies are not limited to making prudent investments. In a sense, that is just the beginning. Many companies have invested in IT for years, with technology permeating every aspect of their operations. To compete in the world of IoE, firms must remain at the forefront of technological change while ensuring the systems they already have in place are compatible with, and enhanced by, new technologies.

Increasingly, the products and services that achieve sustainable competitive differentiation will be platforms, rather than stand-alone offerings. They will also combine IoE enablers such as data from multiple sources, analytics, and the ability to provide high-value expertise at a low cost through virtual channels. Effective integration of new and legacy technology systems and networks will be essential.

What are the benefits respondents expect to gain from IoE? At the top of the list is increased operational efficiency as companies automate processes, use their resources more effectively, and reduce downtime and inefficient work practices.

What are the benefits respondents expect to gain from IoE? At the top of the list is increased operational efficiency (see Figure 12) as companies automate processes, use their resources more effectively, and reduce downtime and inefficient work practices. They also expect to be more effective serving their customers, with whom they will have more innovative and less costly modes of interaction.

Figure 12. Top Benefits Companies Expect from IoE in Next Three Years.



Source: Cisco, 2013

Critical Success Factors in Realizing IoE Value

What can companies do to realize more IoE value? The specific answer will differ from one company to another, but according to the results of the IoE Value Index there are three things companies can do to improve the bottom-line value that they capture from IoE.

- **Focus on the types of IoE connections that will deliver the highest Value at Stake.** IoE comprises three types of connections: M2M, M2P, and P2P. In each industry, the kinds of connections that provide the largest IoE opportunity differ somewhat. By pursuing the largest pool of potential value, firms can ensure they are competitive in the most promising markets. They should not neglect opportunities in other connection areas, however, especially when their current market position and capabilities make success probable.
- **Invest in the capabilities that enable successful value realization in the targeted connection areas.** Certain IoE capabilities are vital for each connection type, requiring a combination of technology and business processes. In M2M, for example, a core capability is tracking physical assets remotely, which requires wireless technologies such as sensors and readers, integration of wireless data into enterprise applications, and people who can make the right decisions with the information they receive.
- **Develop innovative products and services that turn IoE enablers into a competitive advantage.** Cisco's estimate of $14.4 trillion in IoE Value at Stake over the next decade, including $1.2 trillion in calendar year 2013, is based upon 21 IoE use cases that drive revenue and market share today. Firms can seek to emulate companies that have had success with these use cases, develop their own IoE innovations, or do both. Cisco expects the number of use cases that have a strong market presence to expand rapidly as technology enablers mature and as more executives understand how crucial IoE is to their companies' future prospects.

For manufacturers to improve their ability to profit from IoE, they should focus on two main areas: M2M and M2P connections.

Next Steps: An Industry Perspective

We will now examine how companies can realize more IoE Value at Stake by looking at three industries that have some the greatest potential to realize IoE value – manufacturing, energy, and retail.

The IoE Value Index survey asked executives from companies across industries to rate their capabilities across 16 IoE enablers that provide the technology foundation for M2M, M2P, and P2P connections. The following examples show where companies in each industry are strongest, where they have the most opportunity to improve, and some of the IoE use cases on which they should concentrate to increase their share of value realized.

Manufacturing

At $224 billion, manufacturing firms have the largest Value at Stake among all industries in 2013. Even so, manufacturers are poised to realize only 46 percent of this potential bottom-line value. For manufacturers to improve their ability to profit from IoE, they should focus on two main areas: M2M and M2P connections, each of which constitutes about 40 percent of Value at Stake (see Figure 13).

Figure 13. Manufacturing Firms: IoE Strengths and Opportunities.

Type of connection	M2M	M2P	P2P
Share of VAS	39.0%	40.3%	20.6%
Top use cases	• Smart factories • Smart grid • Supply-chain efficiency	• Connected marketing and advertising	• Next-gen workers • Faster time to market
IoE enablers: current strengths	• Managing energy consumption through smart, connected systems	• Viewing KPIs through information dashboards	• Unified communications
IoE enablers: largest opportunities	• Intelligent machines/robots • Remote tracking of physical assets	• Decision support through real-time, multi-dimensional data analysis	• Integrated video collaboration

Source: Cisco, 2013

M2M includes technologies that enable devices, machines, and sensors to share information without direct human intervention. Despite extensive M2M investments in some quarters, manufacturers as a whole have enormous upside potential in enhancing M2M capabilities, particularly because several of the most material use cases for manufacturers rely on precisely these connections.

The single largest source of IoE Value at Stake for manufacturers is smart factories, a use case that relies on sensors to connect intelligent machines with one another, incorporate data from business applications, and provide intuitive interfaces for factory employees and management. Smart factories can adjust the pace of production and the kinds of products that are made.

... manufacturers need to invest in machine intelligence and robotics as well as networks that can transmit data wirelessly in a plant-floor setting.

The result combines high availability of production equipment and high output, with the flexibility to build multiple models and options as demand dictates. To better enable IoE use cases, and smart factories specifically, manufacturers need to invest in machine intelligence and robotics as well as networks that can transmit data wirelessly in a plant-floor setting.

Manufacturers are much stronger in the second opportunity area, M2P, in which data analytics technologies figure prominently. In fact, the top three IoE capabilities for manufacturers were in M2P, with the ability to view key performance indicators through information dashboards presenting the biggest opportunity. This is a typical form of M2P, which is common in enterprise resource planning (ERP) systems. Manufacturers have an opportunity to improve their M2P capabilities by being able to support decisions through real-time, multidimensional data analysis (sometimes called OLAP). While manufacturers have already been relatively successful with M2P connections, the analytics/"Big Data" opportunity looms large as a future focus.

Here are here are some ways manufacturers are using IoE today to drive value (see Figure 14):

Figure 14. How IoE Is Driving Value in Manufacturing Today.

IoE in Action: Manufacturing	
Machine-to-Machine (M2M)	• Implement "smart factories" that use IP networks to connect intelligent robots, sensors, and analytics capabilities • Remotely monitor the location of assets within the production facility • Use wireless technologies such as RFID to locate and track shipments and inventory, wherever they are in the supply chain
Machine-to-People (M2P)	• For logistics fleets, adjust transportation routes based on analysis of historical and real-time data • Sense and capture information from customers to drive innovation in the design of new products and services • Use mobile marketing to establish direct relationships with consumers, and to generate excitement about products
People-to-People (P2P)	• Use mobile video to connect design teams, engineers, and the plant floor to maximize global talent, get to market faster, and minimize production delays • Use immersive video capabilities to manage complex supply chains, keeping partners, suppliers, and design teams on the same page • Scale scarce and expensive technical expertise with video collaboration, both internally and with customers

Source: Cisco, 2013

The five highest-rated IoE enablers for energy firms were all M2M technologies.

Energy

Energy companies have the largest IoE Value at Stake in M2M connections, and have been investing in IoE enablers accordingly (see Figure 15). The five highest-rated IoE enablers for energy firms were all M2M technologies. The third-largest IoE Value at Stake opportunity across all industries, smart grid, is based on the ability to monitor and manage equipment proactively, which is a strong point for energy companies.

Many utilities are looking to modernize their electrical grids to make them more efficient, safer, and more responsive to changes in energy demand. Utilities can accomplish these goals by creating a smart grid – an electrical grid with an integrated digital communications network. Smart grids can help utilities moderate their output with real-time data and predictive analytics, handle "bidirectional flows" from sources such as solar power, and make grids safer through automated fault detection.

Figure 15. Energy Firms: IoE Strengths and Opportunities.

Type of connection	M2M	M2P	P2P
Share of VAS	49.0%	23.6%	27.5%
Top use cases	• Smart factories / automation • Smart grid	• Faster time-to-market	• Next-gen workers • Smart buildings
IoE enablers: current strengths	• Proactively monitoring energy production and supply equipment	• Analyze and use large amounts of data	• Unified communications
IoE enablers: largest opportunities	• Making operations more sustainable through sensor data	• Predictive analytics	• Ability to locate experts

Source: Cisco, 2013

Another promising source of IoE value is P2P connections, which are enabled by collaboration technologies. By increasing investments in the ability to locate experts quickly and to access expertise where and when it is needed via video, energy companies can solve problems quickly. For example, oil and gas companies have far-flung exploration and production operations, with rigs in myriad locations. At the same time, there are a limited number of experts to troubleshoot and keep rigs operating when problems arise. By providing video collaboration capabilities on oil rigs, oil and gas companies can monitor production from headquarters, and provide technical assistance remotely, as soon as problems arise.

Here are here are some ways manufacturers are using IoE today to drive value (see Figure 16):

By improving their M2P capacities with predictive analytics, retailers could realize more value from connected marketing and advertising ...

Figure 16. How IoE Is Driving Value in the Energy Industry Today.

IoE in Action: Energy	
Machine-to-Machine (M2M)	• Implement "smart grid" technologies to manage energy transmission with real-time data and predictive analytics • Match energy supply with demand more accurately using smart meters installed in customer premises • Use sensors to remotely monitor pipelines to identify and prevent environmental hazards such as leaks
Machine-to-People (M2P)	• Provide customers with analytical tools to help them understand and optimize their energy usage • Enable utilities to analyze and monitor energy consumption to optimize the performance of distribution infrastructure • Analyze data from oil well production to identify opportunities for proactive maintenance
People-to-People (P2P)	• Build a knowledge management infrastructure to ensure the capture of expertise and best practices from employees as they leave or retire • Use video collaboration to scale technical expertise to remote locations such as power stations and oil rigs • Enable field technicians to improve efficiency by providing mobile access to business-critical applications

Source: Cisco, 2013

Retail

Like energy companies, retailers have been investing in IoE enablers that correspond to their biggest Value at Stake opportunities (see Figure 17). M2P capabilities such as the ability to view key performance indicators (KPIs) through an information dashboard and the ability to gain insights through "Big Data" scored the highest of all 16 IoE enablers. By improving their M2P capacities with predictive analytics, retailers could realize more value from connected marketing and advertising, the second-largest area of IoE Value at Stake, by improving the chances that personalized offers and ads will resonate with customers.

The second-largest Value at Stake opportunity for retailers comes from P2P connections. For example, retailers can provide on-demand sales advice, and scale expert sales staff, by providing video collaboration in their stores. Shoppers can receive expert advice regardless of the size and location of the store. Retailers can use remote-expert solutions to sell specialized products and services, maximize up-sell and cross-sell opportunities, and increase conversion rates by answering critical questions while shoppers are in the store and considering a purchase.

Retailers can also take advantage of the growing "bring your own device" (BYOD) trend to empower sales associates to sell more effectively. Retailers can provide training, product information, and interactive content to sales associates via their own mobile devices. BYOD helps reduce the costs of mobile sales initiatives while ensuring high adoption, since employees use their own devices rather than those provided by the retailer.

Figure 17. Retail Firms: IoE Strengths and Opportunities.

Type of connection	M2M	M2P	P2P
Share of VAS	21.5%	47.7%	30.8%
Top use cases	• Innovative payments • Supply-chain efficiency	• Connected marketing and advertising • Connected vending	• Next-gen workers • Virtual attendants
IoE enablers: current strengths	• Remote inventory tracking	• Viewing KPIs on information dashboards	• Unified communications
IoE enablers: largest opportunities	• Mobile payments • Remote customer monitoring	• Predictive analytics • Data visualization	• BYOD • Rich-media customer interactions

Source: Cisco, 2013

Here are here are some ways retailers are using IoE today to drive value (see Figure 18):

Figure 18. How IoE Is Driving Value in the Retail Industry Today.

IoE in Action: Retail	
Machine-to-Machine (M2M)	• Improve payment flexibility and security with mobile electronic payments • Automatically have product orders placed when inventory falls below a certain level • Optimize energy usage within retail stores using environmental sensors (e.g., lighting, temperature) and smart energy technologies
Machine-to-People (M2P)	• Use mobile and video analytics to track customer behavior in store to optimize customer service and merchandising strategies • Customize offerings, marketing, and advertising messages by taking into account customer history, preferences, location, and budget • Use technologies such as in-aisle interactive displays and digital signage to help shoppers explore products, and drive up-sell / cross-sell
People-to-People (P2P)	• Use video collaboration to provide on-demand advice and to scale expert sales staff across multiple stores • Enable store managers, district managers, and executives at corporate headquarters to increase efficiency of store planning and operations using collaboration technologies • Provide training, product information, and interactive content to sales associates via their own mobile devices (i.e., BYOD)

Source: Cisco, 2013

This access, where everyone can avail themselves of innovations, is the real democratization of IT brought about by IoE: when we connect the unconnected — whether people, process, data, or things — we can create enormous value.

The Democratization of IT and Value

The Cisco IoE Value Index research reveals high levels of competitive parity globally. The clear implication of this, when coupled with evidence of increased globalization (such as cross-border trade and foreign direct investment) and the growing prominence of disruptive innovations throughout markets, is that there has been a democratizing effect in terms of firms' access to IT — and, as a result, in terms of their ability to extract value.

We have observed that company size actually is a poor predictor of value realized. On a country-by-country basis, too, the gap between the worst and best in our sample is only about 15 percentage points. In essence, the competitiveness of a given midsize company in emerging markets, compared with that of a large enterprise in Germany, Japan, or the United States, is not as vastly different as it once was. Whether collaboration, analytics, or sensors, large and midsize companies around the globe are exhibiting high levels of interest and investment in IoE capabilities, with an eye toward tapping new sources of value by connecting the unconnected.

The widespread commercial availability and reduced barriers to adoption in the form of lower capital costs (for example, through cloud-based tools and declining overall hardware and software costs) make the application of advanced IT capabilities, and resulting efficiencies, no longer the exclusive preserve of the wealthiest firms. We have characterized this transition as moving one's firm "from clout to cloud," meaning incumbency is coming under threat due to cloud-enabled agility; and by moving from "bigger is better" to "better is better," meaning that economies of scale less and less determine competitive hierarchies. These notions encapsulate the reality that anyone with the right mix of technology infrastructure and tools, combined with robust, people-centric management practices, can extract value at a high rate in the IoE Economy.

In the same way that access to IT is opening up for firms irrespective of their size and location, the management challenge for leaders is how to make these capabilities more accessible *throughout their organizations,* so that every employee — not just executives or workers in specialized roles — can make better decisions. This must be accomplished by empowering people to leverage IoE to its fullest potential, which in turn demands that leaders focus on inclusiveness within their business, ensure effective use of information, invest in human capital, and measure how they manage. This access, where everyone can avail themselves of innovations, is the real democratization of IT brought about by IoE: when we connect the unconnected — whether people, process, data, or things — we can create enormous value.

... sustainable differentiation will hinge on one critical success factor – the ability to harness, through the right blend of management practices and business process change, IoE-related technology innovations for business gain.

While firms in certain industries (such as high tech/telecommunications and financial services) are benefiting from years of IT investment in these areas, there is still substantial Value at Stake for virtually all players, and almost no companies are insulated from competitive threats from nontraditional rivals. While attitudes toward IoE across the board are generally positive – in terms of jobs, wages, and information security – there is a marked difference in overall optimism about IoE from the vantage point of emerging markets and the developed world. Quite plainly, business and IT leaders from emerging markets view IoE as a centerpiece of their current and future competitiveness, and are turning to capabilities enabled by IoE, particularly the cloud, as platforms on which to innovate and vie for market share.

As a result, leading firms should view their status in the market as increasingly precarious, with tried-and-true avenues to growth and competitive advantage under increasing siege. As data and technology enablers proliferate, reaching ubiquity among large enterprises and midsize companies, sustainable differentiation will hinge on one critical success factor – the ability to harness, through the right blend of management practices and business process change, IoE-related technology innovations for business gain.

You can learn more about this research, and the opportunities presented by IoE, at: http://www.internetofeverything.com

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