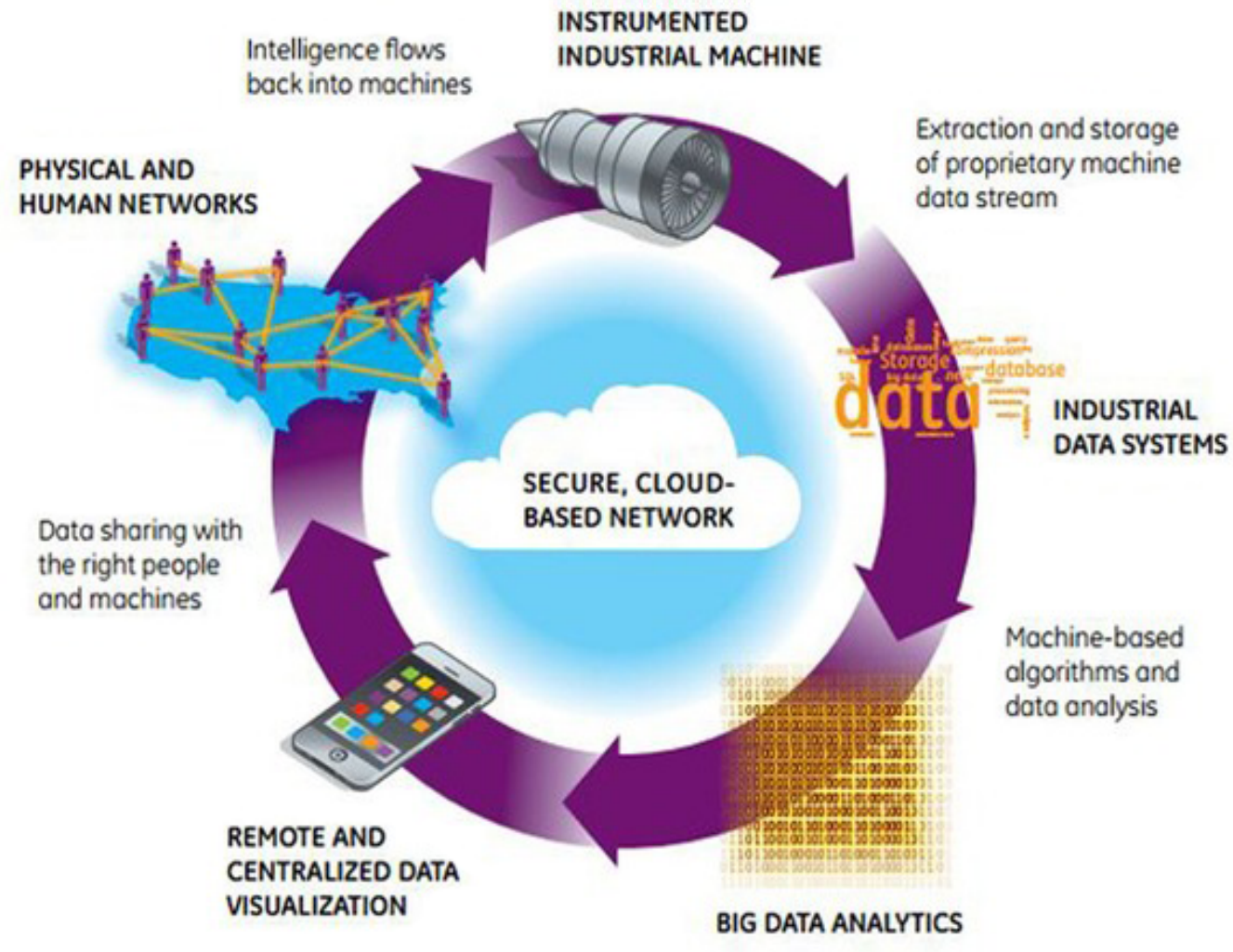
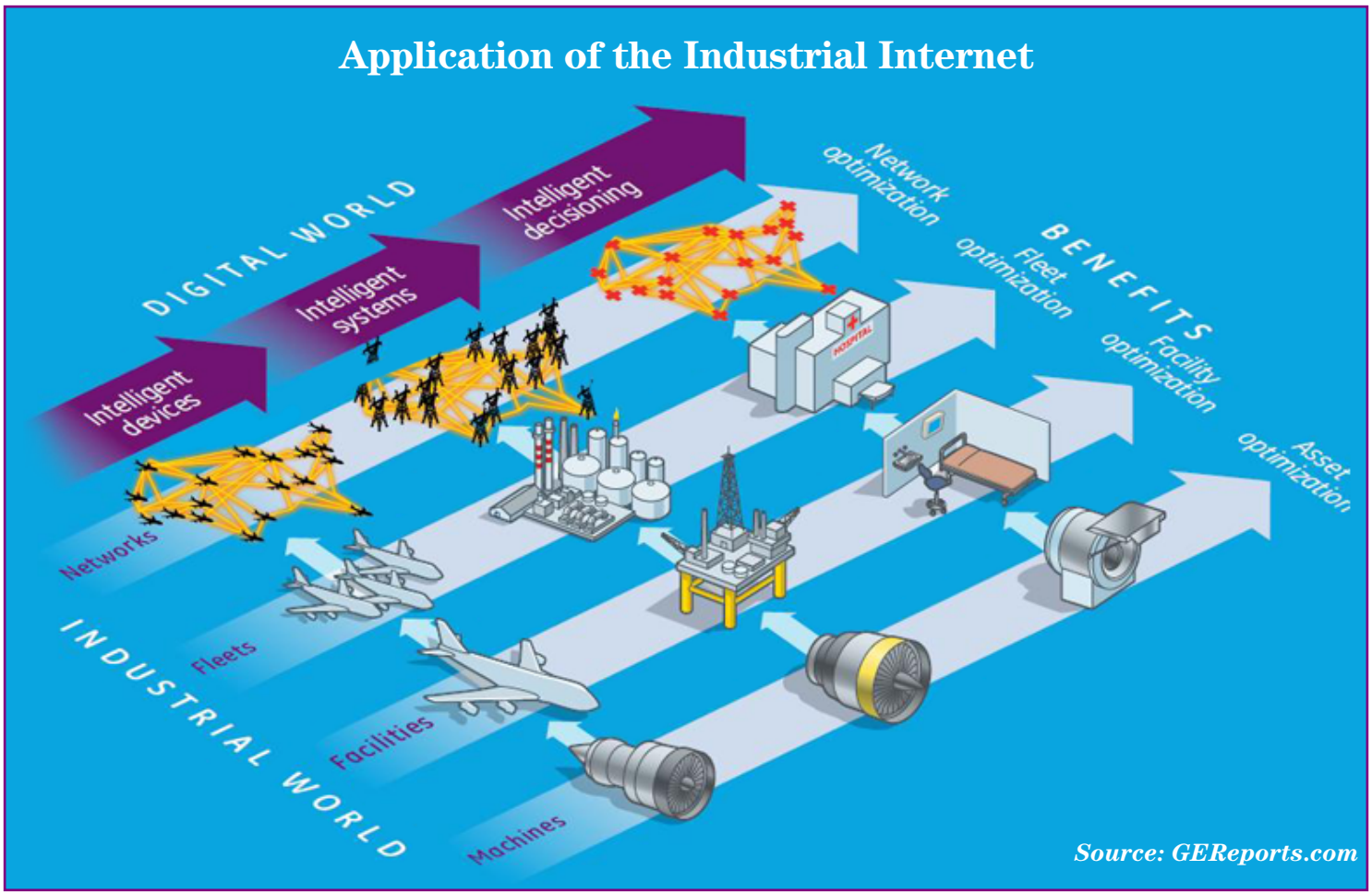
Here Comes the Industrial Internet



By nature, industry is much more pragmatic than individuals because it views every decision through the lens of the bottom line. It has, therefore, been slow to adopt many Internet technologies that deliver benefits related to social connections, simplified purchasing, and information access that don't provide an immediate payback. Of course, companies have leveraged the Internet to connect with customers and sell products, but on the production side, Internet technology has not gained nearly as much traction because it has not offered an unambiguous path to increased productivity. But now, that is poised to change.

That forthcoming change has been called the "Industrial Internet," and it's a subset of the broader



"Internet of Things" trend we've explored on previous occasions. It is characterized by its ability to connect intelligent machines, software analytics, and people, thereby enabling the physical world of industry to benefit from digital intelligence in whole new ways.[1]

The concept of connecting machines on the factory floor so they can collect data and communicate is nothing new. It has been anticipated as part of broader frameworks and described using terms like "kinetic computing," which refers to physical process efficiencies being enhanced by computer-based products.

Whatever the name or vision, the goal is to improve operations through the use of the growing availability of online data, especially that which is coming to be called "Big Data." It is this explosion of data that is finally fueling the full realization of the Industrial Internet. It is the new connections that make up the Industrial Internet that are putting Big Data to work in industry by making it proactive and predictive in real time.

Leveraging this predictive information is turning out to be more than just an upgrade in work-flow. Rather, many see this as the most significant melding of business and technology since the Industrial Revolution.

This flies in the face of those who suggest that the productivity-enhancing potential of Internet technology is running out of steam. The naysayers have argued that the recent innovations, primarily seen in enhanced social media, entertainment, and gaming, are doing little to boost our standard of living through increased productivity and truly new value creation. This view, however, fails to see that although the coming Industrial Internet shares much

of the technology of "the Internet we already know," it will not function as some sort of "industrial social network."

On the contrary, this new Industrial Internet represents a new wave of technology, integrating artificial intelligence, machine-learning software, and vast streams of new and diverse data. This river of data is being produced as a result of the declining cost of instrumentation: specifically, smaller, more powerful, and cheaper sensors, which are being deployed on equipment on a much wider scale. Used in such applications as jet engines, power generation turbines, medical devices, and industrial production lines, these sensors are generating enormous amounts of data.

That's where harnessing the kinds of raw technologies behind IBM's Watson, Apple's Siri, and Google's search engine (which evolved in the consumer world) start to come in. These smart machines are able make this data *actionable*. This is due largely to new software and analytical methods that can extract and make sense of data coming from equipment all along the supply chain.

As more machines are connected to the Internet, they becoming part of a cohesive, intelligent network that can leverage analytics to predict problems and optimize the performance of individual products, processes, fleets, and networks.[2] For example:

- Sensors can enable the prediction of mechanical failures in jet engines by providing better insight into their performance. This allows maintenance to be performed in a *preemptive* way, which can greatly reduce delays caused by problems that occur shortly before take-offs. Machines in general can become smarter with the help of sensors, helping those who maintain them schedule maintenance, avoid breakdowns, and minimize downtime.

- Similarly, hospitals can track the exact location of medical devices, revealing whether they are in use or idle. This knowledge can enable improved utilization rates and more efficient scheduling of patient admissions and medical procedures. This can lead to better health outcomes for more patients at lower costs.

This new ability to collect large amounts of real-time data is also being coupled with cloud computing to provide an unprecedented way to analyze and use data. The revolution in mobile technology will further enhance information sharing and decentralized optimization. As a result, companies in a wide range of industries are beginning to benefit from the Industrial Internet. For example:

- New connections are improving the flow and routing of MRI data so that the information is able to "find" the appropriate doctor, rather than the doctor having to search for a particular patient's MRI images.[3]

- To help prevent costly, disruptive, and dangerous power outages, sensors are beginning to be placed on transformers and power poles to provide status updates and performance data.[4] This information can signal a potential problem before it causes multimillion dollar losses to power companies and their customers. And, in the event of a power disruption, these sensors can instantly pinpoint the problem, which is a crucial ability power companies have not always had.

- In the agricultural sector, moisture sensors are being employed to direct irrigation, resulting in dramatically less use of water.

- A joint venture between GE and Accenture is using software, data management, and analysis services to improve the efficiency of aircraft operations.[5] It is estimated that over the next 15 years, the decreased downtime and waste this solution delivers could save the airline industry more than $30 billion in fuel costs.

GE, which has taken an early lead in developing the Industrial Internet, estimates this technology will result in efficiency-related savings for GE and its customers of as much as $150 billion as it continues to put sensors on industrial products across the industries it serves. Total benefits across all firms are likely to reach dozens of times this amount over the next 20 years.

Given this trend, we offer the following forecasts:

First, the emerging Industrial Internet will play an important role as we transition to the "Golden Age" of the Digital Revolution. The first stage of the Digital Revolution had to do with IT itself. Since the dot-com crash in 2000, we've been transitioning from a world where information technology businesses created value, to a world where information technology embedded in other industries creates value. The potential that Internet technology presents for improving productivity will propel it throughout the industrial sector, changing it forever, just as the "consumer Internet" has transformed entertainment and advertising over the past 20 years. In the process, businesses will be created and destroyed. We'll also see related improvements in energy efficiency and healthcare productivity.

Second, the Industrial Internet will both eliminate and create jobs. Higher productivity will naturally eliminate some jobs. However, new ones in different fields will be created as global growth is impacted by the scope and reach of the Industrial Internet. To maximize this growth in jobs, the education system will need to train and retrain people with the skills needed to support advanced manufacturing technologies, including the Industrial Internet.

Third, the efficiencies enabled by the Industrial Internet will allow the U.S. to fully exploit its competitive advantage in raw materials and energy. As discussed in prior issues of *Trends*, the United States is rapidly gaining a cost advantage, in terms of energy and certain other raw materials, that more than offsets the advantage of emerging countries in terms of labor costs. This advantage will only increase as advanced manufacturing complements our natural advantage in innovation and market proximity. Over the coming decade, this "economic trifecta" will create higher-paying jobs, leading to higher standards of living.

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February 2013 Trend #4 Resource List:

1. *Vox*, December 7, 2012, "The Next Productivity Revolution: The 'Industrial Internet'," by Marco Annunziata. © Copyright 2012 by VoxEU.org. All rights reserved. http://www.voxeu.org/article/next-productivity-revolution-industrial-internet

2. Ibid.

3. *Forbes*, October 4, 2012, "The Industrial Internet: Even Bigger Than Big Data," by Bill Ruh. © Copyright 2012 by Forbes.com, LLC. All rights reserved. http://www.forbes.com/sites/ciocentral/2012/10/04/the-industrial-internet-even-bigger-than-big-data/

4. Ibid.

5. *InformationWeek*, November 29, 2012, "GE Isn't Running an Industrial Internet Charity, Folks," by Chris Murphy. © Copyright 2012 by UBM Tech. All rights reserved. http://www.informationweek.com/global-cio/interviews/ge-isnt-running-an-industrial-internet-c/240142916

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