The Internet of Things—
An Option for the Fastener Industry

by Dean Tseng, Fastener World

(Fig. 1)

IoT is Everywhere

(Fig. 2. Source: Wikipedia)

The Internet of Things (IoT) is not a distant concept. It is right at your front door. You probably use Amazon or Alibaba for your day-to-day purchase, or use Google Drive or Drop Box to store or transfer your file. All of these service providers have dug deep into the development of IoT, and behind them is something even bigger than you would have imagined—The whole manufacturing industry and service industry of the world's powerhouses, especially the U.S., Europe and China, is geared toward the technology of IoT and building related infrastructure. The IT giant Cisco Systems predicts there will be a total of 50 billion objects connected to the Internet by 2020, and that is only a small fraction of the potential you might expect from IoT which along with artificial intelligence (AI) is dubbed as the symbol of the 4th industry revolution.

The former vice president and IT executive manager of Hitachi Ltd., Mr. Osamu Oono, wrote a book (see Fig. 1) published at the end of 2016 on the drastically changing Japanese manufacturing business model driven by IoT. He is an industry legend, who literally revamped and integrated Hitachi's corporate information system and brought Hitachi to a brand new level of success. In his book he articulates the idea of IoT in full detail with a few pragmatic examples and offers his suggestions for every manufacturing company that wants to take on the power of IoT for its business. I will review his concepts in the book, and reflect on the fastener and manufacturing industry at the end of this article.

Mega Corporations are Dominating the World's Industries with Their IoT Platforms in the Making

In his book, Mr. Osamu brought up the most critical concept—Whoever controls the PLATFORM dominates the IoT industry. His observation is backed by many real-life examples, the most obvious of which are Industry 4.0 and IIC.

As Osamu explains, Industry 4.0 is a concept that combines the industry, academia and the government, and is formulated by the German government in 2013 out of the crisis awareness that the technical advancement of emerging countries may keep pace with Germany and take away advantages of the German manufacturing industry. The big picture of Industry 4.0 is to utilize standardization to turn the whole Germany into an imaginary FACTORY. The members of Industry 4.0 include the world's largest auto parts maker Bosch, as well as Siemens, SAP, and IBM. The best example of Industry 4.0 is Bosch. Bosch's core technology is its sensors widely applied in IoT. "What you might not know is that Bosch has produced an amazing total of 5 billion sensors, which translates to 4 million sensors per day, and that 50% of the world's smart phones are equipped with its sensors," said Osamu. Bosch has established its own "Bosch IoT Platform" and later configured it into a service package called "Bosch IoT Suite" **(see Figure 3)** scheduled for sale in 2017 to not just the automotive industry but also general industries, even to the destinations of your daily grocery purchase—Supermarkets! With the Suite powered by Bosch sensors, carmakers can share auto parts data with their community (including cities, universities and insurance companies), and buyers at a supermarket can quickly locate the position of their desired agricultural produces once they have sent out the electronic purchase lists. Just when you think Bosch only focuses on the automotive parts industry, in fact, it has already been stretching arm through IoT platform to any other different industries you can possibly think of.
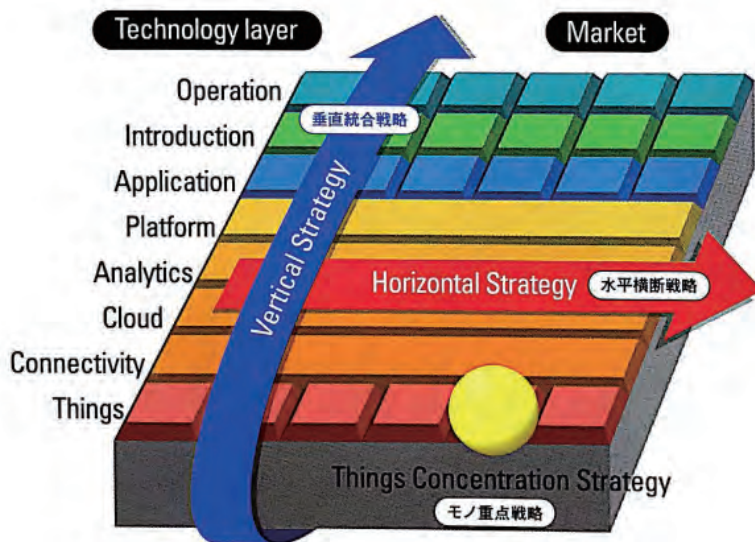
On the other side of the globe, the IIC (Industrial Internet Consortium) is an America-based IoT platform formed in 2014 by GE, INTEL, IBM, Cisco, and AT&T. The participating members have increased to 223 companies, making IIC the biggest IoT group in the world. IIC is best represented by GE. GE utilizes its self-developed "Predix" IoT platform (see Figure 4) to provide real-time monitoring, damage prediction, maintenance alert and solutions suggestion service for aircraft engines and airports. "Predix" can even predict the times of flight arrivals at the airport for ground staff to get necessary tools and repair parts ready beforehand, thus saving time and cost.
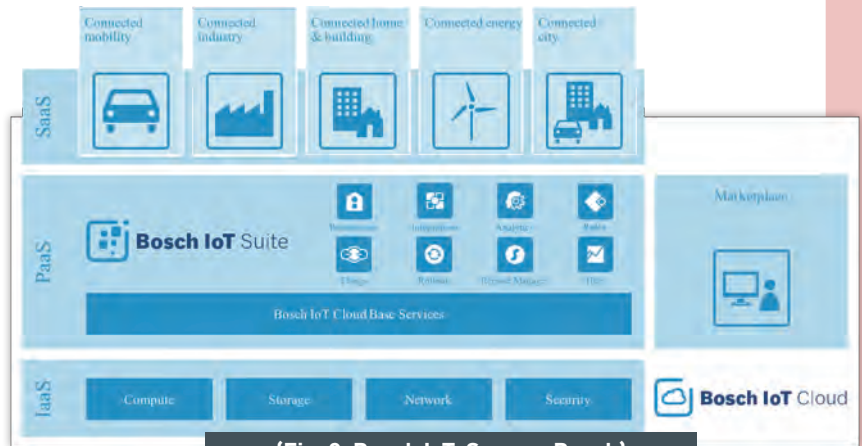
(Fig. 3. Bosch IoT. Source: Bosch)
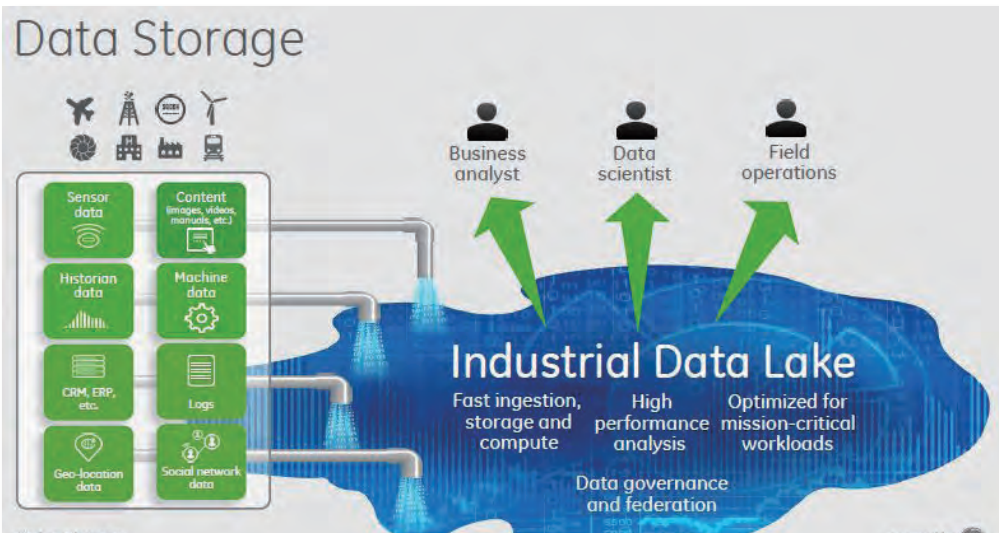
(Fig. 4. GE Predix. Source: Praas Chaudhuri's Linkedin article at www.goo.gl/cRIVom)

You might wonder how Bosch and GE managed to create their IoT platforms that dominate the markets. Osamu's observation leads to a shared structural characteristic between Bosch (representing Industry 4.0) and GE (representing IIC), and that is the "vertical integration strategy & horizontal cross-territory strategy" diagram illustrated in **Figure 5**. The vertical axis is an 8-level structure. In a nutshell (here is my own interpretation of the structure), the factory (or company) produces THINGS (or products) → the things are connected to CONNECTIVITY devices (or the sensors, the Internet or hubs) to connect with the CLOUD → the Cloud does the ANALYTICS within an IoT PLATFORM where the analyzed data of things become a part of an APPLICATION (or the aforementioned Bosch IoT Suite) INTRODUCED to the market for industrial or daily-life OPERATION. On the other hand, the horizontal axis, to my understanding, is the manifestation of cross-market business involvement of a company at a single specific level of the vertical structure.

(Fig. 5. Vertical integration strategy & horizontal cross-territory strategy. Image from Osamu's book cover)

As Osamu notes, an individual corporation cannot possibly cover all 8 levels on the vertical axis, and therefore you will find corporations scattering across the diagram. For example, Bosch has already made it to the "Introduction" level (second to the top on the vertical axis) while simultaneously trying to introduce its Bosch IoT Suite to the automotive market, general markets and even supermarkets. Siemens is at the "Application" and "Introduction" levels with its Siemens Plant Cloud Services being introduced into production lines of the manufacturing market. Hitachi is at the "Introduction" level with its self-developed Lumada Platform on sale since 2016. Google has surpassed the "Cloud" stage and entered the "Analytics" and "Platform" levels with its successful Google services (Google Play, Google Drive, etc.) targeting the consumers market, and so is Apple with its iOS Siri and Apple Store. Some big brands like Seimens that originally had no IoT platform chose to collaborate with SAP to provide IoT service. As Osamu indicates, the utilization of Big Data goes through 5 stages: Connect → Monitor → Analyze → Predict → Optimize. So far most companies that adopt IoT are still at the "Analytics" level, and this shows the development of IoT technology is still not very mature and can offer unlimited business opportunities.

Let's turn our focus back to the question—How did Bosch and GE create their own IoT empire? To answer this, just think of the easiest example around yourself—Google—and you will get the idea. Google has done an extraordinary job to cover everything relevant to your daily life with numerous application software like Google Trip, Google Map, Google My Business, Gmail, Google Car (under development), Google Search, to name just a few. If you think of online search, you may think of Google, and Google is no doubt one

of best performing search engines that surprises you with its almost impossible predictivity of what you really desire, because Google is the very first search platform that unleashed the power of IoT way back before you learned the concept of IoT for the first time. It is one of the first service providers that constructs an IoT platform dominating the Internet and search engine industries, and it has gone to great lengths to try to dominate your whole life. This kind of logic goes the same with Bosch and GE. The thing is that Bosch takes a different approach by extending its Bosch IoT Suite from its dominating automakers market to the general market while GE sells its platform to other manufacturing industries. Google, Bosch, and GE fought to be the first inventors of IoT platforms in their respective industries, which perfectly proves Osamu's claim in his book—Whoever controls the platform dominates the IoT— or perhaps even the world someday!

## The Focus of Manufacturing is Shifting from Object Production to Cloud-based Service Provision

As said in a previous paragraph, the development of IoT technology is an ongoing progress with unlimited and gigantic amount of unknown data awaiting to be analyzed and applied. You can already imagine everything around you in the future may be connected to the Internet and shared with a public or private CLOUD that tells everything around you how to function to your own preference, and everything may be wrapped into a software app and connected to a distant cloud. However, the point here is not the "Things". It is the provision of service backed by the Things and Clouds that matter to modern consumers. Take Google and Apple

for instance, you choose them not just because of a specific product (such as Google Document or iTunes), but because their whole IoT-backed hardware and software together give you a sense of service completeness and the ultimate convenience. The key here is to package the products (Things) into a cloud-based service often dubbed as something like "OOOO Suite", as in Bosch IoT Suite and Adobe CC Suite. That sense of service completeness, in my interpretation, is critical to the success of Bosch, GE and other corporations' IoT business.

With regard to the manufacturing giants including Bosch, GE, Toshiba, and Hitachi, Osamu predicts that the future manufacturing will put a senor on every manufactured product (THING) and start to work on the vertical integration strategy, building the necessary cloud platform, connecting it with the THINGS and eventually transforming the Things into a comprehensive service. "The manufacturing industry will not be able to survive if it does not do so." "Our lives will change dramatically as the THINGS that was once 'possessed' become something to be 'utilized'," notes Osamu. He says "Uber" is a classic example because it does not possess the Uber taxis but has a platform to turn the taxis into its service of transportation. He also suggests companies in the manufacturing industry distinguish between the competitive field where a company should seek to utilize "core technology" to dominate others, and the collaborative field where data are shared with other companies.

Imagining the Fastener Industry with IoT

Although IoT is yet to be prevalent in the fastener industry, it does not mean IoT does not exist there. Brighton Best International (BBI), the largest fastener distributor in the U.S., has its platform connecting products to warehouses and customers. Such an inventory management and sales integrated platform is at the
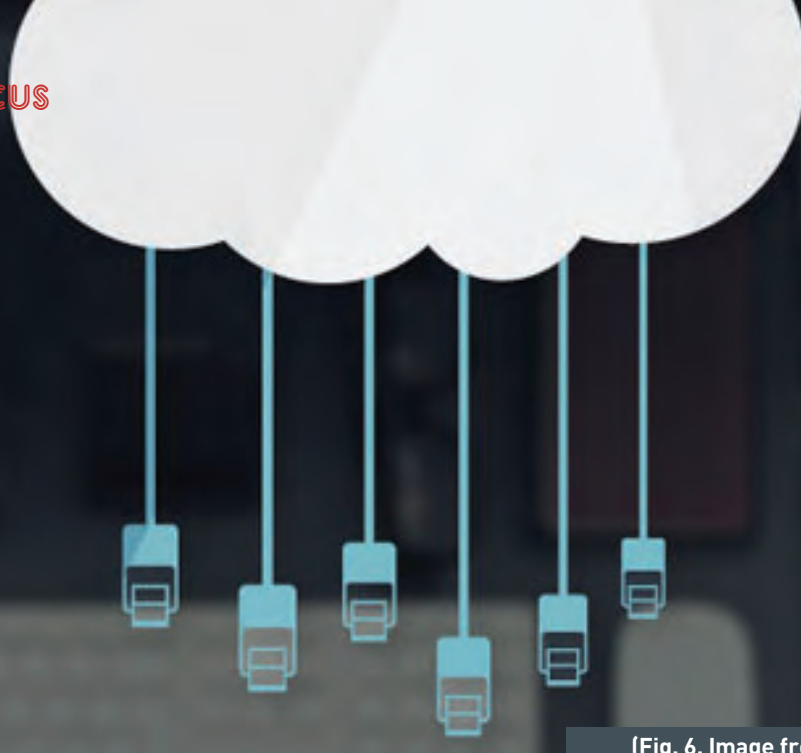
CONNECTIVITY and CLOUD stage. So far, the fastener industry as a whole is somewhat still absent from the global IoT trend, but if nothing is impossible, is there anything this industry can do with IoT? Below this article will look at this matter through the standpoint of Taiwanese fastener industry, and hopefully this will provide an inspiration for other countries as well.

The Kaohsiung City of Taiwan already has a thoroughly developed fastener supply chain with several and closely connected fastener makers, distributors and traders from the up, middle and downstream. Over the years Taiwanese fastener companies have co-established a broad network of various domestic and overseas markets. Now, here is a question: Is it possible to build a bigger fastener platform that offers customers and suppliers inventory status notification, multiple options for logistics and distribution routes, predictive customer-supplier matching and recommendation service, and more? Such a fastener IoT platform will not just be a cloud gathering tons of company information, but also have to require the analytic software technology to help customers find exactly what they want and attract more of them to use the platform.

In terms of the structure and market status of Taiwanese fastener industry, developing a certain level of IoT will encounter challenges. Establishing IoT infrastructure and business will encounter intricate problems involving corporate classified material, costs, R.O.I, and so on. However, in my opinion, the industry still has a chance to utilize the concept of IoT and start to work on the first level (Things) and the second level (Connectivity), developing internal (corporate level) "small cloud" of respective company that will optimize corporate internal operation by applying IoT on production lines, labor management, purchase, sales, etc. If a fastener company cannot develop the small cloud alone, would it be possible to reach out to IT companies that have the analytics technology, or seek software designers that know how to custom-make and introduce small clouds? Bosch, the head of Industry 4.0, has successfully drawn the blueprint for IoT with its Suite software. We stand at the shoulder of this automotive parts giant and witness the vision that it brings to the manufacturing industry. Why don't we try and find our suited style of IoT?

* (Follow-up) Regarding the manufacturing industry: On March 20, 2017, the TV news program "Focus World News" reported that Japan has initiated a project called "Society 5.0" that is set to transcend and surpass the German Industry 4.0. While Industry 4.0 mostly targets the manufacturing industry, Society 5.0 takes a higher and broader approach, trying to connect not just the manufacturing industry but the whole society through the power of IoT. This reveals Japan's awareness to challenges from other competing countries that are eyeing the lion's share in the IoT industry. Japan is agile enough to make a quick move on this global trend. If we don't start our move or react accordingly, will we be able to keep pace with the world?