Fastener Manufacturing Revolution Through *Industry 4.0*

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Industry 4.0 is much more than a flashy motto. The power of Industry 4.0 is moving from potential to reality by a convergence of trends and technologies which has reformed the way things are made. The first industrial revolution (1.0) introduced the mechanical production facilities by converting water to steam power about 1780s. 30 years after, the second industrial revolution (2.0) and the age of mass production started with the support of the first electricity powered assembly line. The third industrial revolution (3.0) began in the late 1960s, the era of production automation, supported by programmable logistic controllers (PLCs) through the use of electronic and IT systems.

Manufacturing companies have traditionally been slow to respond to the initiation of digital technologies, but now Industry 4.0 is changing manufacturing. Although, advanced digital technology is already used in manufacturing, with Industry 4.0, production will be transformed. In a broader view, today, the fourth industrial revolution (4.0) is transforming economies, renovating jobs, and even changing society itself. Under industry 4.0's umbrella, numerous physical and digital technologies are joining through analytics, big data, artificial intelligence (AI), and the Internet of Things (IoT) to build digital enterprises for more informed decision-making. In our future articles, all these terms and jargons will be discussed and explained, but in this article, at a very high level, we try to describe them in simple words.

Digital transformation journey starts with DATA, so-called the new oil, and analytics is the combustion engine. Data can be generated from human, from machine, from various devices and sensors. Regardless of sources of data, the most challenging part is to refine this new oil. We need to make sure that we could extract the real value from our data. Big data explains that no matter our data are structured or unstructured, historical or real-time, and how big they are, with the new advanced techniques, tools and infrastructure, decision makers in each industry would be able to unlock the power of data and extract insights related to a particular business problem using their internal or even external data. For instance, a fastener manufacturer needs to find out optimal torque settings of manufactured fasteners by data analysis or to predict product defects using predictive analysis. Or another example, the predictive maintenance can be used in a factory to prevent full-blown crises to everyday waste and inefficiency in production. There are many other examples of (big) data analytics in manufacturing, but now let's talk more about data and its crucial role in new advanced manufacturing.

Data could be extracted and analysed from sensors. They could be transferred and exchanged between machines and devices via Internet. Manufacturers can tap into their data and apply it to achieve new levels of business operation performance. The Internet of Things (IoT), is all about networks, devices, and data. As one of the subsets of IoT, the Industrial Internet of Things (IIoT), or Indus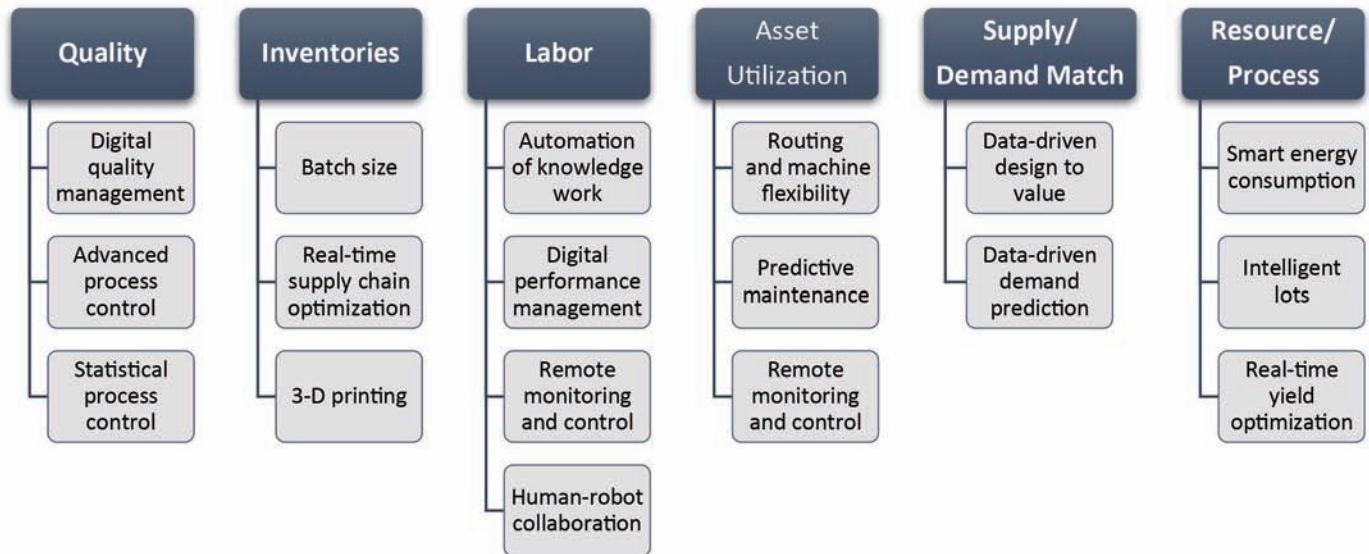trial Internet, brings together excellent machines, advanced analytics, and people at work. IIOT is the network of a large number of devices connected by communications technologies (Wi-Fi, Bluetooth, etc.) that results in systems that can monitor, collect, exchange, analyse, and deliver valuable new insights as never been before. Industry 4.0 could be defined by putting all mentioned techniques, technologies and platforms together. And with no doubt it allows manufacturers to have more flexible manufacturing processes that can better react to customer demands.

Industrial fastener market is highly fragmented and competitive in nature due to the presence of several small and large manufacturers. Fastener manufacturers, more specifically large manufacturers, must do things differently to be still relevant in the market and to win market share in today's environment. It is not sufficient to just sustain the current situation without considering any digital transformation. To live and succeed and to be one step ahead of competitors, fastener manufacturers must focus on growth. With no doubt, one of the ways that fastener manufacturers can reach evolution and development is by leveraging Industry 4.0 technologies, as this would be the next phase in the digitization of the manufacturing sector.

Although Industry 4.0 originated from a project in the high-tech strategy of the German government, China has been actively acquiring Industry 4.0 firms to become the global centre of smart manufacturing. Most probably, with the newly announced guidelines for the "Made in China 2025" strategy by the Chinese government this country will be going to challenge Germany in competition for Industry 4.0 adoption. The main objective of implementation of the guidelines is to boost the country into a higher value-added economy by concentrating on manufacturing sector refurbishment, digital transformation, and innovations-based production. It should be considered that China slowly loses its advantage of cheap labour as this country will face an aging population and it pushes China or even other players in global industrial fastener market to innovate aggressively.

McKinsey and Company has prepared a digital compass based on 8 major manufacturing value drivers and 26 practical Industry 4.0 levers applicable in any industries such as fasteners, tools, and machinery. The following figure exhibits some of the major pillars in this digital compass. Other value drivers include services/aftersales, resources/process and time to market.

Fastener manufacturers have a keen interest in process effectiveness. Industry 4.0 offers intelligent tools for predictive process control which can be applied in fastener, die and mould manufacturing, new tools for smarter energy consumption, greater information storage in products and pallets, so-called intelligent lots, and real-time yield optimization. Plant managers could access to real-time monitoring systems with the new advanced visualization tools to track and monitor the production while they can improve their products and operations through predictive analytics. By receiving required real-time data, managers could be able to make their decisions and take proper actions on the spot with no idle time. This is just one of the practical examples of Industry 4.0's application in the fastener industry.

Quality	Inventories	Labor	Asset Utilization	Supply/ Demand Match	Resource/ Process
Digital quality management	Batch size	Automation of knowledge work	Routing and machine flexibility	Data-driven design to value	Smart energy consumption
Advanced process control	Real-time supply chain optimization	Digital performance management	Predictive maintenance	Data-driven demand prediction	Intelligent lots
Statistical process control	3-D printing	Remote monitoring and control	Remote monitoring and control		Real-time yield optimization
		Human-robot collaboration			

Now, if you are so excited about Industry 4.0 and smart manufacturing, the only question left is, "How to start?" One of the most common answer for this question is "Please don't boil the ocean!" Prepare yourself for a digital transformation first and try not to investment for all those advanced, and most probably expensive, systems, platforms, or equipment without knowing your main challenges. Manufacturers should build their business cases, identify their major challenges, and then find the right innovative solutions and relevant digital platform to address their current and future challenges. This could be the groundwork that supports manufacturers succeed through Industry 4.0. ■

Resources:

Industry 4.0: Are you ready? Deloitte Review, Issue 22

Manufacturing's next act, McKinsey & Company