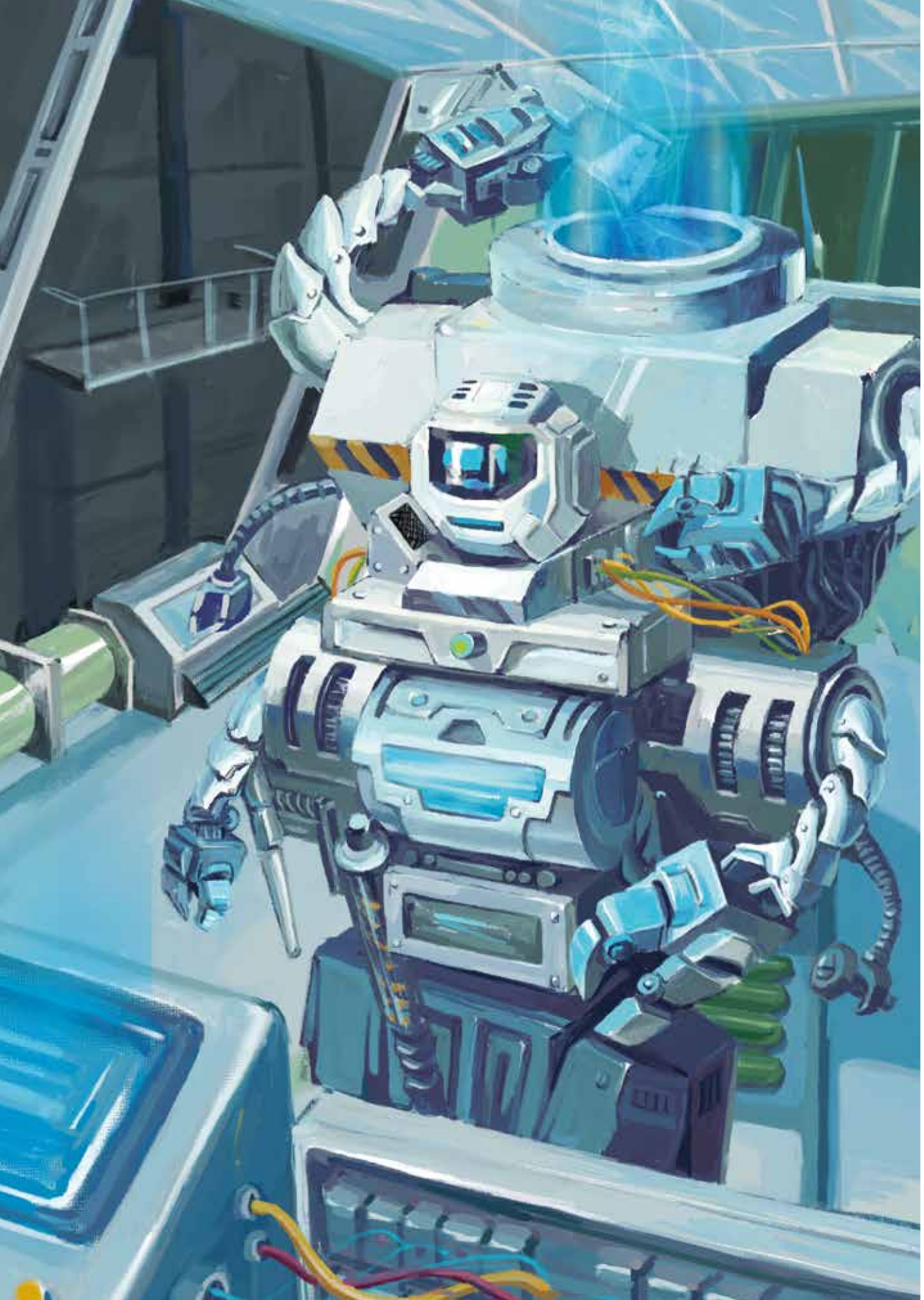


Manufacturing is changing in four respects: user needs, products, ecosystems, and circulation patterns. These trends will impact the methods of value creation and distribution for an industry which leverages digitization, smart manufacturing and "Internet Plus".

Transformation Begins for Manufacturing Industry

By / Ricky Tung, Jill Qu

Manufacturing is undergoing an unprecedented, radical transformation as consumer expectations and technology trends converge. Consumers' expectations from products have risen: they want to know more about the products they are buying and also want the ability to customize their purchases. Products have become "smarter" therefore, with sensors connected to platforms and applications that generate real time data and analysis. As a result, manufacturing is no longer confined to the product alone, but involves supplying an extended chain of associated goods and services that together make up the end product, which may be closer to an experience. The line between hardware and software is blurring, and as consumers demand greater product differentiation to meet increasingly exacting tastes and needs, the line between production and consumption will get blurred as well.

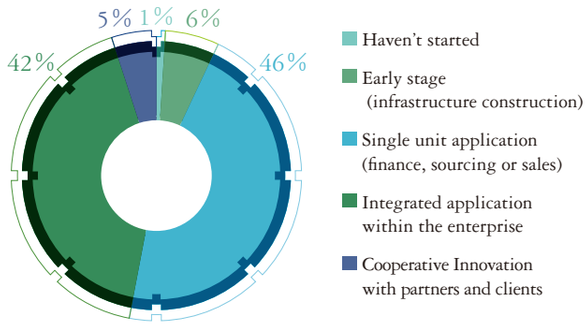
These trends will impact every part of the manufacturing industry in significant ways. In China, the trend towards intelligent manufacturing, digital production, and the "Internet of Things" (IoT) will transform how value is created and distributed along the entire supply chain.

The Information Economy Arrives in Manufacturing

Industry 4.0, the Industrial Internet and the Internet of Things may have different origins, scopes and focal points, but they are united in the recognition that physical objects can connect with each other through networks and platforms, exchange information and communicate with each other to gain insights into consumer behavior and perform certain functions. The emergence of intelligent, connected products is the starting point for a radical change in manufacturing.

According to the standard set by the Chinese Ministry of Industry and Information Technology, the integration of the information with the manufacturing economy passes through four stages: a preliminary explorative stage; single unit application; integrated application; and finally cooperative innovation. In China, although the transition from single unit application to integrated application began several years ago, until recently only a small number of enterprises had been involved, so the impact of information technology on manufacturing was limited. However, research by Deloitte in 2015[1] showed that 46% of companies interviewed were at the stage of single unit application while 42% had already progressed to the integrated application stage (Figure 1). As more enterprises advance to the level of integrated application, the overall effect on China's manufacturing industry will be enhanced.

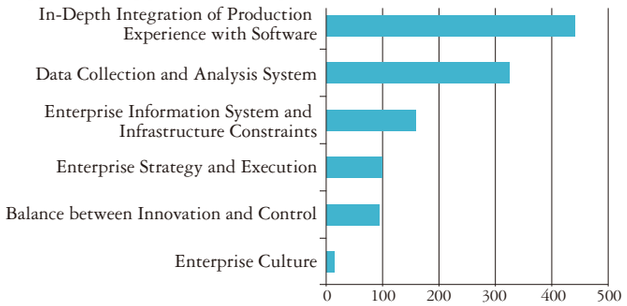
Figure 1 Digital Economy : Stages of Enterprise Development



Source of information: Informatization Research of Chinese Manufacturers, September 2015, Deloitte Research.

It is worth noting that the technologies driving the information economy tend to mature rapidly; however, enterprises are slower to make effective use of the real-time data and analytics delivered by the new technologies, given that these require new working processes and enterprise capabilities. In short, technology moves quickly, whereas enterprises are slower to change, as they are challenged by integrating their operations with new software and production possibilities (Figure 2).

Figure 2 Biggest Challenges of Transition



Notes: Enterprises choose top three challenges based on their importance, No.1 earns 5 points, No.2 earns 3 points, and No.3 earns 1 point. The aggregated result is shown above.

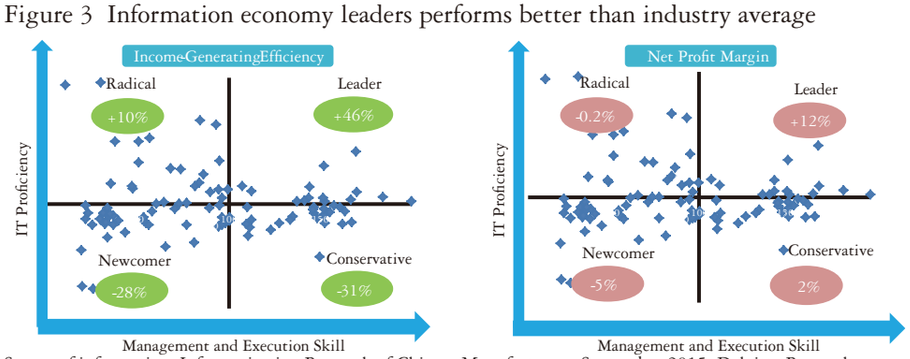
Source of information: Informatization Research of Chinese Manufacturers, September 2015, Deloitte Research.

Most companies agree that integrating the information economy with manufacturing can enhance productivity and add value to the product. Yet many remain unsure of whether financial benefits really will follow. As a result, some companies are hesitant to make significant investments into this area.

Deloitte has conducted preliminary research to answer the question of who actually reaps financial gains from corporate investment into the information economy. Based on the work of George Westerman, the MIT Initiative on the Digital Economy, and others, as well as results of interviews with 132 companies, we classify companies into four types according to their respective IT proficiency, and management and execution skills: leader, conservative, radical and newcomer.[2]

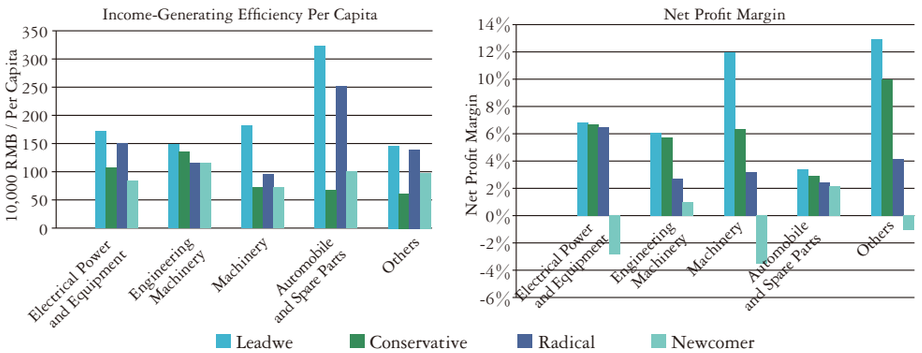
Following this, we evaluated these companies' financial performance, using the net profit margin and per capita revenue generation of their employees in 2014 as yardsticks, and aggregated these results for each quadrant. We found that the net profit margins of information economy leaders was 12%, and the revenue generation of their employees 46 percent higher than the average for all 132 companies (Figure 3). The survey also found that a higher IT proficiency improved income-generating efficiency and net profit margins within each quadrant of the survey. (Figure 4).

Figure 3 Information economy leaders performs better than industry average



Source of information: Informatization Research of Chinese Manufacturers, September 2015, Deloitte Research.

Figure 4 Performances in major industries by four types of enterprises



Notes: 1) Based on enterprises' data in 2014. 2) Machinery includes robot manufacturers.
3) Others include fine chemical, rail transit, aerospace, medical instruments, electrical wire and cable, etc.

Source of information: Informatization Research of Chinese Manufacturers, September 2015, Deloitte Research.

Intelligent Manufacturing: Extensive Application Initiated with True Value yet to be Discovered.

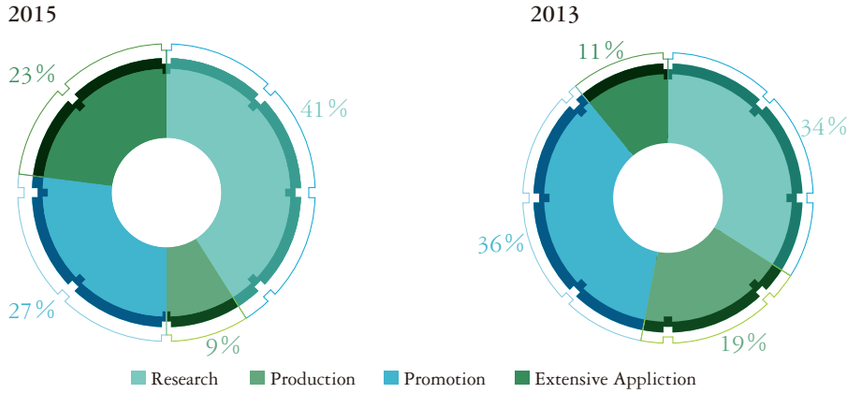
Endowing production facilities with information (analog or digital) capability, enables them to calculate, communicate and diagnose, thereby turning them into "intelligent devices". When intelligent devices are applied on a large scale, the entire production process starts to become self-diagnosing and self- improving. This begins the transition to 'intelligent manufacturing'.

Our survey research shows increasing use of intelligent devices in manufacturing enterprises since 2013. 23% of the enterprises interviewed in 2015 had begun to extensively integrate intelligent devices into the production process, up from just 11% two years earlier (Figure 5).

The percentage of companies that were using any kind of intelligent device had also risen from 51% in 2013 to 59% in 2015. Among such enterprises, those in the automobile and spare parts industries recorded the highest usage of intelligent devices, followed by those in engineering machinery, electrical power and equipment, and other machinery.

Based on current trends, it is plausible that the use of robots in production in the 3C electronics, metal, rubber and plastics, food, and pharmaceutical industries will rise above their use in the automobile industry in the next three years. In other words, the general manufacturing sector will become the new front for industrial robots.

Figure 5 Stages of Production of Intelligent Devices of Interviewed Enterprises (Compare 2015 to 2013)



Source of information: Informatization Research of Chinese Manufacturers, September 2015, Deloitte Research.

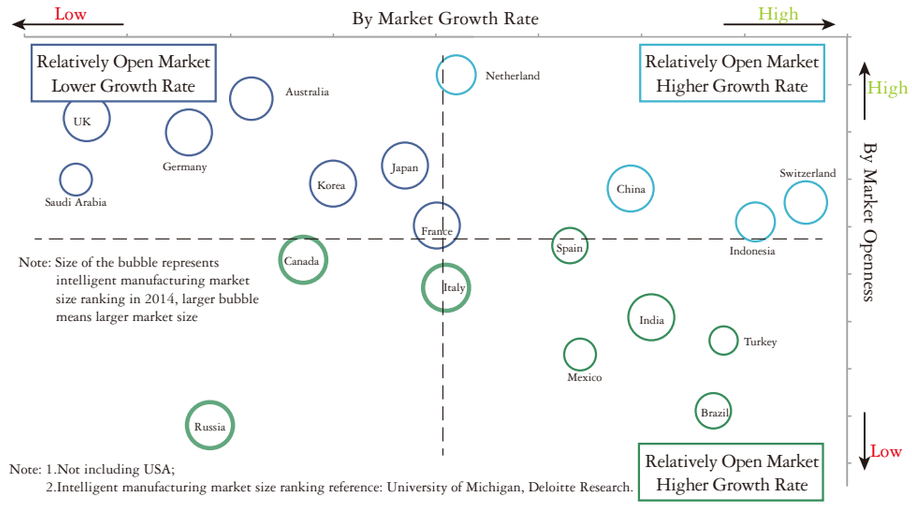
Intelligent Manufacturing in China: Competition ahead

China's manufacturing industry, with its massive production capacity, offers a new frontier for the transition towards intelligent manufacturing, while creating opportunities for the equipment and software industries. Robots, sensors, industrial software and 3D printing all have potential market sizes of tens or hundreds of billion RMB.

In February 2014, the University of Michigan analyzed and compared the intelligent manufacturing markets of 19 countries outside the USA, in order to gauge the size of the market for the American intelligent manufacturing industry abroad. The research, which aggregated data on growth potential, market openness, market size, infrastructure, and country risk, characterized China's market as possessing relatively high degrees of openness and potential for growth (Figure 6).

Market openness, growth potential and sheer size will make China a key market for multinational intelligent manufacturing enterprises to compete in.

Figure 6 Intelligent Manufacturing Market Potential Comparison among Major Countries (2014)



Note: 1.Not including USA;
2.Intelligent manufacturing market size ranking reference: University of Michigan, Deloitte Research.

Source of information: University of Michigan, Deloitte Research.

Most of Intelligent Manufacturing remains unexplored; Enterprises focus on technology upgrades while business model innovation lags behind

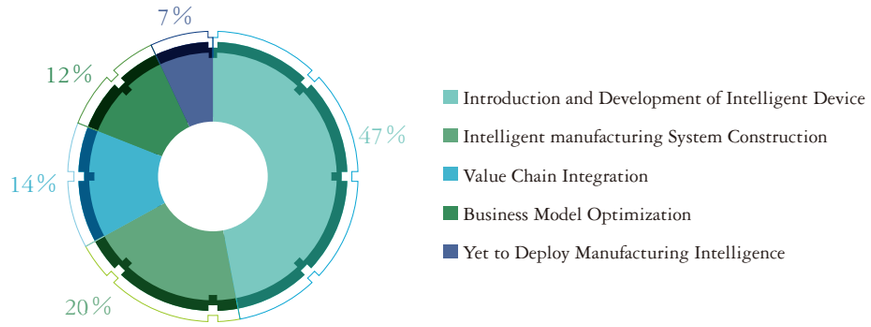
Simply installing robots inside the factory will not create intelligent manufacturing. Although it might be a necessary first step, it must be followed by data analytics, business process upgrading, and ultimately, business model innovation. In these respects China's manufacturers are still in the early stages of development .

Although many interviewed enterprises (47%) have introduced intelligent devices, only 20% are constructing intelligent manufacturing systems. Even fewer have extended the scope of intelligent manufacturing to value chain integration and business model optimization (Figure 7). Given the focus on devices and equipment, business model optimization and innovation has lagged behind. Most Chinese enterprises still try to simply upgrade equipment to take advantage of the latest technology, while imitating the business models of foreign enterprises.

The entire manufacturing industry is undergoing a transition from the traditional model

of "mass production + mass marketing" targeting passive consumers towards the model of "customization on demand + big data marketing + collaborative production" centered on creating experiences for prop-active consumers. Only through a transformation of business operation from "sales oriented" towards "market oriented" and by offering consumers more personalized and customized services and products, can an enterprise convert technological achievement into business profits and market value more effectively.

Figure 7 Intelligent Manufacturing Focuses of Interviewed Enterprises



Source of information: Informatization Research of Chinese Manufacturers, September 2015, Deloitte Research.

"Internet Plus Manufacturing": The Platform Revolution and Maker Movement

Intelligent manufacturing eventually leads to integration of the Internet with manufacturing, and the Internet of Things. Although this is still in an early stage, the Internet has begun to permeate the management of the supply chain, R&D, manufacture, logistics, sales, and customer service, and as a result, is beginning to reshape the structure and business model of manufacturing, and reconstruct the relationship between companies and users.

The Platform Revolution

1. Turning products into platforms

The shift in users' needs and the success of software platforms, paired with the wider availability of embedded technologies, has prompted many manufacturers to explore how to turn products into platforms. A software platform open to third party partners allows all participants to add new platform-based modularized functions. Such a platform model will not only bring software applications to physical hardware but, more importantly, also enable enterprises to accelerate the design and innovation of products, allow greater personalization and customization, shorten time to market, and satisfy more individualized and diversified users' needs.

2. Benefit from Internet platform value

Internet-based platforms can provide companies opportunities to improve their branding, procurement, sales, services and other capabilities.

- Branding: With the help of Internet and e-commerce platforms, enterprises can reach both domestic and overseas markets, furthering their brand in multiple markets;
- Procurement: More information about stock and flow makes it easier for enterprises to find the right suppliers and reduce procurement costs;
- Sales: Companies can use the Internet to expand marketing channels, cut intermediate or agency costs and increase margins on sales;
- Service Innovation: Platforms can help companies establish direct links with users, allowing them to more effectively understand their needs, interact with them, and meet their aspirations;
- Business Model Innovation: In combination with service innovation, companies are able to transform their business model from pure product sales to "product + service" sales.

With the help of Internet platforms, enterprises, clients, and other interested parties can all participate in various parts of the supply chain, including value creation, value delivery and value realization. Internet has changed the manufacturing value ecosystem and thus given birth to new ways to create and distribute value, while also creating new competitors and collaborators.

3. Towards the construction of value chain platforms?

Some leading manufacturers have considered constructing value chain platforms to better integrate resources, data, technology, and supply-demand information of the entire value chain. However, they have encountered some difficulties. The main barrier is the lack of an overarching acceptance of big data and cloud computing that integrates the entire manufacturing industry. Why? With market integrity and legal systems still under development, few Chinese companies are willing to give access to their data banks without sufficient protection. The first movers may well be companies that are either more powerful or have closer relations with customers, which they can use to initiate platforms that span the entire value chain.

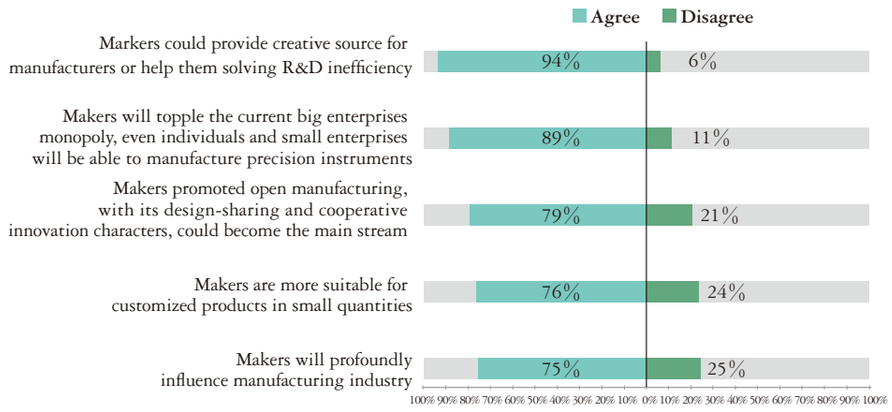
The Rise of the Maker Movement: Implications for Manufacturing

The Internet has permeated many markets and industries, initiating a radical reshaping of the industrial order. Driven by technological innovation, the Maker Movement is democratizing the means of production and enabling connections between resources and markets. The Makers,

with their keen sense of new technology and their ability to turn it into processes that "disrupt", i.e. technologically displace, existing business practices, are leading and influencing this revolution.

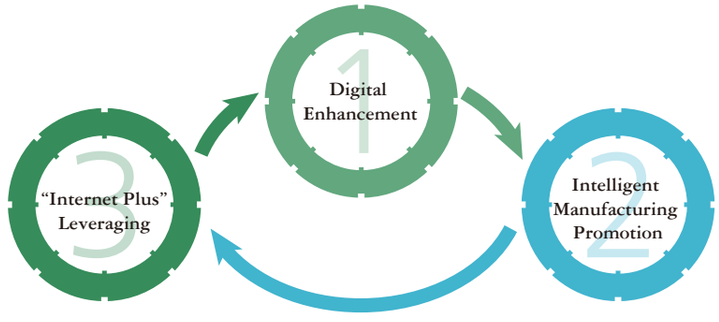
Companies that we interviewed generally acknowledged that the Maker movement did have an impact on manufacturing and 75% of them agreed that makers had the potential to influence the future of manufacturing profoundly. As to which parts of manufacturing will be most impacted, 94% of the interviewed enterprises chose R&D; 89% regard makers as the ones who will topple the current manufacturing environment, which is dominated by big enterprises; 79% thought they would initiate open manufacturing; and 76% thought that they would lead the way to an individualized and customized manufacturing model (Figure 8).

Figure 8 Interviewed Enterprises' Opinions on Makers



Source of information: Informatization Research of Chinese Manufacturers, September 2015, Deloitte Research.

How Should Enterprises React?



Chinese manufacturers should acknowledge the change in consumers' needs, the nature of products and the manufacturing environment that has resulted from the Internet. Based on this, they need to radically alter the yardsticks they use to evaluate their strengths and value adding capability. In other words, the information economy and the Internet of things can motivate traditional manufacturers to re-evaluate, and restructure their enterprises to prosper in the new era of global competition. This will require developing a range of key capabilities, including the following :

1 Digital Enhancement

- Strategy Planning: By constructing a comprehensive information architecture, unifying usage standards, and creating harmonized data interface between different application systems, enterprises can integrate information resources and achieve a more strategic, system-wide view of enterprise operations.
- IT System Integration: Construct a new system with better inclusivity, which may incorporate sensor suppliers, modules, control system communication network, commercial applications and user interface applications and other components.
- Data Mining and Management: Comprehensive perception, collection, mining, analysis and sharing of data, including the achievements of big data.

2 Intelligent Manufacturing Promotion

- Optimization and Reconstruction of Business Model: Based on "value design", key elements include: subdivision of customers for locating true potential customers, analysis of the needs of target customers, valuation and integration of enterprise's core resources, creative thinking and transformation of the service delivery model, open cooperation, and final value delivery.
- Intelligent Supply Chain: Big and comprehensive data could make the supply chain from customers' needs to final delivery "smarter", more transparent and more efficient.
- M&A and Integration: Enhancing enterprise capabilities and reach through targeted M&A, and more informed risk analysis, transaction execution, and post-merger integration.
- New Tax Model: The application of 3D printing will bring changes to laws and regulations on VAT, customs duty and other taxes.
- Intellectual Property Management: New business model and cooperation model will require enterprises to work out fresh, individualized resolutions to digital intellectual property issues.

3 "Internet Plus" Leveraging

- Multidimensional Innovation and Innovation Management: innovation in product, process, profit model, services, distribution chanel etc., manage innovation in terms of strategy, organization, structure, project management and product development etc.
- Information Security Planning: Construct customized risk management system and Internet security tactic to prevent or reduce potential attacks on each section of the value chain. With respect to IT security, manufacturing industry lags severely behind financial industry.
- Enterprise Venture Capital Management: Identify new trends, and invest in them at an early stage in order to benefit to the maximum from the exponential growth of disruptive innovation and new technology application.
- Continuous Learning: Enterprises' application and integration of new technologies should be continuous and gradual so as to support sustainable growth. A radical approach often leads to a decrease in efficiency.

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Note

1. *Deloitte and China Machinery Industry Federation have conducted research on the informatization of the manufacturing enterprises, of which the samples have included 132 large, medium and small-sized manufacturing enterprises in the areas of machinery, automobile and spare parts, engineering machinery, electrical power and equipment, electrical wire and cable, rail transit, etc.*
2. *Detailed definitions of the four types of enterprises can be found in the report "Informatization Research of Chinese Manufacturers", which can be downloaded at:http://www2.deloitte.com/cn/zh/pages/manufacturing/articles/china-enterprise-informatization-research.html*