



New Thinking for the Development of Taiwan's Services Sector with the Emergence of Smart Manufacturing

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Introduction

The world today faces challenges including energy, resource efficiency, urbanization, and talent structure changes. Germany's Industry 4.0 project and the United States' advanced manufacturing initiatives are both plans to confront and mitigate these challenges, bringing new changes for the manufacturing sector. With active investment in the development of smart manufacturing from countries in Europe and North America, the "servitization" of global manufacturing seems inevitable. In the face of this wave of servitization, Taiwan should use its accumulated advantages in the ICT field to find innovative service models that integrate manufacturing and services in response to the broader trends of the industry environment. This could be a feasible path for breaking the current bottleneck faced by Taiwan's service industry.

Increasing Investment in Knowledge and Technologies of the Service Industry on the Basis of Solving Demand Issues

1. The Issue of Population Structure Changes and Labor Productivity

Many developed countries are facing changes in their population structure. For the industry, the most immediate effect of these changes is the change in labor supply. National Development Council projections show that Taiwan's working-age population will peak in 2015 and start decreasing in 2016 by an average of 180,000 per year. With late entry and early retirement both common for Taiwan's workers, both the manufacturing and services are facing labor shortages and an aging labor force.

In the past, global industrial development has never taken place against a backdrop of population decreases. Thinking on economic and industrial development has long been based on the assumption of continued population growth. However, development strategies must now be prepared to respond to a dwindling and aging population in the future. For example, the growth of the senior population will drive a major increase in demand for medical and health services and a corresponding increase in demand for skilled professionals in the medical, health, and senior care fields. Another related issue will be the decrease in the working population and the question of how to raise labor productivity. This issue is highly relevant to developments in smart manufacturing. Through smart manufacturing equipment and environments, companies may raise productivity to make up for labor shortages. The sales models for products and services will also change with the population's age structure.

2. The Rise of Environmental Awareness

Since the start of the Industrial Revolution, humankind has engaged in industrial production with large-scale use of the earth's resources. This development has also brought pollution and resource consumption. The rise of environmental awareness will bring a profound impact on industrial development and commercial consumption models. As environmental standards and environmental protection measures become stronger around the world, manufacturers must look beyond cutting costs. Precise compliance with international environmental standards and the development of high-value green industries are crucial factors for continued growth for corporations. Green and sustainable products will be a requirement for



21st-century industries looking to enter international markets.

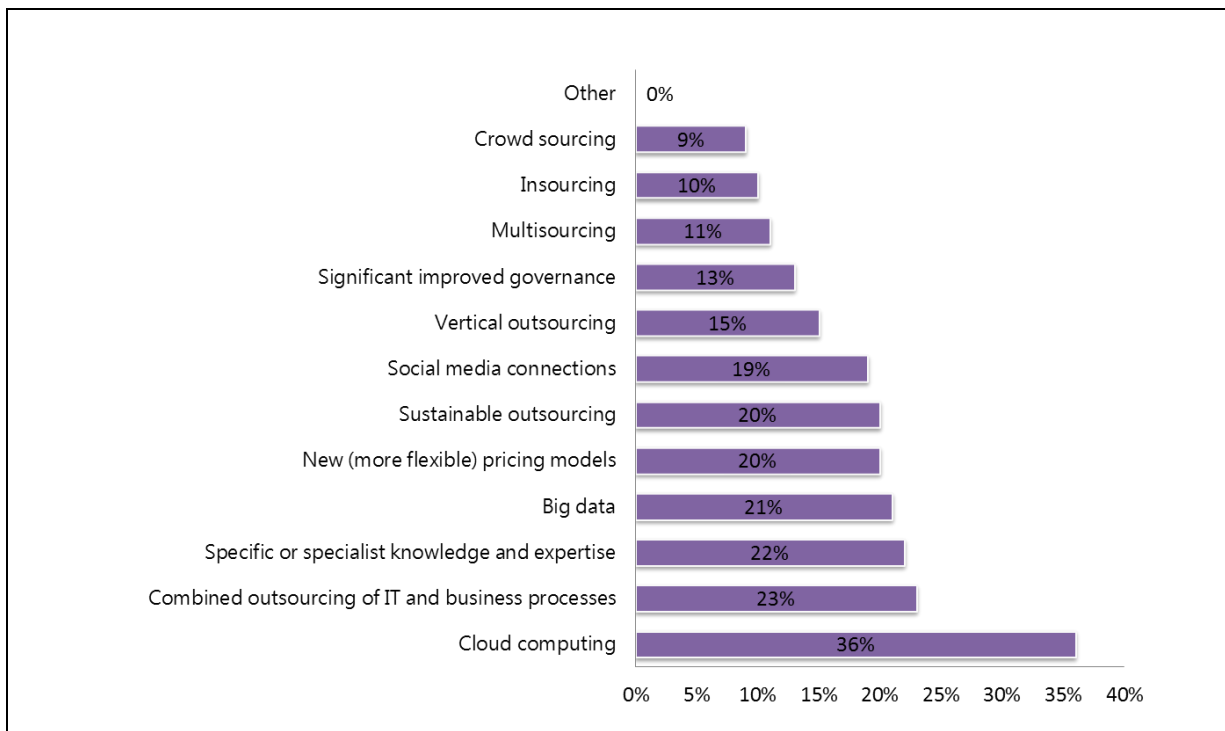
Low carbon emissions and high value will be the inevitable path of future industrial development. For the support services industry, product development, manufacturing technologies, and storage and transport will all need sustainability-related knowledge and technologies. Therefore, the support services industry must have the capability to guide the industry chains to support toward a lower-emission, higher-value direction. This transformation will involve technical services for sustainability- and environment-related industries and carbon emission verification services. The integration of services and manufacturing will spur a further evolution of traditional manufacturing industries and a transformation into higher-technology, lower-energy, lower-pollution industries.

3. Increased Demand for Division of Labor and Outsourcing

As the manufacturing industry becomes smarter, corporations are focusing more on developing new business models. The past thinking on outsourcing services, which emphasizes only lower costs for clients, is not enough to attract manufacturers to outsource their internal services. Outsourcing providers must become providers of business models focusing on offering talent,

technology and specialized knowledge, at the same time sharing risks and profits with their clients. As corporations demand more and more of their outsourcing partners, it can be seen from the outsourcing service needs of corporations (Fig. 1) that cloud computing services is a major growth area in the outsourcing market. Cloud computing has also driven corporate demand for big data services and flexible pricing models. Outsourcing firms must speak the language of their clients and respond to the demand for industry-specific software and applications.

Sustainability-related services is another important growth area for the outsourcing market. As corporate social responsibility becomes increasingly important for companies, all corporate manufacturing and services must take into account effects on health, safety, the environment, the people, and the community. Companies will therefore require that their outsourcing partners adhere to their corporate social responsibility rules and obtain sustainable development certifications. The government of the Netherlands, for example, has introduced sustainable development plans that encourage Dutch corporations to focus on sustainability and reducing carbon dioxide emissions. This has driven demand among corporations for outsourcing services in these areas.



Source: Outsourcing in Europe (2013), compiled by III MIC, December 2014

Figure 1. Outsourcing Service Needs

The Emergence of New Industries, Practices, and Models Driven by the Convergence and In-Depth Application of Information Technology

Gartner predicts that manufacturing, utilities, and transport will be the top three vertical businesses using the Internet of Things (IoT) in 2015. It also points out that corporate CIOs should leverage this growth trend to create new services, applications, and business models. McKinsey Global Institute also projects that by 2025, the economic value of IoT will reach US\$6.2 trillion annually, and that 80% to 100% of manufacturers will be using IoT applications. The economic impact on global manufacturing alone will be US\$2.3 trillion. New applications and solutions made possible by IoT could cause a transformation in industry practices. The Industry 4.0 project in Germany, the advanced manufacturing initiatives in the US, and the robotics industry in Japan are all based on the core value of IoT--smart services. These industries are building an all-new "smart manufacturing + services" business model.

The manufacturing industry must start from the beginning in re-thinking how to establish, operate, and provide smart services in the IoT world. Firms must transition from manufacturing-oriented thinking to service-orienting thinking, providing customized and exclusive services for clients in accordance with their needs. The value and differentiation created by these services will be the key for these firms to strengthen their competitiveness. Each vertical application field involves different devices, equipment, software, hardware, and services as well as different means of value creation. Hardware, software, and service providers that are interested in developing IoT applications for different fields and industries should explore diverse and complex value creation methods, ecosystems, and market channels to devise possible product approaches, market opportunities, and channel development.

Under the Industry 4.0 concept, smart factories introduce IoT frameworks to integrate and link all factory-related data with their upstream and downstream supply chain partners. The aim is to increase productivity, shorten time to market, and implement production models that can fill the demand for more complex and customized products and services. This requires highly complex hardware and software integration services as well as the ability to collect data on consumer habits in order to develop products that fit their true needs. In other words, companies must introduce "end-to-end" solutions that can link facilities, services, and applications.

Promoting a New Transformation for Taiwan's Service Industry, Leveraging the Demand for Integrating Smart Manufacturing with Services

The Industry 4.0 concept is influencing business models, production models, division of labor models, and even value chain structures across all industries. With Taiwan's OEM manufacturers facing low profit margins, the government has suggested a transition to services and value-added products. However, firms still have no concrete guide to follow. The innovative management models of the Industry 4.0 concept, including distributed process management, automation, and value chain restructuring are all ideas that Taiwan's manufacturers can immediately evaluate and implement as appropriate. Taiwan's OEM manufacturers have long pursued low-cost labor resources across the globe. In China, however, they are encountering problems with labor shortages and high employee attrition. Automation is an excellent goal for OEM manufacturers. Fully automated manufacturing plants allow them to establish plants even in areas where labor costs are high. Not only does this greatly reduce expenditures on low-end labor, it also allows high-end labor to engage in value-creating work such as R&D, innovation, and services. This increases the added value of products and services provided by these manufacturers.

Smart production is needed to meet new manufacturing demands, as products grow more diverse, life cycles grow shorter, batches grow smaller, and production grows more complex. Smart manufacturing plants need more than key technologies and mature products in order to fulfill their potential. They need full integration of all related systems. The biggest difference between smart plants and automated plants is in applications related to fields such as big data and cloud computing, as well as virtual plant design and automated system integration. In the age of smart plants, robots and robotic arms can be used in vertical applications in which they have not yet been widely introduced, such as the home appliance industry and the ICT industry. Taiwan's industrial PC providers have established presences in key smart plant-related fields such as IoT devices, smart devices, robotics, and robotic arms. Therefore, in addition to strengthening product features such as performance, specifications, I/O interfaces, and price for vertical applications in which they hold existing advantages, industrial PC providers should also be aware of smart plant introduction in those applications, adjusting product features and product lines to seize business opportunities when client needs change.

In addition, due to the highly networked nature of smart plants, most sensor nodes in those plants are deployed in



unmonitored environments with fragile defenses and limited resources. Internet security threats are inevitable, such as denial-of-service attacks or reading, inserting, and modifying information when equipment is sending data. The threat is especially grave in industrial environments, where malware invasions can halt production lines and lead to severe consequences. In other words, data and communications security for networks and systems will be an important test for the technical capabilities of corporations. High-level information safety monitoring solutions to guard against these external threats will be a fast-growing area of service.

The rise of the Internet and smart automation has driven high demand for technologies such as IoT, cloud computing, and big data analysis across all industries and applications. System integration for a wide range of interlinked equipment in an IoT environment, embedded system design, and remote cloud management services are all technologies that are familiar strengths for Taiwan's information service providers. How Taiwan can use its existing advantages in the ICT field to discover opportunities to offer innovative service hidden within the various components of the supply chain and the consumer end, and build a strong foundation for ICT hardware, software and services for the manufacturing sector of the future, will continue to be an issue worth exploring.