Chapter 30
Cloud Manufacturing Towards Sustainable Management

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ABSTRACT

Nowadays, most manufacturing companies have realized the importance of collaboration between dispersed factories, different suppliers, and distributed stakeholders. Cloud computing is an evolution of the Internet; it does not just change the technology, but also enables collaborative innovation. Cloud manufacturing (CM) is another form of networked manufacturing. It provides common and standard manufacturing services by cloud logic and principle. In this chapter, a new concept is suggested based on the fundamental theory and key technologies of CM. Cloud Future Factory, which is intended to manage a matrix-type organizational structure, focuses on improving communication in lean manufacturing. This case company has dispersed production lines and business departments. Therefore, it's very necessary to introduce an efficient and dynamic information integration platform. This chapter leads to a different way of thinking for using the cloud manufacturing concept in different formations. CM is not just suitable for small and medium sized enterprises, but also fits large size companies.

1. INTRODUCTION

The quality of our life has been improved by manufacturing industry. But it has become increasing difficult to ignore that industrial activities have caused negative environmental consequences. Waste and emissions of industrial manufacturing and usage of products intensify the problems of the global environment. Accordingly, this situation causes disadvantages for the traditional industries (Jovane, Westkämper & Williams 2008). It is widely recognized that environmental sustainable development is a priority for fundamental research (Bi & Wang 2013) because that environmental degradation becomes one of the serious problems and concerns for human today. Therefore, manufacturing is under intense pressure to manage sustainability.

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Additionally, the levels of competition and uncertainty are very high in the current manufacturing environment. The mounting demand for new products requires more worldwide production activities. This globalization tendency brings companies more and more opportunities with sharing knowledge and expertise in a collective manner. People and other related resources from all across the globe need to be connected instantaneously. These changes require manufacturing paradigm shift towards a more sustainable and agile business model. This evolvement must meet emerging dynamic needs from customers and maintain the sustainable competitive advantage in industrial development. Finding solutions to adopt these changes is very critical, because it requires a deep understanding of sustainability and a broad scope of engagement with all the levels of the organisation and stakeholders.

Numerous factors, such as business strategies, organizational structure and technologies, have impacts on the implementation of a new manufacturing paradigm. The success of a manufacturing paradigm is the process of optimizing both hardware and software (Bi & Wang 2013). The emergence of the Internet and other advanced technologies has led to the development of collaboration networks in many different areas. This phenomenon has resulted in a power-shift from the hierarchical business models (Wu et al. 2013). The traditional business models cannot afford the flexibility and connectivity of today's business environment and sustain the innovation. Especially in manufacturing industry, companies have to be agile and reconfigurable so that their business structures or products can be adaptive in a dynamic environment.

Cloud computing is an attractive element of companies' competitive strategy now. Its appearance becomes one of the primary enablers for the manufacturing industry. Xu (2012) emphasizes that cloud computing is considered as a multidisciplinary research field. However, little work has been reported on investigating the potential of cloud computing in terms of product design and manufacturing (Wu et al. 2012).

As discussed by Xu (2012), the adoptions of cloud computing in the manufacturing industry can be mainly classified into two types: smart manufacturing and cloud manufacturing. Smart manufacturing means manufacturing with direct adoption of cloud computing technologies and enables better-integrated and more efficient processes. Cloud manufacturing means the manufacturing version of cloud computing, which very similar to networked manufacturing concept (Tai et al. 2012; Zhang & Zhong 2012; Li et al. 2011). Regardless which cloud adoption method is used in the company, the concept of cloud transforms the traditional manufacturing business model, and helps the company to align innovation with business strategy, and creates intelligent factory networks that encourage active collaboration (Xu 2012).

Columbus (2013) posted an article in Forbes and discussed using cloud computing to revolutionize manufacturing based on his visits with manufacturers. He pointed out 10 ways to utilize cloud computing such as implementing cloud-based business tools to mobility support the analysis and reporting, also deliver real-time order status and forecasts, and create multiple access entry points. These business tools can support different business purposes, such as customer management, marketing management, product management, vendor management, etc. However, there was a main central theme draw out attentions: collaboration. Using cloud-based platform can ensure collaboration in any phase of manufacturing and product management, which is strategy that many manufacturers are pursuing today. Zhou et al. (2011) emphasize that enterprise has become a node in the global inter-enterprise collaborative manufacturing network.

Collaboration is the key enabler to minimise cost, improve adaptability, responsiveness, robustness, and sustainability of manufacturing processes, especially in lean manufacturing. Value chains and co-operation between companies, especially SMEs, are increasingly flexible.