

Review of Adopting Cloud Controlled Manufacturing Technique (CCMT) in India

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Abstract

Indian industries are revolutionising. The traditional Manufacturing is superseding and hence there is a need for digitalisation of industries as our current government scheme is Digital India. The new dynamic and global business models are forcing this traditional production process to change, in the sense of integrating them in a global chain of resources and stakeholders. Cloud Manufacturing is a paradigm shift towards this digitalisation and making smart factories where digitalised manufacturing is implemented. This paper presents a broad perspective of the research on cloud manufacturing. The topics studied mainly include adaptation of Cloud Manufacturing in India, resource and capability virtualization, design and collaboration of cloud manufacturing services.

Keywords: Cloud Manufacturing, Cloud Computing, Manufacturing Industry, SaaS

1. INTRODUCTION

Now-a-days, the manufacturing industries are undergoing major transform equipping IT and related smart technologies. Among which Cloud computing is one such smart technology. Collaborative manufacturing in widely distributed range is becoming the national trend with the rapid raising of national industrialization and development of information technology in the country. The collaboration of Internet of Things (IoT) with Cloud has been identified as key business trend that will reshape enterprises

worldwide [1]. There is a continuous strive for new efforts among the researchers and practitioners from industry to remain competitive in the area of product design and manufacturing. As manufacturing enterprises become increasingly concerned with meeting the dynamic requirements of a global marketplace, capturing, and sharing product-related information, manufacturing resources in globally distributed settings has become a key challenge [2]. Manufacturing enterprise is adopting such advanced technologies as Numerical Control (NC), Computer-Aided Design (CAD), Computer Aided Manufacturing (CAM) as well as Networked manufacturing. Considerable progress in shortening lead-time, improving production efficiency and improving process design quality has been made. Hence a new highly collaborative, knowledge-intensive, service oriented and eco-efficient manufacturing industry is expected to lead the way of the so called ‘a third industrial revolution.’ [3].

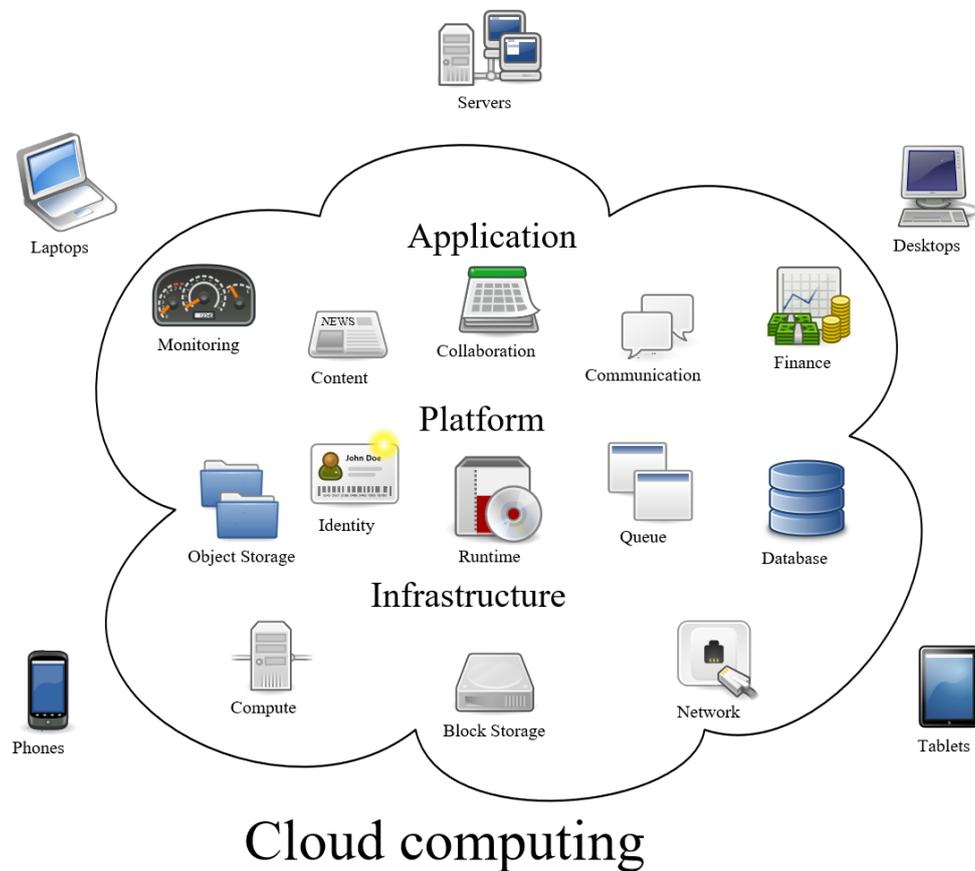


Figure 1. Diagram showing overview of cloud computing with typical types of applications.

(Source: www.wikipedia.com)

Information technology has given powerful impetus to manufacturing transformation to face the new challenges. Manufacturing is going digital in almost all aspects. A number of remarkable information technologies, such as cloud computing and Internet of Things (IoT) are rapidly developing. Cloud manufacturing is a new smartly networked manufacturing model, which is highly efficient and consumes less energy. Cloud manufacturing integrates cloud computing, Internet of things, semantic web and service-oriented concept. This idea has great impact on manufacturing as well as computing. Through cloud manufacturing customers can easily have access to services such as design [4], social networking [5], simulation [6], production, testing, etc. as a service. Hence cloud computing is the sum of Software as a Service (SaaS), Infrastructure as a service (IaaS) and Platform as a Service (PaaS).

Cloud Manufacturing is globally being adopted by many countries and has become a growing interest to companies, but the adaptation of the same is prevailing due to cost and obstacles. The main goals of this study are to share the research progress of cloud manufacturing and to find economic and potentially interesting directions for future research.

Accordingly, our goal in this paper is to address the following questions:

- What is cloud-based design and manufacturing, and how is it different from previous paradigm shifts?
- What new opportunities may be enabled through CCMT?
- What are potential obstacles in implementing CCMT and potential strategies for overcoming them?

In order to respond to the above questions, we present an overview of the scientific basis for and its related field and identify a number of related research issues and directions.

2. THE FOUNDATIONS OF CLOUD MANUFACTURING

It is important to define the fundamental concepts used in cloud manufacturing for further discussions on future research and development.

Cloud computing is a model for enabling ubiquitous, convenient, on-demand network access to a shared pool of configurable *computing* resources (e.g., networks, servers, storage, applications, and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction.

Cloud manufacturing is a model for enabling ubiquitous, convenient, on-demand network access to a shared pool of configurable *manufacturing* resources (e.g., manufacturing software tools, manufacturing equipment, and manufacturing capabilities) that can be rapidly provisioned and released with minimal management

effort or service provider interaction [7].

Manufacturing assets should be assigned to the users on demand. Abstractions, Virtualization are prerequisites for achieving Cloud Manufacturing [8].

Manufacturing Resource supports an activity or a function involved in the life cycle of a product. Manufacturing resources has two basic types: **hard resource** and **soft resource**

A **hard resource** could be a manufacturing cell or IT hardware, whereas a **soft resource** could be software, data, information, knowledge or other intellectual elements.

Enterprise Resource Planning (ERP) is business process management software that allows an organization to use a system of integrated applications to manage and automate functions related to technology, services and human resources.

3. THE GLOBAL SCENARIO OF CLOUD MANUFACTURING

Many organizations globally have already implemented cloud services due to its agility i.e. positioning IT to change automatically to alter capacities according to changing business needs. Manufacturing industries are in the middle of a digital transformation where manufacturers want to operate and service customers globally. There is more dependency on cloud service providers for technology resources and operational support at low costs.

China has launched a National High-Tech Research and Development Program [9], related to cloud manufacturing since 2009. About 50 universities, institutes, corporations and SMEs are involved in this project. According to 2014 study by IDC, almost half of the European manufacturers have adopted or will adopt the ERP software running in public cloud. Manufacturers in Asia-Pacific region are using both public and private cloud collaboratively with adoption rate close to that of European manufacturers. Hybrid cloud models seem to be the preferred one to improve customer service and hence are able to make real time business decisions.

With much interest there were confusions as well. According to the MintJuras survey of SaaS adoption in manufacturing, distribution and other industries, the following points were observed:

- About 49% of the respondents in manufacturing and distribution industries are facing difficulty in understanding the difference between single tenant and multi tenant SaaS architectures.
- Of all the manufacturing and distribution software installed today 22% have SaaS-based applications and will grow to 45% in coming decade.
- The three most important characteristics of a SaaS solution in manufacturing

and distribution includes giving customer a measure of control over upgrades, allowing a rapid and frequent upgrades and constant support for global operations.

4. ADOPTION STRATEGY OF CLOUD MANUFACTURING

In India manufacturing and distribution software uses SaaS delivery model and this adoption is expected to exceed further by 45% in coming decade [10]. The primary aim of cloud adoption in India is at inefficient demand planning, overcoming challenges in legacy software and high cost and low productivity. Indian manufacturing companies are adopting cloud models to implement CRM, ERP, enterprise mobility tools and dashboards to share information and enhance accuracy in their production process. ERP continues to be the primary enterprise IT application for manufacturing companies. Manufacturing companies need to migrate to a cloud-based ERP in stages to fully leverage the advantages offered by the next-generation application. Collaborating cloud, ERP and other associated systems can be an effective combination to take step towards new technology adoption [11].

The initiative by the government towards 'Make in India' is providing a big boost to the manufacturing sector with much better contributions to the cloud ERP market in India and is still growing. The Indian manufacturing scenario offers big potential for cloud adaptation in 2016 and beyond the initiatives by the Indian Government like 'Make in India' and 'Digital India' are expected to foster cloud adoption in SMEs and large enterprises in coming years. Many computer technology corporations in a bid to cater to the needs of organizations that seek independence and security while transitioning to the cloud to reap its potential benefits have started providing services in India to bring their public cloud in customers' data centre.

Indian manufacturers prefer to use open source technology and acknowledged OpenStack IaaS for its low cost and to avoid vendor lock-in concerns. SaaS platforms are emerging as a delivery vehicle for analytics mobility and for better handling of big data projects. On an average, the larger companies have higher adoption on it than the smaller businesses.

Government initiatives for promoting use of technology could be witnessed by making the sector more competitive by setting up the National Manufacturing Competitiveness Council (NMCC). Also it has taken steps to give a turn towards the use of technology in this sector by providing subsidies for technology upgrades in pharmaceutical, textile and food processing companies and Introducing schemes for technology development in SMEs and emerging trends like cloud [12].

CONCLUSION

Adoption of cloud computing is Low-cost solutions. Using cloud-based systems to streamline key areas of their business, manufacturers can free up more time to focus on investments in new products and selling more. Deployment models (SaaS) for various applications, including ERP, cloud be the way forward for the small and medium enterprises. Thus increasing productivity, accuracy, shortens sales cycle and improve decision making. For competing manufacturers with tight schedule market requirements, cloud computing is emerging as a means to trim the time taken from months to days on strategic sourcing, supplier qualification, supplier quality audits and during production , supply chain planning, management and optimisation. It could also help manufacturers to design entirely new supply chain networks that span vast geographies, components and parts from anywhere in the world.

In summary, cloud manufacturing service is an effective way to access, analyse and share large volume of information across the manufacturing industry.

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