

Smart Technologies on Supply Chain Management

Thandar Than¹, Theint Theint Aung²

¹Faulty of IT Support and Maintenance, University of Computer Studies, Taunggyi, Myanmar
thandarthan@ucstgi.edu.mm

²Faulty of Information System, University of Computer Studies, Taunggyi, Myanmar
theinttheintaung@ucstgi.edu.mm

Abstract: Modern supply chains have access more information and technologies to create a new digital supply chain management. Supply chain management(SCM) is the management of the flow of goods and services. All processes in SCM transform raw materials into final products. The digital supply chain management develop quickly on the use of “smart technologies”, such as Cloud Computing, Internet of Things (IOT), Big data and Block Chain Technologies (BCT). This paper discusses how to improve supply chain quality management by adopting smart technologies.

Keywords— supply chain management, smart technologies, big data, block chain, cloud computing, Internet of Things

1. INTRODUCTION

Supply chain management (SCM) is a phenomenon which has grown in importance to the business community because its ability can reduce the risk and uncertainty associated with international business operations. A supply chain (SC) includes all the activities, functions and facilities which involved in the flow and transformation of goods and services from the material stage to the customer [3]. In an manufacturing organization, the supply chain management (SCM) implementation achieves competitive advantage and strategic fit over other manufacturing organizations. [7] For completing a customer’s order, a supply chain must be all activities involved directly or indirectly. A basic supply chain mainly consist of 5 steps.

- supplier
- manufacturer
- distributor
- retailer
- customer

Through practical overview the concept of supply chain management emerged from some alteration in the area of manufacturing such as cost increasing, inventory decreasing, product life cycle and business globalization [8].

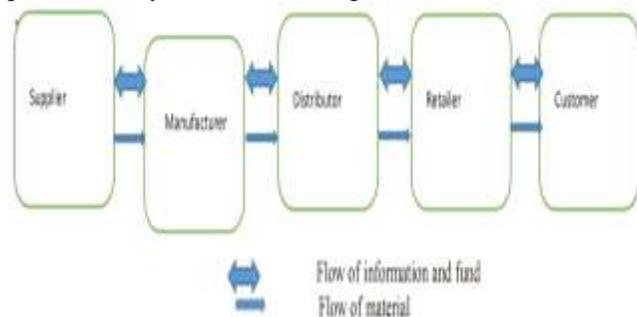


Figure 1. A basic Supply Chain

Supply chain management is made up of a few components that are very important as well as critical to the system. Each of the components is discussed briefly in the following.

A. Planning

Before the beginning of the entire supply chain, it is important to finalize the strategies and place them into place. Checking the viability, checking the demand for the product or service, , profit, costing, and manpower etc., are vital. Planning can help to identify the demand and supply trends in the market. Therefore, this helps to create a successful supply chain management system.

B. Information

Information is important in a knowledge-based world economy, and for the prospects of the business, ignorance about any aspect of business may actually spell doom .

C. Source

Suppliers play a very important role in supply chain management systems. With the help of different raw materials, products and services which sold to the end user are created. If a supplier is unable to supply on time, and within the stipulated budget then the business is bound to suffer losses and gain a negative reputation.

D. Inventory

Inventory is very essential for a highly effective supply chain management system. An inventory means raw materials, the ready list of items and other essentials required for the product or service.

E. Production

Production is the most important aspects of supply chain management system. It is only possible when all the other components of the supply chain are in sequential with each other. For the process of production to start it is critical that proper planning and supply of goods, as well as the inventory, are well maintained.

F. Location

In any business, one wants to survive as well as flourish and he needs a location which is profitable for the business. A business cannot survive if it has to share an already scarce raw material with the community.

G. Transportation

Transportation is essential in terms of carrying raw materials for the manufacturing unit and delivering the final product to the market.

H. Return of goods

Among the various components that create a strong supply chain is the facility for the return of faulty/malfunctioning goods, along with a highly responsive consumer grievance redress unit [12]. The eight components described in this section are interdependent and ensure a usable supply chain management system. It ensures the success and reputation of a business. In order to create a flawless supply chain, a business must focus on all these components .

A supply chain organize many elements of several types, these elements and the interrelationships are substantial for the complexity that occurs in the system. Complexity is directly related to interdependence, uncertainty in a supply chain that prevails due to the lack of knowledge of the whole system and variety that represents dynamical behavior of a system [2]. Therefore, supply chains face many challenges including uncertainty, complexity, vulnerable problems and cost. Therefore, supply chains management should be smart enough in order to overcome these problems.

2. SMART TECHNOLOGIES

These following smart technologies have the possible to enable the users to improve the supply chain management.

1. Cloud computing
2. Big Data Analytics
3. Block Chain Technology (BCT)
4. Internet of Things (IOT)

3. CLOUD COMPUTING IN SCM

Cloud computing refers to the provision of IT infrastructure, middleware, operating software and applications hosted within a datacenter and accessed by the end user over the Internet. Cloud computing can be classified into; private, public, hybrid, and community cloud.

Public cloud - is allocated for open use by general public, it can be managed by multiple partners besides a company and it exists externally on the premises of the cloud provider. Since a third party provider covers the application costs, the end user can get an inexpensive setup in public cloud [9].

Hybrid cloud - is combination of two or more different cloud infrastructures. In a hybrid cloud, a company can employ its private cloud and when local capacity is used up, it can be scaled out to a public cloud [11].

Community cloud - is assigned for organizations which share common matters, such as security requirements or regulatory compliance. One or more parties of the community can manage in community cloud [9].

Cloud Computing comprises three different models named as follows:

- Infrastructure as a Service (IaaS)
- Platform as a Service (PaaS)
- Software as a Service (SaaS)

(IaaS) model is a platform that can benefit equipment's in the form of hardware, servers, storage-space, at pay per use service. In this service model, a cloud provider offers from virtual or physical machines to load balancers, raw storage, firewalls and networks. Moreover, users do not control the basic cloud infrastructure but can control, storage, operating systems, and employed applications [9]. The cloud providers host a computing environment including, database, programming language, operating system, and execution environment where users develop and implement applications in (PaaS) [11].

(SaaS) model is a software delivery model that provides on demand access to software applications. Moreover, users neither control cloud infrastructure including network, operating systems, servers and storage, nor individual application capabilities [9].

Cloud computing technology offers efficient solutions for companies. In cloud computing, the amount of data of organizations increases rapidly. For companies that want to develop their business, It is becoming more complicated to keep up to speed with smart solutions instead of spending in technologies.

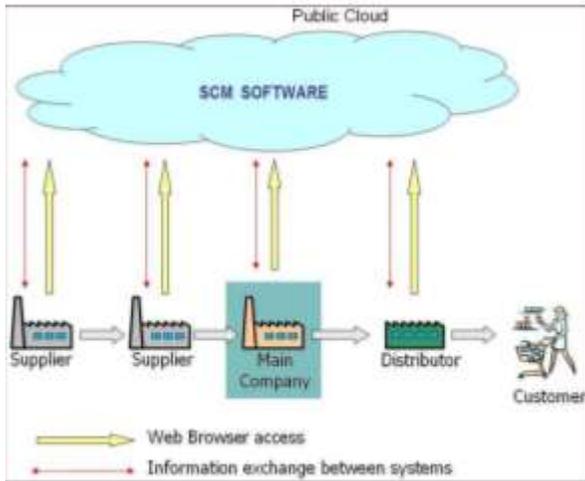


Figure 2: Cloud computing to integrate processes in the supply chain

Figure 2 shows a software for managing the supply chain installed “in the clouds”, being this a public cloud. The system would be offered as a service through a specialist provider according to the concept of public cloud. A specialist provider will have the responsibility for the system management and maintenance. This supplier does not need to be a business partner of the supply chain, but only a service provider. The supply chain members would have access to the system simply through a web browser. They will have the possibility to exchange the data from this software to their existing management systems.

4. INTERNET OF THINGS (IOT)

Internet of Things (IoT) represents an advancement in technological innovation connecting objects and devices through Internet [1]. The network of objects (e.g. devices, machines, vehicles, containers), embedded with sensors and software has the potential to collect and communicate data over Internet [5]. There exist several problems such as overstocking, stock out and delivery delays in traditional supply chain management systems. These several problems returns to several factors such as complexity and uncertainty which exist in real supply chains. IOT is applied in SCM systems in this research . in order to overcome these drawbacks of supply chain management systems.

The internet of things [IOT] enables anytime, anything, anywhere and any media communications. The IOT can be applied in any aspect of lives as in Figure 3. To reduce cost which results from acquisition process of knowledge, the smart devices of IOT enables supply chain companies [10].

[4] presents the contribution by generic ICT driven digitally enabled supply chain integration significantly associated with the performance of supply chain and in turn the performance of the retail firm. The adoption of IoT helps achieving organizational integration capability from organizational capability theory perspective. The

implementation of IoT helps many organizations for enhancing their capabilities to integrate the suppliers, customers and intra-organizational logistics processes.

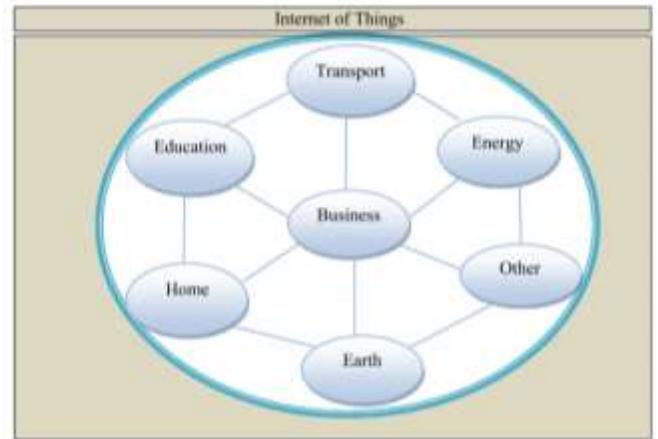


Figure 3. Internet of things applications fields.

5. BIG DATA ANALYTICS

Big Data Analytics involves the use of advanced analytics techniques to extract valuable knowledge from vast amounts of data, facilitating data-driven decision-making. Big Data Analytics consists of three different levels of analytics. Each level of analytics has a different role and desired outcome. Big Data can be characterized by the five Vs that are defined as velocity, volume, veracity, variety, and value. Velocity describes the large amounts of data generated at an excessive speed. Volume refers to the vast amount of data generated every second. Veracity refers to the truthfulness or accuracy of the data. Variety means Big Data comes from a great variety of sources. Value implies the ability to turn the Big Data into business value [13]. The five components (Vs) of Big Data are shown in Figure 4.

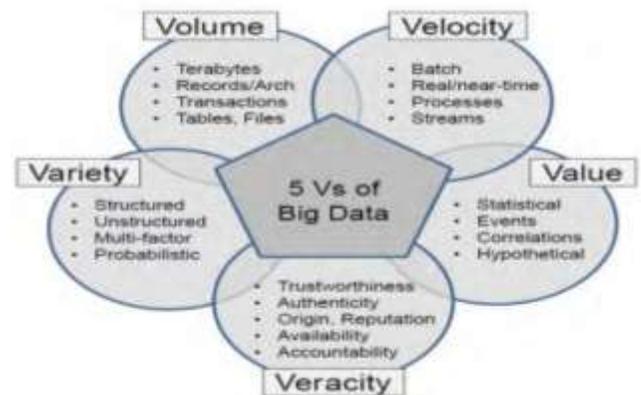


Figure 4. The 5 Vs of Big Data

Supply Chain is a significant contributor to Big Data wherein the diversity of information is large. Among the technology to improve supply chain management, big data

analytics is playing an instrumental role. It resolves several pain points at operational, strategic, and tactical levels. Big data is making an impact on all supply chain activities. To reduce the communication gap between manufacturers and suppliers, big data ranges from improving delivery times to identifying ways. To achieve operational efficacy and monitor performance for improving productivity, big data analytics reports enable decision-makers [14]. Big Data helps to solve problems in a diversity of business fields, but operations and sales are on the top [6].

6. BLOCK CHAIN TECHNOLOGY (BCT)

Blockchain is an internet-based technology which is prized for its ability to publicly validate, record, encrypted ledgers and distribute transactions in immutable. The blockchain technology was invented to support transactions in bitcoin, a digital cryptocurrency that operates independently from a central bank. If not millions, of computers linked to networks in all parts of the world, the blockchain technology provides the platform for creating and distributing the ledger, or record, of every bitcoin transaction to thousands.

Blockchain is one of the key innovative technologies revolutionizing digital supply chain management. As supply chains grow more complex in nature, involve diverse stakeholders. It mainly rely on a number of external intermediaries. The blockchain emerged as a strong contender for de-tangling all the data exchanges happening within the supplychain exosystem. [14].

7. CONCLUSION

This paper presented smart technologies; Cloud Computing, Big Data Analytics, Internet of Things (IoT), and Blockchain on supply chain management from many papers. Smart technologies helps supply chain management system to obtain valuable knowledge from enormous amounts of data, facilitating data-driven and decision-making. And also, supply chain management improved by using these technologies to reduce cost productivity, transportation, data storage cost and service. The future research will develop smart supply chain model that combines integrates Cloud Computing, Big Data Analytics, Internet of Things (IoT), and Blockchain technology.

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