

AN EMPIRICAL STUDY OF CLOUD COMPUTING: MANAGING GARMENT SUPPLY CHAINS

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ABSTRACT

Members of the apparel and manufacturing supply chain need to look at strategies besides reducing labor costs to improve margins. The key area is collaboration which is an opportunity to reduce costs in the supply chain in the areas of product development, inventory holding, and manufacturing. Apparel and garment industry is highly changeable and are characterized by short life cycles, unpredictable demand, multiple trading partners and stagnating economic conditions. Cloud computing enabled option for delivering on-demand, self-service computing resources with unique network access, location-independent resource, and high elasticity. Retailers should prefer to form partnerships with suppliers who have gone ahead and implemented processes and systems which facilitate collaboration. In this paper, the study of adaptability of Cloud computing model for apparel and garment manufacturers to achieve collaboration among the supply chain partners to manage the Supply Chain is presented.

Keywords : Cloud Computing, SCM, Collaboration, cloud computing framework, apparel and manufacturing sector

1. INTRODUCTION OF CLOUD COMPUTING:

Definition 1: Cloud computing is Internet-based computing, where shared resources, software and information are provided.

Definition 2 : Computing in which services and storage provided over the Internet includes Cloud Infrastructure, Platforms and Applications.

Definition 3 : A new technology in which distant servers for data storage which is allowing the device to use smaller chips that consume less energy than the standard one.

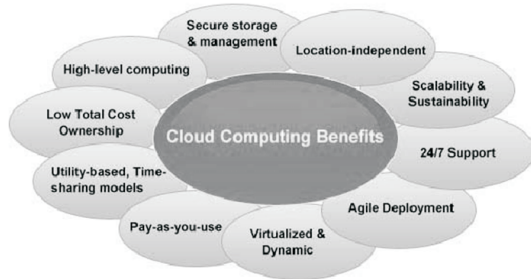
Cloud Computing, a differentiating element of information technology implies a

service oriented architecture, reduced information technology, flexibility, reduced total cost of ownership and many other things. Its aim is to become a valuable and economical contributor.

Until recently, early adopters of cloud computing in the public and private sectors were the catalyst for helping drive technological innovation and increased adoption of cloud-based strategies. As driven in large part by the financial crisis gripping the Indian economy, more organizations are turning towards cloud computing as a low-cost means of delivering quick-time-to-market solutions for mission-critical operations and services.

Benefits of cloud computing:

- Low implementation and maintenance costs
- Increased mobility for a global workforce
- Markets are benefited with the time factor.
- IT department work load has been reduced (as focused on innovation vs maintenance an-dimplmentation)
- “Greening” of the data center
- Increase availability of high-performance applications to small/medium-sized businesses



Layers of cloud:

Infrastructure as a Service provider (IaaS) includes raw utilities such as power and electronic storage resources, as services over the network.

Platform as a Service (PaaS), includes tools and environments to build and operate cloud applications and services.

Software as a Service (SaaS), enables on-demand use of software over the internet and private networks

Business as a Service (BaaS), includes application functionality coupled with physical and human resources required to perform a broader set of business activities e.g. a call

center module, as part of the customer service process, fully cloud-based supply chain-management.

From the business perspective the trend towards consumer driven innovation and partnership ecosystems is accelerating software development. From the IT perspective several trends fo-cused on increasing the efficiency of software distribution and hardware utilization have con-verged to enable a cloud computing model.

In Today’s world as Enterprises try to balance and optimize their budgets. Cloud computing can be an effective strategy to reduce the IT operations and management costs and free the re-sources and budget for discretionary innovative projects. Typically, enterprises have a split between regular ongoing IT operations cost which includes hardware, software licensing costs, development and maintenance. Even though IT budgets are being slashed enterprises will not stop investing in IT as it helps them to gain and maintain competition. The cloud offerings will help enterprises to continue to invest in IT as it changes from being a capital expenditure to operating expenditure.

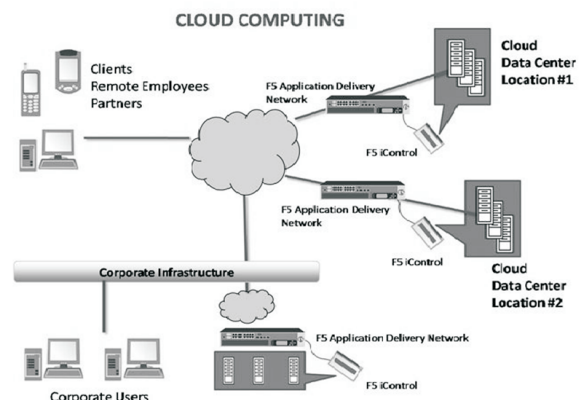


Fig.2. Cloud Computing model

Technologies constitute cloud computing:

Cloud computing is a paradigm that is union of services. These include services like IaaS, PaaS, SaaS, BaaS. Many other cloud providers have developed various access models to these services based on standard internet protocols like HTTP, SOAP, REST, XML. Cloud computing is the maturation and advanced version of computing concepts like Grid computing, ASAP, Server Hosting, Utility computing and virtualization.

Supply chain of Apparel / Garment sector

The textiles and clothing sectors can be seen as a supply chain consisting of a number of activities. Supply chain is used for sourcing of raw materials through design and production to distribution and marketing is being organized as an integrated network. Where the production is grouped into specialized activities and each activity is located where it can contribute the most to the value of the end product. When the location decision of each activity is being made, the variables like costs, quality, reliability of delivery, access to quality inputs and transport and transaction costs are considered.

Apparel and Garment manufacturing industry is characterized by:

- Entire demand for a given season/style order must be fulfilled by one lot
- Demand and pricing for seasonal and/or fashion items is uncertain and time-sensitive
- Multi-tier, disaggregated suppliers, due to specialization/cost structures/quota constraints, erode loyalty and make supply chains fragile and dynamic
- Moderately high setup or change over costs, so cost is lot size dependent
- Distributed, global suppliers, most with little infrastructure

- Plans based on rules of thumb for production and transit lead times, cumulative roll ups/padding very inaccurate—low confidence in on-time delivery creates buy and sell side date padding
- Delays in determining status and no easy mechanism to notify downstream-suppliers or participants
- Lack of documented accountability and genealogy of communications
- Externally imposed finite capacity, e.g. time-dependent quotas, with no visibility over other competitor's shipments for sale quota category
- Supply chain cycle time is 2-3X total season cycle times and 6-9X profit season cycle times for many styles. Consequently, consumer demand for popular styles is frequently not satisfied and margin opportunities are lost flows for product returns, servicing, and recycling;
- Information-flows, which represent order transmission and order tracking, and which coordinate the physical flows ; and
- Financial-flows, which represent credit terms, payment schedules, and consignment and title ownership arrangements.

These flows are supported by three pillars:

Processes : which embed the firm's capabilities in logistics, new product development, and knowledge management—

Organizational structures : which encompass a range of relationships from total vertical integration to networked companies, management approaches, and performance measurement and reward-schemes—

Enabling technologies : which include both process and information technologies for every organization's supply chain. However, in service organizations there is usually no flow of materials, but a flow of documents containing the valuable information for decision making. Regardless of company or an organization all the three pillars should be used.

iGarment delivers all the benefits of Cloud Computing

Increased Return On Investment (ROI) : The pay-as-you-go model eliminates upfront costs. You pay only for the services you use. With Cloud Computing, financial impact is minimized and ROI is dramatically accelerated.

Lower Total Cost of Ownership : The most significant investments for conventional purchased systems are the costs for implementation, training, maintenance, customization, integration, quickly depreciating equipment and software, as well as continued staffing. These post-software procurement costs are not fully recognized until after the software procurement and are often referred to as the "hidden costs". Due to Cloud Computing, hidden costs, recurring IT and support resources are reduced to minimum whereas variable costs into a predictable monthly expenditure, eliminates over-budget situations. This is effective in both the short and long runs.

Reduced Implementation Time : It eliminates the need of application software installation, database installation, network operating installation and most hardware environmental issues. Cloud Computing accelerates the implementation and allows you getting to a working system much faster.

Better Service Delivery : Due to the Cloud Computing model's tremendous economies of scale, customers receive higher service and

benefit from constant upgrading & maintenance service and technical support.

Unmatched Flexibility : With Cloud Computing, there is no long-term binding, technology lock-in. Customers are free to terminate the service if not suitable.

Assured Information Security, Reliability and Availability : The Cloud Computing service provider has far more resources to provide thorough and extensive data security options than a single company can provide for itself. iGarment employs privacy policy and facilities to ensure reliable and secure data via internet

- Multiple user authorization set up
- Encrypted data transfer
- Strong firewall protection and monitoring facilities.
- Fault tolerance storage technology
- Sure-safe daily backups
- 24x7 non-stop data server with powerful backup facilities
- High business ethics, data access is controlled by our privacy policy, which does not give iGarment employees or our data center partner's access to your data under any circumstances.

Focus on Core Competencies : Cloud Computing allows an enterprise to focus on managing and growing their business and relieves them from day to day IT troubleshooting or distractions.

Cloud Computing, a new technology is enjoyed by many companies. On-Demand applications have been focused on the market as a whole and have left certain key industry segments behind. iGarment, however, utilizes

the world's leading technology to deliver On-Demand application solutions for the apparel industry.

Founded by software veterans and garment industry experts, iGarment combines deep industry domain expertise, management system deployment experience, and Cloud Computing (SaaS) concept with a focus on the apparel industry. As iGarment not only provides ongoing software upgrading and maintenance services, but also stores and manages all customer-related data. You need nothing more than internet access to utilize our application systems by subscribing to our services.

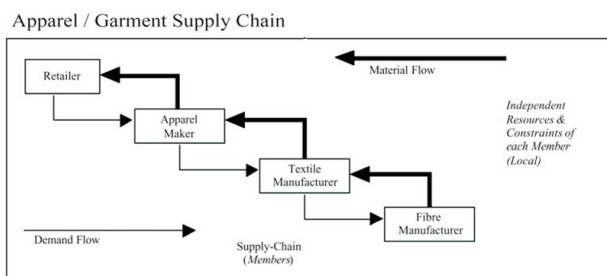


Fig 3. Apparel / Garment manufacturing Supply Chain

4. Apparel / Manufacturing industry- Adaptability to Cloud Computing:

Supply Chain Management :

Supply chain management is collaborative process and project management to meet the needs of the end customer efficiently and effectively. It should be noted, in general, that there are three flows that occur in supply chains:

Material-flows, which represent physical product flows from suppliers to customers as well as there verse flows for product returns, servicing, and recycling

Information flows, which represent order transmission and order tracking, and which coordinate the physical flows

Financial flows, which represents credit terms, payment schedules and consignment and title ownership arrangements.

SCM in Textile / Apparel / Garment Industry:

The supply chain in the textile and clothing sector is illustrated by figure 2. The dot-ted lines represent the flow of information, while the solid lines represent the flow of goods. The direction of arrows indicates a demand pull driven system. The information flow starts with the customer and forms the basis of what is being produced and when. It also shows that the information flows directly from the retailers to the textile plants in many cases. We can say that there is direct communication between retailers and textile mills when decisions are made on patterns, colors and material. In these condcase textile mills of ten deliver household appliances directly to the retailers. The Indian Textile industry adds 14% to the industrial production and 8% to the GDP of India. It provides employment to 38 million people and is these cond largest employment provider after agriculture. The Indian Apparel &Textile Industry also adds 21% of the total exports of the country.

Adaptability to cloud computing:

The clothing sector is both a labor intensive, low wage industry and a dynamic, innovative sector which is one of the highly focused sectors in market segments. In the high quality fashion market, the industry is characterized by modern technology, relatively skilled designers and a high degree of flexibility. The competitive advantage of firms in this market segment is related to the ability to produced esigns that capture tastes and preferences and cost effectiveness. In the low to middle priced market, the role of the retailer has become prominent in the organization of the

supply chain. The retail market has become more concentrated as they have market power not only in the consumer market, but also have considerable buying power. In addition, high-volume retailers have developed their own brands and source their clothing directly from the suppliers, whether foreign or local.

Cloud computing the next fashionable and prominent computing system offered through internet. This computing system is providing various useful services in textile and apparel industries. There are some special management systems to simplify various business operations in the apparel and textile industry. With the arrival of this new pattern of computing system, people believe that textile firms, apparel industry or any organizations will no longer need to invest in maintaining assets like servers, internal software and storage systems. This would considerably reduce the IT investments cost and save valuable business time. In garment industry work is made simple by some special functions like production planning, raw material management, costing, processing the orders, sampling, monitoring the preparation of order and final delivery of the product. Augmented Reality (AR) can be regarded as one such computing system which is widely used in the apparel and fashion industry. It gives the user a virtual view of actual environment through computer generated applications. AR application can be acquired with the help of camera and internet. Many such applications can be introduced by Cloud computing in the future.

Typical Cloud Platform Provider's Services and offerings:

- Hosting
- Storage
- Platform
- Application Services
- Tools

Adaption of Cloud Computing in Apparel and Garment Enterprises

Cloud Computing gave the new definition for IT to eliminate redundant work. It will truly empower the CIO to focus on Information management. IT departments will have to focus on developing solutions and supporting business functions' rapid use information to react and develop new offerings, instead of managing servers and infrastructure. Information Technologists Enterprises will need to build architecture road maps and develop information strategy that IT can step up to handle. In essence, IT as we know will change to more business focused than being infrastructure focused. It also allows CIOs to focus on translating the business metric send to end and map that to technology metrics meaning translating business goals into application and architecture goals. CIO scan have revenue goals instead of cost management goals. ROI of the application portfolio will become a key metric.

IT and Apparel / Garment Industry

The value of information has been well established over the past 20 years. Businesses have long recognized that flow less information and knowledge processing streamline business objectives and execution plans, there by enhancing overall business performance. As businesses entered the era of Information Technology (IT), they began to utilize advanced technologies, such as ERP and CRM systems, to automate information flow and business processes within the company. While up until 15-10 years ago the focus of Information dissemination was internal. Globalization has forced businesses to work closely with suppliers and other business partners.

In 1997 it was observed that information

across different stages of supply chains tends to be distorted and such distortion leads to poor inventory and production decisions, a phenomenon known as the bullwhip effect. Naturally, the need for more data transactions and frequent technology upgrades evolved, and companies started using B2B solutions to automate information exchange between trading partners and collaborators in their business networks. To overcome this problem, some companies started handing over portions of their noncore IT capabilities to external service. Advancement in IT and acceleration of globalization has created another problem for business communities: supporting inter-operation of various data formats and communication protocols used by different trading partners.

Cloud Maturity Model

Cloud Computing may take 5-10 years to rule the IT world. A maturity model has been developed to know how it will be adopted in different phases. Today the adoption has started with small and departmental applications. In the next phase this will move to a Hybrid model, where the Cloud Services will integrate with Data Center applications and Security. This will mature to integrate with other Data Center based business applications. And in the final phase of model, Line of Business applications will migrate to the cloud to adopt Cloud platforms. From a client perspective, the application models will mature from today where they are only Web based applications.

Functional Framework for Cloud Computing Adoption.

Business Priorities

First companies should prepare the business objectives and priorities for adopting

cloud computing for supply chain management. The companies are majorly focusing on the priorities and useful aspects of supply chain parameters for attaining maximum benefit from the implementation of Cloud Computing for SCM. The most common priorities are supply chain collaboration. Information sharing capabilities and prospective information reliability is the next priority for some companies where collaboration information is vast and confidential. In addition to this Indian companies are aiming at cost reduction in operation of supply-chains. At the light of globalization forces of emerging economy, Indian companies are focusing at achieving greater customer satisfaction through faster deliveries.

Cloud Computing Adaption Framework:

The textiles and apparel sector has been characterized by a high degree of complexity, which is an unavoidable part of the framework in which firms have to operate. This complexity can partly be traced to behavioral patterns influencing the final purchaser's buying, which cause some difficulty in forecasting demand when defining apparel collections, and also to the short life cycle of a typical garment. The entire sector is affected by these complex interactions, which have effect on the strategies adopted by firms seeking to defend a competitive position.

This framework is further complicated by the process of modernization of the distribution network. With respect to industrial organization, in the Indian context a striking feature is number of textile and apparel firms, most of which are fairly small, often bound by local aggregations corresponding to the model of the industrial district. Also, as regards the structure of

distribution, independent and traditional retailing maintains the largest market share, in contrast to the typical model in the other European countries. The frame work suggested here is to be implemented with a strategic approach through some modules like Selection, Manage, Design, Implement and Evaluate.

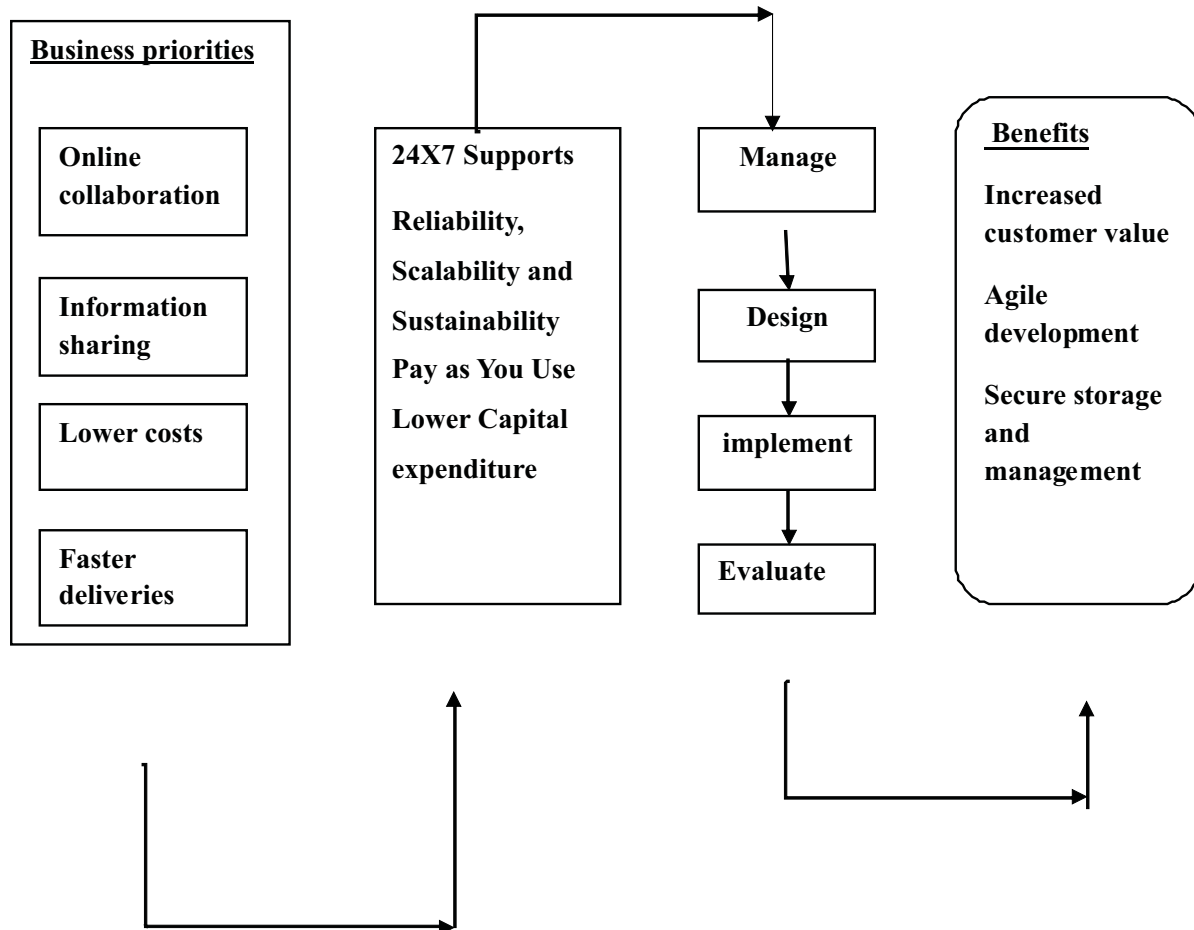


Fig: 4 Cloud Computing adoption frame work

Selection

Selection is based on risk minimization. The following phases or steps of Cloud Computing are:

- Selection of appropriate Cloud Computing infrastructure and architecture,
- Selection of right tools matching organizational business priorities.
- Implementation strategies and organization transformation.
- Meeting current and future needs of Cloud Computing.
- Immediate updates and technological renovations.
- Investment decisions and returns on investments (ROI).
- Disruptions and visibility constraints and obstacles.
- Documentation and ownership.

- Education and training to the personnel including the partners.
- Overall after performance of the firm.

Businesses have to prepare efficient internal systems using Cloud Computing infrastructure to respond quickly to customer's requests, questions and comments. The operational excellence model for Cloud Computing assisted SCM is that which delivers the highest customer satisfaction on a business infrastructure for an emerging economic situation that has the characteristics like: User friendly, Functional, Reliable, Cost effectiveness, adequacy and Performance. The cost effectiveness is very important character for adaptability in emerging economic perspective.

The principles, practices, and methods required to raise employee awareness about basic information security and train individuals within formation security roles to increase their knowledge, skills, and abilities.

Manage

- Identify business priorities and requirements and establish enterprise-wide policy for the IT adoption strategy for management of Supply Chain.
- Acquire and manage necessary resources, including financial resources, to support the Cloud Computing adoption
- Set operational performance measures for impact of Cloud Computing modules in business operations and metrics like profitability, ROI etc.,
- Ensure the organization complies with Cloud Computing enablement environment
- Ensure that appropriate changes and improvement actions are implemented as required to adopt Cloud Computing.

Design

Develop the implementation strategies and policies for Cloud Computing enablement

- Develop administration change management procedures to ensure Cloud environment
- policies and controls remain effective following a change
- Define the goals and objectives of the Cloud Computing in the Supply Chain operations like collaboration, Information Sharing etc.
- Establish tracking and reporting strategy for Cloud Computing enablement
- Establish a change management process to ensure transformation of business environment
- Develop collaboration strategies with the supply chain partner.

Implement

- Perform a needs assessment to determine risks and identify critical needs based on mission requirements
- Develop new or identify existing improvement opportunities that are appropriate and timely
- Communicate management's commitment, and the importance of the Cloud Computing enablement and implementation to the workforce.
- Ensure that Cloud Computing systems operations and maintenance enables day-to-day business functions
- Collaborate with technical support, incident management, and engineering teams to develop, implement, control, and

manage new Cloud Computing enabled SCM administration technologies

Evaluate

- Assess and evaluate the Cloud Computing security awareness and training program for compliance with corporate policies, regulations, and laws (statutes), and measure program and employee performance against objectives.
- Review Cloud Computing security awareness and training program materials and recommend improvements
- Assess the awareness and training program to ensure that it meets not only the organization's stakeholder needs, but that it is effective and covers current Cloud Computing security issues and legal requirements
- Ensure that information security personnel are receiving the appropriate level and type of training
- Collect, analyze, and report performance measures.

Benefits

Benefits from cloud computing framework

- High level computing
- Improved information sharing capabilities
- Enhanced operating efficiencies
- Increased customer responsiveness
- Decreased supply chain complexity

Conclusion:

Cloud Computing has become the business need. An organization can choose to move certain aspects to their IT requirements

with the correct assessment of their needs, existing infrastructure and through understanding of an organization's strategic objectives, a capable partner can provide relevant and focused solutions. There are few major factors that hold back business from deploying Cloud Computing, the most prominent one is the security issue. Many potential users are still apprehensive about releasing the information housed at the data center of an external Cloud Services Providers due to issues such as privacy, security etc. Apparel and Garment Companies should develop an overall understanding of Cloud Computing enabled supply-chain. Supply Chain Infrastructure and architecture to create Supply chain vision is to be arrived at before implementing the Cloud Computing modules for management of supply chains and also constantly re-evaluate to improve management of supply chains by creating benchmarking efforts in Cloud Computing enabled SCM.

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