

Supply Chain as a Service (SCaaS) in Apparel Industry

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Abstract

Supply Chain as a Service (SCaaS) represents an innovative approach for businesses to outsource various aspects of their supply chain, including manufacturing, procurement, warehousing, quality assurance, and logistics. Within the apparel industry, the supply chain encompasses five key categories: design, textile manufacturing, apparel manufacturing, distribution, and end-user purchase. Due to its consumer-centric nature, the apparel supply chain experiences fluctuating demand, posing challenges for effective management. Small apparel businesses often struggle with planning and implementing efficient supply chain strategies, resulting in significant losses, wasted labor, and missed deadlines. This paper proposes the implementation of SCaaS as a tailored solution for apparel units. The primary aim is to offer comprehensive end-to-end management services, ranging from strategic planning to product delivery. By leveraging SCaaS, companies can optimize their time allocation, focusing on customer interactions and the innovation of new products. This approach streamlines operations, enhances efficiency, and mitigates the risks associated with supply chain management, ultimately enabling apparel businesses to better adapt to market dynamics and meet consumer demands effectively.

Keywords: Supply chain management, Apparel Manufacturing, Push and Pull supply chain

1. Introduction

Supply chain as a service (SCaaS) is a business model that offers technology-driven, end-to-end supply chain management solutions for businesses that don't want to invest their time or money in logistics while improving supply chain efficiency. This highly adaptable model enlists one or more logistics partners to handle production control, manufacturing, warehousing, inventory management, order fulfillment, and shipping. Finally, it provides the infrastructure and technology needed to lower logistics costs by offering flexible fulfillment options and integrating technology and automation to increase speed, visibility, and accuracy throughout a whole supply chain network. The rise of "as a service" platforms and providers adds to the supply chain outsourcing's complexity. It's no longer just about outsourcing logistics. Manufacturing, planning, storage, and other services are now available as a service. Organizations must choose which components to outsource and which to deliver in-house. Instead of having all the components in-house, the supply chain could be treated as a service and the service provider can be given incentives based on the services chosen by the customer. While providing the services of the supply chain, the service provider can keep an eye on economies of scale, attractive outsourcing perspectives, and economies of scope. Logistics has undergone significant changes in the past few years. Earlier the focus of the supply chain was purely operational aspect reporting to manufacturing and sales and ensuring the uninterrupted supply of materials to customers, but now it has become a self-sufficient supply chain

management function. Some companies now have a separate department of supply chain which is led by “chief Supply Chain Officers”

Many firms has started working with some supply chain tools like analytical demand planning or integrated S&OP, and these process has become established SOPs in many firms whereas logistics related to operations are being taken care by some third party. The supply chain functions is helping in achieving the seamless operations from customer to suppliers [1].

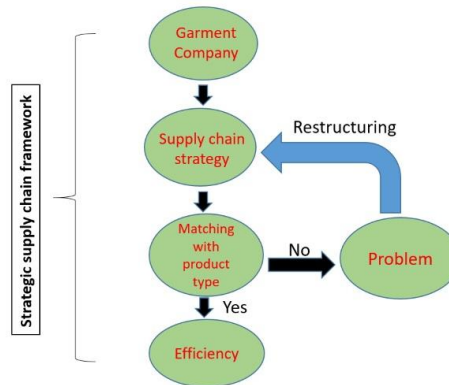


Fig 1: Strategic Supply Chain Network

Some of the advantages of this model include utilizing variable cost delivery strategies to cut costs, improving visibility, predictability, and reliability in operations, Improving forecasting and planning with greater transparency is crucial for informed decision-making, aligning operational strategy with a business model to organization strategy and supporting, advanced manufacturing methods, analytics, and new digital technologies.

2. Challenges of Traditional Supply Chain Management (SCM)

Because traditional organization-centric SCM organizations, procedures, and software solutions fail to match the needs of today's complex and increasingly distant supply and demand networks, the cloud has enabled Supply-Chain-as-a-Service a viable choice for solution providers. The normal optimization between internal and outsourced SCM operations has a detrimental influence on end-to-end performance, and the standard tools and processes are insufficient to properly manage extended supply chains and the cost benefits of globalization. 2016 (Keppler) SCM organizations commonly utilize manual and spreadsheet-based solutions, which increase costs and reconciliation time while diminishing efficiency and service quality. Adopters of more complex SCM systems, on the other side, are frequently disappointed by the advanced tools' high initial and ongoing costs. SCM becomes less of a fundamental business skill and more of a technical and organizational evolution supporting the needs across supply networks, which may appear counterintuitive. As outsourcing and global competitiveness continue to drive the growth of supply chain management, firms will employ SCaaS to understand more intricate networks with higher agility and resilience.

3. Market Overview: SCaaS

The retail sector is experiencing rapid growth, and it requires the effective management of an uninterrupted flow of products, distribution, transportation, and storage, among other important elements. So the service (Supply chain) has become crucial and is playing an essential role in optimizing the processes involved

within the retail industry. Also for global market growth, the distributors require a better planning and should have some strategies to provide better service of the supply chain. The number of e-commerce platforms has also increased and consumers have a lot of options to choose. They have the option to return the product to the retailers if the product is not as per their expectations. This has increased the competition among the retailers and has created a burden on the retailers to meet the quality expectations of the customers.

There are many advantages of a digital supply chain. Digital supply chain will lead to heightened productivity, improved connectivity, reduced costs, enhanced service quality, increased flexibility and adaptability, and more effective asset management. Some new technologies like blockchain help the diverse system to work as a unit and they will create lot of opportunities in the upcoming years. There are some negative impacts of COVID-19 but post Covid the market is anticipated to grow more in the future. The challenge will be related to data security, which might hinder the market expansion in upcoming years.



Fig 2: Global Supply Chain as a Service Market

Source: <https://www.verifiedmarketresearch.com/product/supply-chain-as-a-service-scaas-market/>

The Supply chain As a Service Market is growing day by day and it is anticipated that the growth will be more in the period from 2012 to 2028. As the retail industry is increasing there is also the demand for management in logistics services. Moreover, it is also expected that a significant increase will be there in consumer expectations fuels market. The Integration of Blockchain Technology. and omnichannel supply chain is poised to create lucrative opportunities for this sector. Apart from this, the digitalization of “Supply Chain Management” services will also contribute to market growth. This service market is divided into four categories- product, application, geography and key players.



Fig 3: Supply Chain- Segmentation Analysis

Source: <https://www.verifiedmarketresearch.com/product/supply-chain-as-a-service-scaas-market/>

Some of the key companies that have adopted Supply chain as a service are-

1. Tata Consultancy Services Limited- TCS is leading this sector with its capabilities in supply chain consultancy. TCS utilizes ERP applications, IoT, cloud, and analytics. TCS is focused on providing services such as order to cash, source to pay, digital manufacturing, and Integrated business planning. TCS has a dedicated team that supports the customers in planning, control, strategy, logistics, sourcing, and procurement enabling them to reduce costs, improve customer experience, and grow market share.
2. Ceva logistics- It offers a digitalized technology platform that connects all network partners, allowing visibility and value creation through data and analytics.¹
3. FedEx Corporation- It optimizes inventory and fulfillment across all channels including retailers, distributors, and direct-to-consumer deliveries. Also, it executes Packaging, kitting, warehouse operations, Reverse logistics and liquidation, postponement, and transportation management.²
4. Zensar Technologies- It partnered with companies to solve logistical challenges and increased efficiency to help benefit it's supply chain.³

4. Supply Chain in Apparel Industry

The apparel Supply chain has several stages including-⁴

1. Design- Before any apparel is created, it must be designed and planned- all the materials, styles, colors, designs, and embellishments.
2. Textile Production- Weaving takes place for making the fabric. It requires some synthetic/natural material which undergoes some processes like weaving, bleaching, dyeing, and washing. After these mandatory processes fabric is sent to garment factories to make the garments. This operation also generates some pollution that includes air as well as water pollution.
3. Apparel Production- Apparel production is the second step where fabric is cut into pieces and sewn together to make a garment. It takes the input from the design stage to make the garment.
4. Distribution- It will be delivered to a distribution warehouse, which is frequently shared by numerous major merchants. To keep correct supply records, the movement of a garment within a distribution warehouse is digitally traced at every step.
5. Purchase- Finally, the garment is purchased through a retail or wholesale channel by the end user.
 - a. Market demand and inventory considerations ultimately determine supply chain configuration. There are essentially three variants-
6. Push Supply Chains- Push supply chain depends on the forecasting. Based on the forecasting data the demand in the retail stores are anticipated and production is done based on that. This model has a large number of inventory and that inventory is pushed to the stores for sales.
7. Pull Supply Chains- This supply chain model runs on the demand generated in the market. This model maintains a lower level of inventory and reduces the cost of warehousing, But in this strategy, there are chances of running out of stock as there are chances of not being ready when the requirement of the product is in the market.
8. Push/Pull Supply Chains- The balance of the Push and Pull supply chain maintains the inventory at the warehouses and is distributed according to the demand. This reduces the chances of retailers running out of stock.

¹ Source: <https://www.cevalogistics.com/en/what-we-do/ceva-lead-logistics/services/supply-chain-technology>

² Source: <https://supplychain.fedex.com/enterprise-solutions/industries/consumer-goods/>

³ Source: <https://www.zensar.com/insights/case-study/modernizing-supply-chain>

⁴ Source: <https://apparelmagic.com/the-apparel-supply-chain-everything-you-need-to-know/>

The Apparel Supply Chain faces several significant problems-⁵

1. An impending trade war has made sourcing executives concerned about future demand, which is exacerbated by rising production and sourcing costs as a result of tariffs put on Chinese goods
2. Human rights and labor violations in international manufacturing are prompting calls for greater production transparency.
3. Demand forecasting is challenging in the apparel sector, and it can make supply chain management problematic as well.
4. Inventory management provides obstacles to supply chain management in the garment industry, even though software is a game-changer in today's corporate climate. [2] [3]

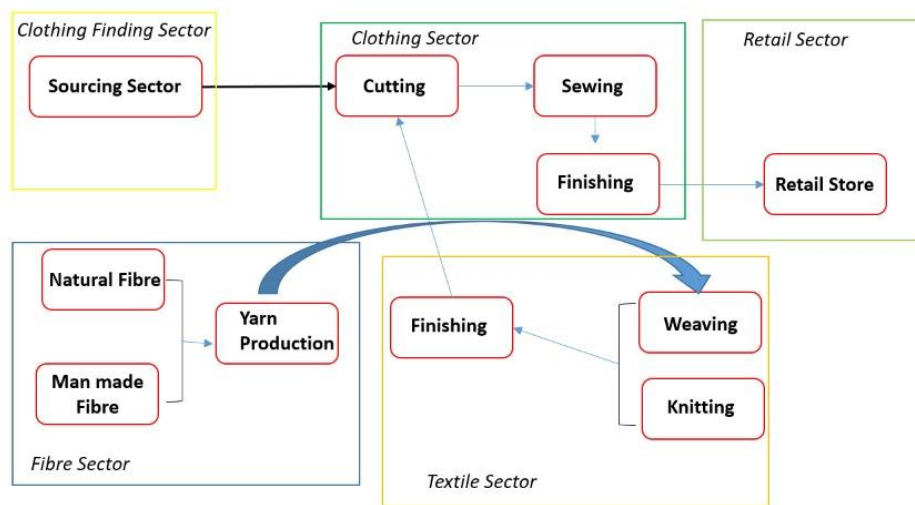


Fig 4: Textile and Manufacturing Flow



Fig 5: One stop service in supply chain

5 Implementing SCaaS in Apparel Supply Chain

5.1 Framework

To meet customer needs, the supply chain encompasses not just the manufacturer and suppliers, but also involves transporters, warehouses, retailers, and even the customers themselves. Service dominant logic, on the other hand, emphasizes collaboration among all stakeholders in the creation of value. As a result, a service-based supply chain is a series of interconnected actions that occur as a result of resource

⁵ Source: <https://apparelmagic.com/the-apparel-supply-chain-everything-you-need-to-know/>

exploitation to create value. Players should co-produce service offerings, trade service offerings, and ultimately co-create value, according to this structure. The design process of a service-based supply chain follows the nature of value creation, according to the concept given above. The collaborative beneficiary contact between suppliers and consumers creates value, and the interaction is the result of a chain of linked value actions. Value activities are described as separate actions performed by a company on a set of resources, including operand and operant resources, to propose value for meeting client needs. The service-based supply chain incorporates three characteristics, namely resource design, value-proposing activities, and value constellation, to reflect the nature of value production. The design of resources is based on the 'conventional' supply chain. It covers facility design, inventory management, transportation, information, sourcing, and pricing. The value proposition will be viewed as a quality criterion that the product should meet, and it may be treated as part of an optimization issue in this process. The decision to make or buy/outsourcing is taken throughout this step.

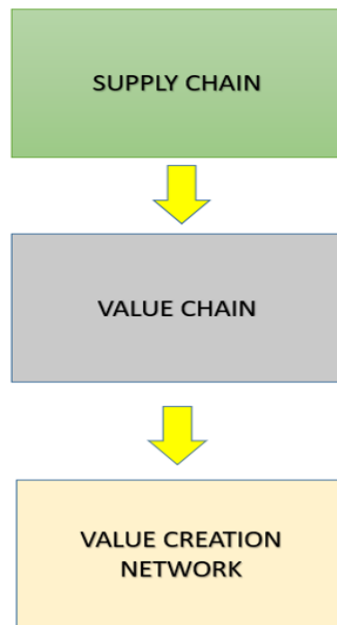


Fig 6: Framework for SCaaS

Value activities refer to distinct physical and technological operations undertaken by a corporation to enhance value within the value chain. These are the components that enable a company to generate a product that is valued to its customers [6]. Value cannot be created (or added) solely by the enterprise, according to SD reasoning. A company can only provide value through its product. As a result, value-proposing activities are referred to as this level of design/analysis. To explore the origins of competitive advantage within activities, a value chain analysis can be employed to scrutinize all operational facets of a firm and their interconnectedness systematically.

A provider cannot produce value on their own, according to service-dominating logic. Instead, the provider and the client work together to produce value. Service, according to service science, is defined as the co-creation of value. The interaction between the 'provider' and the 'consumer' results in value co-creation. Values are traded among supply chain participants during the transaction. As a result, value networks are formed through a series of interactions between supply chain players. The e3value model suggested by Gordjin [17] or value network mapping could be used to model value exchange and interaction among

supply chain participants. Agent-based viewpoint, as Simatupang indicated, might be used to represent the social aspects of interaction and value exchange. The supply chain players are expected to create collaboration until the very end. Supply chain cooperation concepts could be used to create a collaboration platform. In addition, the value co-creation model might be utilized to determine what type of collaboration should take place inside the chain.

5.2 Discussion

Because of the many stakeholders involved in serving customers, A supply chain must be grounded in a robust service-oriented foundation for supply chain management to serve as a source of competitive advantage. As a result, it is proposed that the growing service-dominant logic notion be implemented into supply chain management. Previous studies have shown that There exists a conceptual divide between supply chain and service-dominant logic on one hand, and yet there is a coherence of ideas between the two notions on the other.

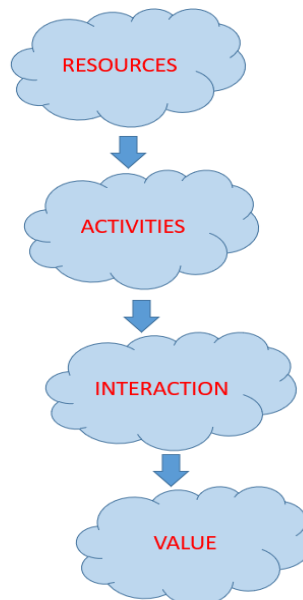


Fig 7: Process of Value Creation

It has been proposed that the supply chain should be viewed not only as the flow of actual goods, additionally, it serves as a connected series of value creation activities conducted by multiple stakeholders, emphasizing collaboration, relationships, networks, value creation, and value constellation. This study proposes a conceptual framework for assessing a supply chain system from a service-dominating logic perspective to improve its performance.

This paradigm examines the similarities and differences between supply chain and service-dominated reasoning. When constructing or analyzing a service-based supply chain, this framework shows what factors to consider. The 'conventional' aspects of the supply chain, such as facility design, inventory management, transportation distribution policies, sourcing activities, and price decisions, should not be overlooked by service-based supply chains. Those are essential functions in the supply chain. The value chain analysis is offered to discover value activities that can be a source of competitive advantage to develop the supply chain into a service-based supply chain. Furthermore, value constellation is advised to be emphasized through value network interaction and player participation.

However, there are significant gaps between the two notions that require further investigation and critical scrutiny. More research is expected to go deeper into some of the constructions. An empirical research of the framework to build or assess a supply chain through a service-dominant logic lens is expected to be conducted in the future. Supply chain and service-dominant logic compliance necessitate not just conceptual analysis but also measurement. Future study is expected to include performance measurement of service-based supply chains.

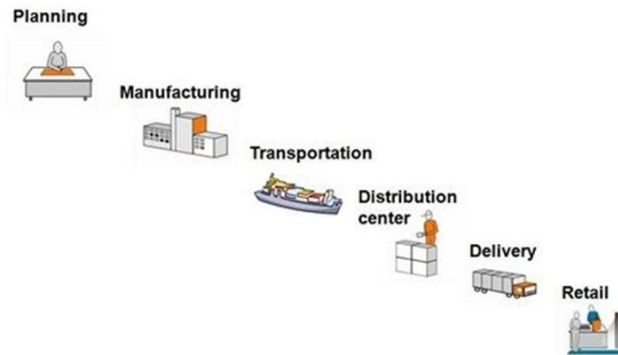


Fig 8: Supply Chain Flow

5.2.1 Supply Chain System

The supply chain in manufacturing runs from suppliers to customers. The supply chain is unidirectional in terms of production inputs and outputs, as shown in Figure 5(a), where "" symbolizes the sequence of production, which includes raw materials, WIP, and Finished products. Coordination and information sharing are key components of an integrated supply chain. Customer-supplier duality in the service industry

means that manufacturing moves not only from suppliers to consumers but also from consumers to suppliers. As a result, manufacturing flow is bidirectional, which is important for connecting traditional supply-chain concepts to real-world service processes. In terms of the bidirectional supply chain, customers provide inputs to the service provider, who transforms these inputs into outputs delivered back to the consumer. The figure depicts the single-level bidirectional supply chain.

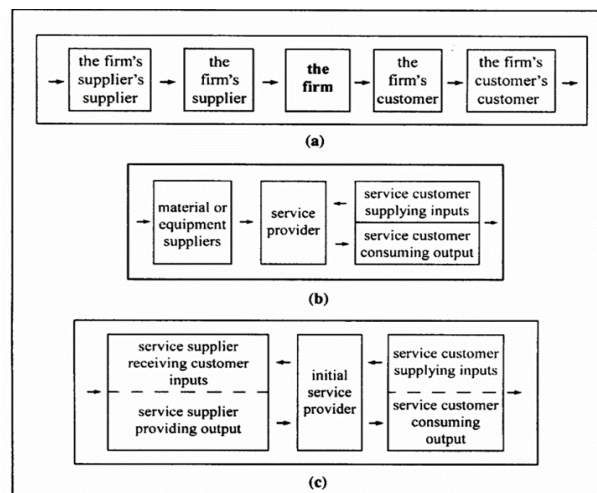


Fig 9: Supply Chain System

5.2.2 Impact on Manufacturers and firm's performance

The demand of services like computerized equipment or technology-intensive equipment from manufactures is in demand. Product-based services, such as after-sale services, financial services, training services, provision of spare parts, expert assistance, online help, and logistics support, concentrate on ensuring the functionality and effectiveness of products. There are services like customer action-based services that focus on helping the customers in achieving their missions and learning and understanding about their internal business processes.

Services can add value from 30–70% in a typical industrial company, according to Rosen (1998). Marketing, financial, and strategic opportunities are all advantages of service businesses in the manufacturing sector. Better services for selling more things might be described as marketing opportunities. Service strategies promote new-product uptake in the business-to-business setting (Frambach)1997; et al. Maintaining a quality level of services provided is an effective strategy to preserve long-term partnerships (Evans and Laskin, 1994), as they have an impact on total customer satisfaction (Burger and Cann, 1995), as well as the confidence of the customer and the credibility of the suppliers. When it comes to strategic advantages, opting for a competitive edge in services provides product makers with the potential to earn good margins or create barriers to market entry. This stands in the opposite of other strategic alternatives like cost-effectiveness and quality of the product. Because of the following qualities of service businesses, financial gains can be acquired. Product services tend to reduce cash flow vulnerability and volatility, allowing for greater shareholder value (Srivastava et al., 1998). Because services are intangible, there is an information gap between customers and manufacturers. Customers are less able to estimate the cost of a service before purchasing it, allowing for comparatively high service costs. Furthermore, switching service providers has higher search costs than switching products (Nayyar, 1993). As a result, manufacturing companies that focus on service have a more consistent customer base and a more stable revenue stream (Skaggs and Droege, 2004).

Customers must rely on the manufacturer's service reputation when purchasing service because of the intangibility and complexity of customer action-based service. A company can expand its service offerings by leveraging its knowledge and resources gained through manufacturing products for specific customer applications. Knowledge and resource spillovers, according to Markides and Williamson (1996), let organizations leverage synergies between their production and product-based services. As a result, in product-based service, manufacturers' service reputation may be built relatively quickly by relying on manufacturing advantages. Customers' perceptions of risk when considering the purchase of a new service can be influenced by past accomplishments in service offerings (Storey and Easingwood, 1998). Furthermore, customer action-based service, such as engaging in the development of a new product for a client, necessitates greater confidence and a more stable relationship between the supplier and the consumer. For example, new product development is a vital competency that must be safeguarded so that customers are eager to share their data with trustworthy manufacturing suppliers. Suppliers and customers improve communication and devote more to maintaining a loyal connection in product-based service initiatives, which could be an important foundation for growing customer action-based service. Direct contact with customers aids in the formation of realistic expectations, which leads to increased satisfaction. Furthermore, a manufacturer can have a deeper understanding of a customer's operations and needs through product-based service, which aids in the development of high-quality advanced service.

5.2.3 Use of Data and Tech Advanced Software

The new term came into the picture in 2007 and this term was Cloud Computing. It describes a concept for the allocation of resources. In the process of virtualization, the available resources can be easily used in the form of services. The internet-based platforms help the service providers to make the services available and allocation of the services can easily be done. The Cloud idea allows for three possibilities, depending on the resource type and capabilities provided: 1) Infrastructure as a service (IaaS), which describes pure computation resources like storage and processing capacity; 2) platform as a service (PaaS), which describes software platforms, such as machines with an operating system; and 3) software as a service (SaaS), which describes software applications that run in the Cloud. By transforming computing into a utility akin to water, power, and transportation, the pay-per-use model becomes feasible. With such models, service consumption can be effortlessly metered, enabling accurate and straightforward monitoring of charges based on actual usage. [8]. Its application in supply chain systems is mostly determined by the commodity nature of services. When rivals offer more homogeneous goods or services to price-sensitive clients, this is referred to as commoditization. It is a driver for outsourcing corporate processes [10] and has been recognized in numerous industries [9]. Commoditization aids in the conversion of fixed expenses to variable costs, but it also has the potential to destroy firm competitive differentiation [11]. Cloud Computing can be viewed in this light as a tool for incorporating commoditization into electronic business processes. However, assessing its potential requires consideration of the organizational context and cultural variables, which are beyond the scope of this study.

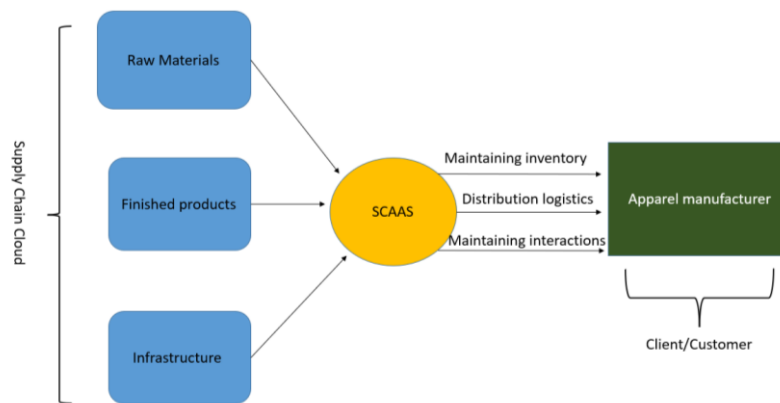


Fig 10: Supply Chain Cloud Process

6 Co-ordination of Supply Chain Services

Supply chain coordination is the concept of working together to improve supply chain performance by harmonizing separate firms' strategies and objectives. The dependencies of different activities on other activities need to be managed. For that, a set of methodologies is applied to the activities. This set of methodologies is called a coordination mechanism. By applying a coordination mechanism a better and improved supply chain can be achieved. Coordination mechanisms find wide applicability in the industry by removing barriers to supply chain performance (Stern, El-Ansary, & Coughlan, 1996) and help in achieving the required performance (Kumar & Seth, 1998). The set of methodologies can be developed by concentrating on the issues related to coordination in the supply chain like logistics synchronization,

information sharing, decision making, incentive alignment, information technology (IT), trust among various supply chain services providers.



Fig 11: Process flow

The emergence of the Internet, high-speed connectivity, robust communications security, and open standards is starting to challenge the traditional concept of in-house hosting for applications. As organizations have become increasingly accustomed to accessing and managing their information via the Internet, application service providers (ASPs) like Salesforce.com have experienced unprecedented growth. The "back-end" of this arrangement is completed by application infrastructure providers (AIPs), who supply the framework for on-demand computing task execution. To ensure satisfactory response times for all users, an ASP hosting thousands of customers—potentially accessing the application simultaneously—would require a substantial investment in computing infrastructure, including servers, networking equipment, and other resources. Additionally, significant investment in human resources would be necessary to manage this infrastructure effectively. These AIPs offer services such as hosting ASP applications on their dedicated infrastructure, managing customer workloads to guarantee quality of service to end customers, and handling various technical responsibilities like server security and reliability, account compartmentalization, backup, version control, support for email systems and DNS hosting, and database systems. IBM, Computer Associates, Hewlett-Packard, and Sun Microsystems are just a few of the major AIPs. The system described above is typical of supply chains and logistical networks, in that end users receive services from providers who, in turn, rely on other suppliers to offer that service efficiently. It also causes system dynamics, which are common in supply chain networks, as the two providers compete for control of the network.

7 Conclusion

In conclusion, Supply Chain as a Service (SCaaS) presents a transformative approach to managing the complex supply chains within the apparel industry. As highlighted, SCaaS offers numerous advantages, including increased flexibility, scalability, cost-effectiveness, and enhanced visibility across the entire supply chain ecosystem. By leveraging cloud-based platforms, data analytics, and collaborative technologies, SCaaS enables apparel companies to streamline their operations, optimize inventory management, mitigate risks, and meet dynamic market demands effectively. Moreover, SCaaS fosters collaboration and transparency among stakeholders, facilitating seamless communication and information sharing throughout the supply chain network. This not only improves efficiency but also enhances agility, allowing apparel companies to adapt quickly to changing consumer preferences, market trends, and external disruptions. Furthermore, the adoption of SCaaS in the apparel industry can lead to sustainable practices by optimizing transportation routes, reducing waste, and minimizing environmental impact. By

embracing digitalization and automation, apparel companies can achieve greater sustainability goals while maintaining competitiveness in the market. However, despite its numerous benefits, the successful implementation of SCaaS requires careful consideration of factors such as data security, interoperability, and integration with existing systems. Additionally, ensuring compliance with regulatory standards and addressing potential ethical concerns surrounding data privacy and labor practices remain crucial challenges to overcome.

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