SELINUS UNIVERSITY
OF SCIENCES AND LITERATURE

International Supply Chain Management

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A DISSERTATION

Presented to the Department of
Business Administration
program at Selinus University

Faculty of Business & Media
in fulfillment of the requirements
for the degree of Doctor of Philosophy
in Business Administration

2025

Abstract

Supply chain management is the process of coordinating the flow of goods and services from supplier to customer. A strategic supply chain management comprises functions such as planning, organizing, directing and controlling procurement as well as distribution activities within an organization to meet customer demand, while enhancing profitability and efficiency as well as gaining a competitive edge in the marketplace. Supply chain management is the coordination of all activities in relation to producing and distributing goods and services. In order to keep up with the competition, companies need to have an explicit vision and strategy for their supply chain as well as the latest technology. The modern concept of supply chain management originated in the early 20th century. In 1924, Henry Ford implemented a revolutionary new system for supplying parts and materials to his automotive factories. Ford's Just-In-Time (JIT) delivery system eliminated waste and improved efficiency. Other companies began to adopt similar strategies and by the 1950s, supply chain management and modern supply chains were becoming a fundamental part of business operations. While supply chains refer to the network of suppliers, manufacturers, distributors and retailers, who work together to bring products to market, supply chain management, on the other hand, is the process by which the participants in these networks manage their interactions with each other. Hence, international businesses adopt the global supply chain management concept, which enables them to source materials and products worldwide. Supply chain management is a crucial part of any business and it is becoming increasingly complex, as the world becomes more digital.

Companies need to have an explicit vision and strategy for their global supply chains as well as the latest technology in order to keep up with the competition. In the years ahead further advances in artificial intelligence and increased digitalization of supply chain management are expected.

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Introduction

Supply chain management has been essential to business since the Industrial Revolution. Mass production manufacturing was a key driver in supply chain evolution, along with the standardization of automobile parts to streamline the manufacturing process. With the advent of computers in business, supply chain management took another step forward as it became possible to coordinate supply chain management across various sources, including data from suppliers, distribution centres and transport providers. Supply chain management was a linear process and one in which only a limited number of employees participated. The simultaneous arrival of the Internet and the expansion of the global economy made the linear view of the supply chain obsolete. Supply chain management meanwhile describes the integration of complex networks of dynamic data sources that are updating in real time and mastery of this complexity is essential to the assessment of customer needs, the accurate forecasting and efficient fulfilment of customer demand. This demand driven operational model requires organizations to maintain supply chain management systems that are highly responsive and flexible. These systems require a considerable institutional investment, diligent communication with partner companies and broad participation of employees within an enterprise. Supply chain management creates benefits that translate to profits, brand image and competitive advantage, which comprise the ability to predict and meet customer demand. Supply chain visibility, risk management and predictive capabilities. Accurate forecasting to support decision making. Elimination of inefficiencies and product waste. Enhancement of quality. Sustainability, both from a societal and an environmental standpoint. Low overheads. Effective cash flow. Efficient logistics.

Supply chain management is categorized into the following phases: Plan. Using supply chain analytics and materials management features in enterprise resource planning (ERP) systems, organizations create strategic plans to meet customer demand for product and thus avoid a bullwhip effect. Source. Organizations identify and select vendors that supply materials in a streamlined and efficient way according to agreements. Supply chain collaboration starts at this stage and is vital throughout the supply chain management process. Produce. At this stage, products are manufactured. This includes production scheduling, testing, ensuring compliance requirements are followed, packing, storage and release. Multiple machines are involved, especially for larger companies and these adopt technologies such as Internet of Things (IoT) and Artificial Intelligence (AI) to proceed efficiently. Deliver. This stage pertains to logistics and focuses on getting finished goods to consumers, in whatever manner of transport is required. Emphasis is on doorstep delivery. Supply chain leaders work with customer service. Inventory management and warehouse management systems are crucial at this stage. Return. This stage refers to product returns, which are defective products and goods that are not supported. The return stage also includes elements from other stages, including inventory and transport management. The basic version of a supply chain includes a company, its suppliers and customers. An example would be a raw material producer, manufacturer, distributor, retailer and retail customer. From the raw materials to the customer, supply chain management involves various stages. Supply chains are complex and layered. The Future of Supply Chain Management. The next phase of supply chain management evolution relates to the deployment of AI resources and Machine Learning to speed the processing of data and expand the utility of its results and supply chain planning, a periodic undertaking in the past, will become

a continuous enhancement process. Principles of Supply Chain Management. A supply chain comprises the core activities within an organization that convert raw materials and components into finished products and services. A supply chain is a system of producing and delivering a product or service, from the stage of sourcing raw materials up to the delivery of a product or service to an end user. Thus, a supply chain embraces aspects of the production process and the activities involved at each stage, information that is communicated, natural resources that are transformed into useful materials, human resources and components that go into the finished product or service. Supply chain management encompasses the planning and management of activities in relation to sourcing and procurement, conversion and logistics operations. Furthermore, it encompasses the coordination and collaboration with channel partners, who are suppliers, intermediaries, service providers as well as customers. Hence, supply chain management integrates supply and demand management within and across organizations. Supply chain management has an integrating role of connecting business functions and processes within and across organizations into a cohesive and effective business concept. Moreover, it is concerned with manufacturing procedures, coordinating processes and operations relating marketing and sales, product design, finance and information technology. On the other hand, operations management is concerned with the process that plans, controls and supervises manufacturing and production procedures as well as the provision of services. Hence, operations management has a crucial role in a business organization, because it manages, controls and supervises goods, services and staff. Thus, it is responsible for the effective functioning of a business relating maintenance, analysis of the production process and material planning.

An operations manager coordinates the internal procedures, that is how products need to be developed. While supply chain management is concerned with what happens outside the organization, that is acquiring materials and delivering products. Operations management, on the other hand, is concerned with what happens inside the organization. Supply chain management deals with evaluating suppliers and negotiating contracts, whereas operations management involves the planning and managing of routine procedures. Procurement is a vital business function, since it enhances profitability. Purchasing constitutes a certain stage within the procurement process. Thus, procurement embraces the acquisition of goods and services, that are required for operations, including sourcing, negotiating terms, purchasing items, receiving and inspecting goods as well as keeping record of relevant procedures. Hence, procurement has a vital role in a supply chain, because it involves the cooperation with reliable suppliers that are able to provide qualitative goods and services with competitive prices relating raw materials and components for manufacturing as well as marketing services and office supplies. The procurement process embraces specific procedures, which are the identification of required goods and services, submission of the purchase request, assessment and selection of vendors, negotiation of prices, terms and conditions, preparing the purchase order, receiving and inspecting incoming goods, inspecting and matching procedures, approval of goods invoice and settlement of payment as well as record-keeping. Logistics management is the part of supply chain management that plans, implements and controls the efficient and effective forward and reverse flow and storage of goods and services as well as relevant information between the point of origin and the point of consumption, in order to meet customers' requirements.

Hence, logistics management activities involve inward and outward transportation management, fleet management, warehousing, materials handling, order fulfilment, logistics network design, inventory control, supply and demand planning as well as management of third party logistics services. Logistics management ensures that goods are shipped in an economical, safe, efficient and timely manner, in order to attain cost savings and customer satisfaction. On the other hand, damaged and delayed shipments lead to dissatisfied customers, returns and scrapped products. The consequences of such instances induce extra costs and customer dissatisfaction. Therefore, effective logistics management necessitates diligent planning, an efficient software network, selection of outsourced subcontractors as well as appropriate resources for an optimal coordination of respective processes and operations. Supply chain planning (SCP) is the process of anticipating the demand for products and planning their materials and components, production, marketing, distribution and sales. The objective is to balance supply and demand so that sales revenue opportunities can be exploited in a timely manner and at the lowest possible cost. Hence, the supply chain planning process begins with demand planning, in which a team consisting of staff from sales and marketing as well as production devises a sales forecast in the light of statistics, data and relevant information. Furthermore, supply chain planning involves data collection, access to real time data for effective decision making and efficient time sensitive processes such as just-in-time manufacturing. Inventory management relates to up-to-date inventory data for lean production and low overheads. Accurate demand and production plans are devised to identify inefficiencies, raw materials waste and excess inventory. Furthermore, tracking customer behaviour and product demand enhances profit margins.

Sourcing is the stage that comes before any purchases are made and can be considered as a part of procurement. Thus, relevant suppliers need to be selected in the first place. On the other hand, sourcing is about attaining the balance between quality of raw materials and components and their affordability. It therefore is crucial to maintain standards of quality according to customer expectations and market requirements. Logistics refers to the overall process of managing how resources are acquired, stored and transported to their final destination. Thus, logistics management involves identifying prospective distributors and suppliers as well as determining their effectiveness and efficiency. In fact, the term logistics used to be a military-based definition referring to how military personnel obtained, stored and moved equipment and supplies. The term is adopted in business and industry, relating to how resources are managed and transferred across the supply chain. Customer service is everywhere along the supply chain. Thus, it begins when products are sold to a customer and it is there when goods are delivered. Through the processes of manufacturing, distributing and selling finished goods, businesses concentrate their efforts on excellent assistance towards their customers by dealing with their enquiries and thus counting on their feedback in order to enhance their operations. Furthermore, companies measure the way customers respond to their service and the way those numbers affect their sales. Hence, customer service throughout the supply chain is a crucial factor in attaining enhanced sales, customer satisfaction and delight. A supply chain is an entire system of producing and delivering products and services, from the stage of sourcing raw materials and components up to the delivery of a product or service to the end user. The supply chain lays out aspects of the production process, the activities involved at each stage, information that is communicated, resources that are transformed into useful

materials, human resources and components that go into the finished product or service. Hence, a supply chain encompasses activities that are required to convert raw materials and components through to finished products and services. Therefore, supply chain management is concerned with the entire supply chain, ranging from the supplier through to the customer and thus review human resources, processes and systems, in order to optimize the value of its activities and ultimately enhance the quality of products and services. A supply chain is a coordinated network of people, businesses, resources and technologies that constitute crucial roles in production, transport, sales and delivery of goods and services. Every business needs to have a supply chain, which involves resources and services based agents and subcontractors. The goal is to balance supply and demand, in order to attain financial targets and service objectives for the business. Thus, production planning is concerned with the production and manufacturing of modules, which considers the allocation of human resources and materials as well as the production capacity. On the other hand, demand planning is the process of forecasting demand in order to ensure the supply of products and services. Hence, an effective demand planning enhances the accuracy of revenue forecasts, aligns inventory levels with peaks and troughs in demand as well as optimizes profitability relating sales channels, products and services. Furthermore, sales and operations planning (S&OP) refers to an integrated business management process, that is concerned with key supply chain drivers, thus involving sales, marketing and demand management, production and inventory management as well as new product launches. The process of sourcing products and services is a key component in supply chain management. In fact, it is about attaining the balance between the quality of raw materials and components and their affordability.

Moreover, sourcing is concerned with the selection of adequate suppliers that provide the required product and service quality at a price that includes the right profit margin. Strategic planning in the sourcing process is key to cost structure and profit margins and thus to competitiveness for the business. The sourcing process encompasses key activities such as tracing quality sources of raw materials and components as well as relevant services, negotiating contracts with prospective suppliers, agents and subcontractors, specifying terms and conditions, determining terms of payment, market research, testing for quality and establishing quality standards. Production is a crucial aspect of supply chain management. For efficiency and effectiveness in production, relevant aspects of the supply chain need to be in place accordingly. Thus, diligent planning and appropriate supply of materials are essential factors. Furthermore, accuracy in inventory management is another crucial aspect. The production of goods and services is followed by quality control, packing and the delivery of finished products and services to retail outlets and consumers directly. Transport in a supply chain involves the transfer of commodities from one location to another. Hence, materials make their way to the warehouse and from there continue all the way to the end user with the customer's order delivered at their doorstep. Thus, a supply chain's efficiency is reliant on the strategic management of appropriate transportation modes. Cross docking is an effective transportation method, where consignments are transferred from one truck to another, in order to deliver cargoes from various suppliers to their final destinations. Through cross docking overall transportation costs are reduced accordingly. On the other hand, transportation costs take up a major part in the budget of logistics within a supply chain. Thus, the transport of commodities from one location to another by adopting one or a combination of transport modes turns it into a cost intensive process.

Warehousing is an integral part of supply chain management. Hence, together with distribution they ensure that goods reach end consumers at the right time and in the right condition. For this, a warehouse serves as a logistics hub, where businesses organize their goods and manage a systematic supply chain, which embraces the despatch and delivery of large scale raw materials as well as small scale doorstep deliveries. At the warehouse, each despatch of consignment has to be performed correctly, in order to ensure an accurate delivery. Reverse logistics relates to the process of forwarding products for purposes such as recycling, capturing value or appropriate disposal. In fact, there are various reasons why customers return products, which may be, when a customer has received the wrong product, a merchandise is delivered in a damaged condition, an item does not match its product description or a customer is not satisfied with the purchased product. Hence, reverse logistics is not without challenges. For this, tracking the profitability of the reverse logistics process is crucial. Depending on the merchandise, it is not always profitable to send unwanted products back to the distribution centre, due to the value of a product, that is less than the cost of a return transport. Supply chain management encompasses the planning and management of activities involved in sourcing and procurement, conversion and logistics management. Furthermore, it involves the coordination and collaboration with channel partners, that is suppliers, intermediaries, logistics services providers as well as customers. In essence, supply chain management integrates supply and demand management within and across organizations. Supply chain management is concerned with the flow of goods and services, that is the entire process from transformation of raw materials up to finished products. Hence, a supply chain covers relevant stages from production up to product development and information networks, in order to manage respective

operations. Furthermore, the supply chain lays out all aspects of the production process, comprising respective procedures involved at each stage, relevant information communicated, natural resources that are transformed into useful materials, human resources as well as components that go into finished products and services. Thus, supply chain management is an effective business concept in order to achieve business objectives. The objective of supply chain management is to organize and coordinate the entire supply chain from supplier through to the consumer and review the core areas of human resources, processes and systems in order to streamline procedures and operations and thus deliver and enhance customer value and delight by providing high quality and cost efficient solutions. Moreover, supply chain collaboration relates to coordinating with internal departments and external partners in order to attain a streamlined flow through the supply chain to effectively meet demand and thus ensure on-time delivery and customer satisfaction. On the other hand, establishing real-time shared visibility and processes with supply chain partners is key for identification and resolution of issues. Thus, effective communication between vendors and distributors as well as transparency are crucial factors for attaining customer value and experience. Supply chain efficiency is the performance of an organization. The objective of a supply chain is to save resources and enhance profits by optimizing the processes in the supply chain. Thus, supply chain efficiency is increased through optimizing logistics operations. Furthermore, collaboration between agents and partners streamlines efficiency. Moreover, effective communication with suppliers is crucial in order to attain supply chain efficiency. On the other hand, shipping optimization ensures that each stage in the shipping process is performed in a cost-effective way. For this, selecting the adequate mode of transport and relevant transport routing is eminent.

Among other key factors are correct freight and customs documentation as well as respective cash flow. Inventory refers to raw materials, goods-in-process, finished goods and merchandise. Hence, inventory management is the process that ensures the adequate availability of appropriate resources throughout the supply chain of an organization. Thus, the objective of a supply chain and respective inventory management is to ensure that the right resources are in the right place and at the right time. Reducing overhead costs while enhancing revenue is crucial. The daily operational costs of a business are defined as overhead costs. Supply chain visibility is the ability to view and track stock as it proceeds across the supply chain. Hence, real-time supply chain visibility is the entire end-to-end view of an organization's logistics, inventory and warehouse management operations as well as personnel in real-time, which entails supply chain visibility eminent in making rapid decisions. On the other hand, supply chain analytics refers to the procedures that organizations adopt to gain insight and extract value from data associated with the procurement, processing and distribution of merchandise, which renders supply chain analytics as a crucial element of supply chain management. Descriptive analytics provides visibility throughout the supply chain, that is for both internal and external systems and data. Predictive analytics projects the likely outcome and future scenario and its business implications, which enables to eliminate disruptions and avoid risks. Prescriptive analytics is adopted to collaborate for optimal business value and thus to reduce time and effort in eliminating any disruptions. Supply chain management relates to the process of goods and services, which in fact begins with raw materials and ends with a product's consumption at the end user. Supply chain management evolved in the 1980s and became widespread since then.

Hence, a supply chain encompasses relevant stages involved in fulfilling a customer request, that is producers and suppliers, forwarders and warehouses, retailers as well as customers. Therefore, a supply chain is a network of utilities and distribution comprising functions such as procurement, transformation of materials into semi-finished components and end products as well as the delivery of finished goods to customers. Furthermore, supply chain management refers to the coordination of production, inventory, location as well as the logistics between respective participants in a supply chain in order to attain excellent responsiveness and efficiency. Moreover, a supply chain is a system of organizations and personnel, information technology and procedures as well as resources processed in transferring goods and services from supplier to customer. Thus, a supply chain constitutes a network of retailers, distributors, logistics service providers, storage facilities and suppliers that are involved in the production and delivery as well as the sale of goods and services to customers. In fact, these activities relate to the flow and transformation of goods and services from the stage of raw materials up to the end user including respective flow of information and funds. Supply chain activities transform natural resources, raw materials and components into finished products and respective services to be delivered to customers. For this, a supply chain is the connection between organizations, suppliers and customers. In addition, a supply chain constitutes a logistics network that comprises suppliers, manufacturers, warehouses, distribution centres and retail outlets managing raw materials, inventory, finished products and relevant services being transferred between respective supply chain participants. Therefore, a supply chain involves activities in fulfilling customer demand. Supply chain management encompasses the planning and management of relevant activities involved in sourcing and procurement, conversion as well as respective

logistics activities. It also includes the coordination and collaboration with channel partners, that is suppliers, intermediaries, third-party service providers as well as customers. In essence, supply chain management integrates supply and demand management within and across organizations. Supply chain management can be divided into three main activities. The product flow involves the transfer of merchandise and related services from supplier to consumer. The information flow includes order information and delivery status. The financial flow relates to payment schedules and credit terms. The Supply Chain Network: A supply chain is a network of retailers, distributors, logistics services providers, storage facilities and suppliers that participate in the production, delivery and sale of goods and services to the customer. A supply chain strategy refers to how the supply chain should operate in order to be competitive in the market. Thus, the strategy evaluates the benefits and costs relating to the process. Hence, the supply chain strategy is concerned with relevant operations of an organization and its supply chain in order to meet respective goals and objectives. Supply chain management embraces the flow of information, products and funds. The design, planning and operation of a supply chain have an impact on efficiency and profitability. A competitive strategy defines the set of customer needs, that a business seeks to satisfy through its products and services, which in turn requires low cost, rapid response and product differentiation. The supply chain network consists of suppliers, manufacturers, warehouses, distribution centres and retail outlets as well as raw materials, work-in-process inventory and finished products, that flow between facilities. In fact, it is the collection of physical locations, transportation vehicles and supporting systems through which the products and services are marketed, managed and delivered.

Green supply chain management is defined as the procedure of processing environmentally friendly inputs and transforming them into outputs that can be reclaimed and re-used at the end of their life cycle, thus creating a sustainable supply chain. Green supply chain practices involve sustainability concepts within the traditional supply chain management. Furthermore, the green supply chain is concerned with waste and overall energy consumption. The green supply chain management (GSCM) is also known as the environmental supply chain management (ESCM) as well as the sustainable supply chain management (SSCM). Eventually, these concepts are defined as the integration of green purchasing, green manufacturing and materials management, green distribution and marketing as well as reverse logistics into the organizational procedures. The concept of green supply chain management is to integrate the environment into supply chain management, thus encompassing product design, material sourcing and selection, manufacturing process and delivery of the final product to the consumer as well as the end-of-life management of a merchandise upon accomplishment of its product life cycle. Green SCM aims to eliminate wastage including hazardous material, emissions, energy and solid waste across the supply chain. Hence, GSCM plays a crucial role in promoting the total environmental impact of any business involved in supply chain activities in order to contribute to sustainability enhancement. Some other benefits of green supply chain management are reduced waste, lower transportation cost, noise reduction, traffic congestion avoidance as well as health, safety and security measures achieved. Ethical or sustainable sourcing is defined as sourcing materials, products and services in a sustainable manner, thereby taking into account the environmental and social impact of its supply chain strategies and activities.

Green sourcing relates to sourcing and purchasing materials and components, that have eco-friendly features such as reusability, recyclability as well as non-use of hazardous and dangerous materials. Thus, the essence of eco-friendly purchasing relates to recycling and remanufacturing. Reverse logistics systems are concerned with how products are processed once they fulfil their purpose. Hence, green supply chain management encourages recycling and reusing, though products might undergo other disposal methods if recycling is not possible. Just-in-Time supply chain management involves placing materials in the right place and at the right time. Manufacturers only bring in as many supplies as they need to avoid excessive inventory. Just-in-Time facilitates businesses to avoid overspending on materials and overfilling their warehouses. Transporting cargo over long distances contributes to greenhouse gas emissions by burning fossil fuels. Thus, green supply chain management calls for the use of alternative fuels and the establishment of localized supplier and manufacturer relationships. For this, organizations need to downsize and procure materials from fewer sources. Certification from initiative organizations guarantees a company's commitment to sustainability. They require organizations to meet extensive criteria in measuring adherence to green practices. Supply chain certification ensures that businesses adopt eco-conscious methods by gauging and enhancing their current production methods. Supply chain visibility is the ability to view or track inventory as it moves through the supply chain. Real-time supply chain visibility is the entire end-to-end view of a company’s logistics, inventory and warehouse management processes and personnel in real-time. Supply chain visibility technology facilitates access and real-time insight to supply chain materials, orders, suppliers and component information. Supply chain visibility enables a business to detect any bottlenecks as they arise, track them to their source and promptly react

and resolve them. It utilizes collaboration between suppliers and customers which in turn facilitates on-time delivery of goods and services. Supply chain visibility enables to track performance and thus forecasts future demands, ensuring to meet future objectives. Hence, enhancing performance opens communication among agents and partners of a supply chain. Enhanced visibility ensures to re-evaluate areas of inefficiency and in turn eliminate risks such as damaged products and mistakes. A resilient supply chain is defined by its capacity for resistance and recovery, which means having the capability to resist or even prevent the impact of a supply chain disruption and the flexibility to recover from a disruption. Supply chain resilience is the ability of a supply chain network to withstand disruption and mitigate the effects of upheaval on revenues, costs and customers. It is emerging as a competitive differentiator. Resilient supply chain technologies eliminate risk by allowing visibility into all operations across a network and thus empowering businesses to streamline and adapt their processes and logistics in real time. In order to be resilient, a supply chain needs to be able to forecast and anticipate disruptions and prevent them accordingly. Supply chain management relates to being capable of responding to disruptions and creating flexible contingency plans. Becoming resilient is a necessity in a competitive market. Supply chains are the backbone for the global economy. They have evolved increasingly complex and consist of suppliers, service providers as well as production and distribution centres throughout the globe. Besides resilience, supply chains are designed for cost efficiency. Buffer capacity is the most straight forward way to enhance resilience, whether in the form of underutilized production facilities or inventory in excess of safety stock requirements. Organizations adopt buffers in the form of surge capacity for new product launches or expansions into new growth areas.

They also create buffer capacity by cooperating with contract manufacturers strategically for their surge needs. Supply chain diversification is about expanding the choices that a business has in procurement within a larger circle of manufacturers from diverse locations. The reason why diversification is advantageous lies in the abundance and flexibility of suppliers to choose from. Hence, the expanded choice provides buyers resilience in their supply chains and assists to create a stronger business foundation. Multi-sourcing, also known as multiple sourcing, is an outsourcing approach in which products and services are contracted to various suppliers to conduct the business instead of adopting traditional single sourcing. Leveraging multi-sourcing utilizes flexibility and mitigates the risk of supply chain disruptions from unexpected incidences, such as natural disasters. On the other hand, working with multiple suppliers adds complexity to the supply chain, making it challenging to manage suppliers. Near-shoring is where a business moves its operations to a nearby country from one of greater distance. Near-shoring is a term that derives from the practice of off-shoring, which is when a business moves their production to a cost-effective region than that of their native country. Hence, near-shoring enables frequent visits to the manufacturing site. Closer proximity equates to mitigation of cultural discrepancies and language barriers. Furthermore, near-shoring places the facility into similar time zones, which enhances communication. Moreover, it utilizes short transit time from the manufacturing site to the ultimate customer. Digital technologies such as Artificial Intelligence (AI), cloud and edge computing, IoT and Blockchain enhance supply chain resiliency. A digital supply chain makes it easier for businesses to achieve the intelligence, agility, scalability and flexibility needed to adapt to a rapidly changing world. A cloud-based platform underpinned by AI and IoT automates supply chain planning.

Thus, it becomes possible to predict which suppliers, plants and distribution centres would be impacted by natural disasters, enabling to make adequate decisions in order to prevent any disruption and financial loss. Supply chain efficiency is an internal standard for measuring performance with regard to how well a business leverages its resources in order to attain its objectives for cost savings and process optimization. It relates to adopting available resources such as financial, human and physical optimally to meet customer demands cost-effectively, which utilizes mitigation in operational costs for resources and packing material as well as waste of time. Efficiency is all about the extent to which a process uses resources in the best way possible in order to ensure streamlined procedures. A shortage in economic terms means that the quantity demanded is greater than the quantity supplied. The growing, long term imbalance of supply and demand threatens business performance. Organizations that are unable to insulate themselves against any threat of scarcity face challenges with their financial performance, growth and competitiveness. Raw material availability is crucial, because if raw materials become difficult to acquire, then market forces shift demand to alternative commodities and thus other supply chains. Manufacturing plants are limiting operations despite demand for their products, because they cannot procure metal parts, plastics and raw materials. Construction companies pay more for paint, lumber and hardware, while waiting weeks and sometimes months to obtain what they need. Freight rates have been rising throughout the freight sector encompassing parcel delivery, trucking, ocean shipping and warehousing. Freight transportation contracts are negotiated annually, although global shippers stipulate multiyear agreements with a variety of carriers. Demand forecasting relates to sales statistics that is adopted in order to conceive an estimate of customer demand.

Thus, demand forecasting provides an estimate of goods and services that consumers will purchase in a foreseeable future. Hence, demand forecasting constitutes an essential component of the supply chain process. In fact, it is the driver for almost all supply chain related decisions. Demand forecasting utilizes key business functions such as budgeting, financial planning, sales and marketing plans, raw materials and production planning as well as risk assessment and formulating mitigation plans. Demand for fast delivery times, production on demand and instantly available order status updates have been activated with the rise of the Internet and its ability to provide immediate feedback. Hence, consumer knowledge and the ready availability of information affect manufacturing and B2C industries. A supply chain control tower is a connected, personalized dashboard of data comprising key business metrics and events throughout the supply chain. Thus, a supply chain control tower enables organizations to understand, prioritize and resolve critical issues in real time. Hence, a control tower provides real-time visibility to orders and shipments with real-time tracking across procedures. A supply chain control tower is an agile cloud platform that concentrates on providing end-to-end supply chain visibility and control. By integrating and extending existing ERP, WMS and TMS systems with suppliers, manufacturers, 3PLs and other partners, control towers utilize actionable, granular visibility and operational control across the entire supply chain, thus assisting to enhance fulfilment lead times, reduce inventory costs, mitigate exceptions in real-time and increase the percentage of orders delivered on-time and in-full (OTIF). Real-time order planning is to enhance customer service levels. A control tower captures and leverages key data in real time, such as the delivery time, inventory availability and transportation costs. Thus, it becomes possible to select a cost-effective order flow.

A control tower is concerned with delivering OTIF orders by tracking supply chain procedures and thus sending alerts when issues arise. In addition to track and trace, a control tower utilizes visibility into the details of each order to effectively fulfil on every required aspect. Supply chain control tower means holistic supply chain solution, which covers an end-to-end supply chain process. Hence, it constitutes a collaboration platform. Ideally, a control tower facilitates visibility not to just what is happening, but what could happen that would adversely affect the business. It therefore escalates supply chain risks. Supply chain planning (SCP) is the process of anticipating the demand for goods and services and then planning relevant materials and components, production, marketing, distribution and sale. Its objective is to balance supply and demand so that sales revenue opportunities are optimally exploited in a timely manner and at the lowest possible cost. The supply chain planning process begins with demand planning, in which a team consisting of personnel from sales, marketing and production creates a sales forecast based on statistical data and relevant information. Demand planning involves forecasting demand through mechanizms such as price cuts, product substitutions and special promotions. Thus, demand shaping is a method that businesses adopt in order to match demand with supply. Once the demand plan is approved, it is implemented into a corresponding production plan and then performed accordingly through distribution and order fulfilment. Sales and operations planning (SOP) is concerned with matching supply and demand. Thus, the sales department cooperates with operational departments such as manufacturing, marketing and procurement in order to devise a production plan. The SOP team gathers information such as forecasts as well as sales and inventory data, develops demand and production plans that are based on the manufacturing and distribution capacities.

The team reconciles the demand and production plans with resource constraints, such as finances to adjust the plan in order to obtain the final approval. Material requirements planning (MRP) is a method for calculating and planning the raw materials and components that are required to manufacture products according to respective demand and production plans. It involves the stock of materials and components, identifying others that are required and making plans to produce or aquire them. Thus, MRP constitutes a crucial role in the supply chain that affects distributors, retailers and ultimately consumers. Production planning (PP) addresses the details of manufacturing products involving the number and types of goods, their components, who will produce them and which plants and machinery will be adopted. Hence, production scheduling is a key part of production planning. Supply chain planning provides further advantages such as data collection. Having access to real-time data enhances decision-making and time-sensitive processes such as just in time manufacturing. Relating inventory management up-to-date inventory data facilitates lean production and thus lowers overheads. In terms of efficiency, accurate demand and production plans assist in detecting inefficiencies such as raw materials, waste and excess inventory. For enhanced customer satisfaction, tracking consumer sentiment and product demand optimizes profit margins. Lean supply chain management is about enhancing efficiency through removal of unwanted and wasted components from a process, which is applied to manufacturing, where supplies are ordered as they are required, rather than keeping excess inventory. With a lean approach it is crucial that organizational leadership identifies what is and what is not of value in the supply chain and thus concentrate on those components that are of value. The elements of a supply chain that are not of value are eliminated accordingly, thereby mitigating cost and inefficiencies.

Non-valued components are those parts in the process that have a zero or negative return on investment, which may induce either a positive or no impact on the outcome of such a process. Eliminate waste in the supply chain so that only value remains. Creating a streamlined flow of products in a lean supply chain requires respective departments and functions in a business to work in collaboration. In a supply chain, the eight wastes refer to zero system complexity, zero lead time, zero transport, zero space, zero inventory, zero human effort, zero packaging and zero energy. Eliminate wasteful energy in the supply chain. Consider advancements in technology in order to enhance the supply chain. Key features of a lean supply chain encompass workforce management across the supply chain, omni-channel fulfilment, cutting-edge information technology, customer order management, customer relationship management as well as any other technology that streamlines the supply chain and thus enhances communication and creates added value to the customer. When participants of a lean supply chain operate in concert with customer demand, they then effectively identify problems, determine root causes and develop appropriate solutions to overcome any bottlenecks. The emphasis is on total cost of fulfilment. Decisions made need to be in accordance with customer expectations at the lowest possible total cost throughout the supply chain. This requires eliminating decisions that benefit only one part of the process at the expense of others, which is achieved when all participants of the lean supply chain share in operational and financial benefits when waste is eliminated. When a product and its deliverability are consistent, then customers gain trust in the brand. Hence, enhanced trust equates to a rise in sales. Reliability in manufacturing and the supply chain utilizes accurate forecasting, leading to just-in-time inventory. Less variability means less waste and fewer returns.

The least profitable part of the supply chain is the one that is returned to the warehouse. When all aspects of an agile and lean supply chain are mapped and accounted for, then the product is delivered as the customer places their order. An order in turn triggers a replenishment in the warehouse, thus leading to a stocking order at the distributor, which entails the manufacturer to produce more of a certain product. The process of continuous enhancement is in the centre of a business. Thus, employees are authorized to identify any opportunity for enhancement, followed by a video highlighting that improvement. Significant opportunities for any optimization are identified and thus solutions are developed accordingly. If the solution results in sufficient gains, then the procedure is effectively accomplished.

Literature Review

Supply Chain Agility: Agility relates to the ability of an organization's supply chain to react to consumer demand, market changes, volatility and the life cycle of its products. Hence, an agile supply chain is the solution to constraints that exist in supply chain networks. This concept enhances the responsiveness of a supply chain in a dynamic environment. Agility relates to a demand driven strategy that is responsive in a volatile market place. As consumer's buying patterns are continuously changing, so does the supply chain management accordingly. The crucial features of an agile supply chain are speed and cost efficiency. Thus, an agile supply chain is based on the sensitivity to consumer demand. Agile supply chains are adopted for products with short life cycles and customizable elements. Agility utilizes the supply chain to change processes and adapt operations accordingly. By means of lean concepts, a supply chain enhances the workflow. Thus, agility facilitates supply chain participants to collaborate for producing the amount of product that is required. Hence, agile solutions streamline the supply chain and thus foster supplier-to-manufacturer-to-consumer relationships. Furthermore, agility in a supply chain is concerned with avoiding potential shortages and eliminating excessively stocked inventory. Agile supply chains are adaptive to markets, vendor and consumer demands. Manufacturers implementing fluid and flexible procedures cut costs. Businesses make forecasts about potential shortages or interruptions in the supply chain, utilizing visibility relating processes and product waste. Eliminated waste, fast decision-making, continuous data review and effective communication utilize an efficient production process. Implementing an agile supply chain is crucial for businesses in order to attain sustainability. A lean supply chain operates optimally.

Hence, it supplies goods and services efficiently with minimal waste and loss. It is flexible in adapting and responding to unexpected delays accordingly. Production is based on demand and not on supply. It essentially is about supply of goods and services when there is a demand. The production is efficient by performing in batches, thus attaining economies of scale. Another emphasis is on quality, which in turn enhances production and efficiency. A lean supply chain relates to lean practices, which facilitates businesses a competitive edge over their competitors. A supply chain is a network of various participants consisting of suppliers, logistics service providers, manufactures and customers. Procurement involves functions such as acquiring materials and services that are required for production, sourcing, negotiating terms, purchasing items, receiving and inspecting resources and thus keeping records of respective stages in a process. Purchasing is the process of buying and acquiring goods and services, which contributes to the efficiency of a supply chain. Goods, materials and equipment procured in a process play a key role in enhancing the quality of products and services produced and supplied by a business. Hence, the purchasing process affects the product quality and optimizes cost efficiency in the value chain. Among the key functions of a purchasing department are identifying business requirements relating goods, materials and services, finding reliable suppliers to meet requirements, negotiating prices, enhancing quality and stipulating delivery terms, setting up order quantities and making bid requests on supply contracts, coordinating delivery and storage procedures, conducting quality control and product testing, managing budgets based on ROI (Return on Investment) and payments. A procurement process embraces surveying the market, identifying potential suppliers, creating an approved list of vendors, detecting internal needs, devising a purchase order, requesting proposals

and evaluating quotations, selecting appropriate suppliers and negotiating effectively, receiving goods and performing quality checks, developing and managing contracts, obtaining invoice approvals and fulfilling payment terms and establishing an efficient supplier relationship. A purchasing process encompasses obtaining a purchase requisition, requesting proposals and evaluating quotations, despatching official purchase orders, receiving products and services, checking the quality of delivered items and effecting payment to vendors. Purchasing is concerned with short-term objectives such as right quality and quantity, right cost, right time and place, whereas procurement management deals with strategic and long-term goals like attaining a competitive advantage and aligning with corporate strategy and goals. Procurement KPIs (Key Performance Indicator) embrace compliance rate, supplier defect rate, purchase order and invoice accuracy, rate of emergency purchases, supplier lead time, purchase order cycle time, vendor availability, cost per invoice and purchase order, spend under management (SUM), procurement ROI and benefits as well as price competitiveness. E-procurement or electronic procurement is a digital transaction process that involves the Internet to buy and sell goods and services. The objective of e-procurement is to dematerialise commercial transactions between businesses and their suppliers via digital solutions in order to streamline the procurement process. E-procurement began in the 1980s when electronic data interchange (EDI) was developed. EDI facilitates files and documents to be shared in commerce. Businesses no longer have to physically send documents, since they are transmitted electronically. Hence, e-procurement automates processes to streamline procedures, it enhances communication among stakeholders and partners to optimize the procurement cycle, it provides a single platform for all procurement activities, giving stakeholders and managers a centralized platform for managing and

auditing, it offers real-time updates for vendors, management, stakeholders and partners as well as the chance to curate and store procurement data, it allows for streamlined negotiation between multiple partners and stakeholders. Operations management and supply chain management are both crucial activities in a business. Thus, they both add value to a business by supporting efficient processes and optimize the revenue of a business. While a supply chain is concerned with external activities, such as acquiring materials and delivering products, operations management, on the other hand, deals with the internal procedures of a business. Operations management in the manufacturing industry deals with the equipment and methods in order to streamline production, which involves managing business resources such as personnel, technology, equipment and other relevant aspects in order to enhance the efficiency and productivity of a business. Operations management in manufacturing ensures that the equipment and user interface proceed well balanced for the benefit of a business. Operations management comprises the activities involved in transforming a product idea into a finished product as well as the planning and controlling of the systems that produce the goods and services. Thus, operations management is concerned with the process relating the transformation of inputs into outputs. During production planning, managers determine how products need to be produced, where production will take place and how manufacturing facilities will be laid out. Once the production process is under way, managers must continually schedule and track the activities that make up that process. They must solicit, respond to feedback and make adjustments where required. Furthermore, they also monitor the purchasing of raw materials and the handling of inventories.

Moreover, the operations manager need to ensure that goods are produced according to specifications and that quality standards are maintained accordingly. Volume refers to the number of product units that is needed to fulfil customer demand. This aspect is eminent for businesses that deal with mass production and product output. Therefore, volume is of major concern as well as the quality of every unit. In fact, volume is an indicator of how well a business is performing in the market. Thereby, a firm refers to volume information and sales numbers in order to make any changes relating to production. Variety refers to the range of goods and services that a firm creates and sells. Hence, a wide variety of product offerings enables to reach target markets and new customer demographics. Variation refers to what extent external factors affect customer demand for a product over time. What kind of factors would affect production and thus entail any changes? Visibility indicates to a company's image in the marketplace and how customers perceive and experience their goods and services. Supply chain management involves the procurement of materials, manufacturing of products and delivery to the consumer. Therefore, supply chain managers need to cooperate with key players in the supply chain comprising suppliers, logistics services providers and customers. For this, they evaluate subcontractors, forecast demand and supply, enhance customer service and work together with other departments of the organization involving marketing and finance as well as sales and quality assurance. An organization's supply chain is an eminent business process, that is key for successful customer experience. A supply chain utilizes business efficiency and responsiveness, thus facilitating customers to get what they want as well as when and where they need it, in a way that is both profitable for the organization and contributes to supply chain sustainability.

A supply chain design describes network processes like where warehouse facilities are located and how merchandise proceeds between them and strategic objectives like demand forecasting, establishing supplies as well as the planning and scheduling of manufacturing operations. Supply chain planning requires the creation of a strategic supply chain deployment plan, inventory planning and the coordination of agents and subcontractors to streamline delivery of goods, services and information from supplier to customers, thus balancing supply and demand. Supply chain execution is concerned with execution oriented procedures and systems, which involves warehouse and inventory management, transport management, global trade management and other related execution processes, such as real-time decision support, supply chain visibility and order management systems. Logistics management is concerned with the procedure of planning and executing the efficient transport and storage of merchandise from the point of origin up to the point of consumption. Thereby, the objective of logistics is to meet customer requirements in a timely and cost-effective manner. Transport and warehousing are the two major functions of logistics. Transport management involves planning, streamlining and executing the deployment of vehicles to transfer merchandise between warehouses, retail locations and customers. Transport is multimodal and involves sea, air, rail and road. Logistics procedures start with order processing. Thus, the commercial department determines respective payment and delivery terms, then processes the order accordingly. Material handling involves the movement of goods within the warehouse to process orders efficiently. Warehousing involves the storing of merchandise, that is to be sold or distributed. Inventory control is concerned with eliminating slow-selling products and maintaining high-selling merchandise.

Efficient transport is vital, that requires optimal delivery routes and cost-effective packaging in order to ensure the safety of merchandise. Transport services involve the transfer of goods and services as well as people and animals from one location to another by road, rail, inland waterway, sea, air, pipeline and cable. Packaging is the wrapping of a merchandise in order to utilize protection during transport, handling and storage as well as provide information for customers and also function as a means of marketing. A supply chain is an entire system of producing and delivering a product or service, from the very beginning of sourcing the raw materials up to the final delivery of the product or service to the end user. The supply chain is concerned with aspects of production processes, respective activities involved at each stage, information that is communicated, resources that are transformed into useful materials, human resources as well as other components and elements that go into a finished product or service. A supply chain deals with procedures to convert raw materials and component parts into finished products and services. Supply chain planning is the process of anticipating the demand for products and thus planning the materials and components, production, marketing, distribution and sale accordingly. Thereby, its objective is to balance supply and demand, so that sales revenue opportunities are exploited in a timely manner and at the lowest possible cost. The supply chain planning process begins with demand planning by creating a sales forecast based on data and relevant information. Real-time data enhances decision making and thus facilitates time sensitive processes, such as just-in-time manufacturing. Up-to-date inventory data utilizes lean production and low overheads. Adequate demand and production plans assist to identify inefficiencies, such as raw materials waste and excess inventory. Tracking customer sentiment and product demand enhances profit margins.

Sourcing is the stage that comes before any purchases are made and is a subsection of the procurement process. Thereby, reliable, affordable and quality suppliers provide the required goods. Sourcing relates to the balance between the quality of raw materials and their affordability. The less is spent on materials, the more profit a business makes. Nevertheless, it is crucial to retain standards of quality, because customers expect quality as well. Logistics services relate to the managing of how resources are acquired, stored and transported to their final destination. Thereby, logistics management involves identifying prospective distributors and suppliers as well as determining their effectiveness and accessibility. Thus, it is about how resources are handled and transported along the supply chain. Customer service is everywhere along the supply chain. It begins when a product is sold to a customer and it is there when products are delivered. Through the processes of manufacturing, distributing and selling finished goods, companies are concerned with the provision of an excellent service to their customers, thus dealing with their questions and counting on their feedback in order to further enhance their services. Firms also measure how customers respond to their services. Hence, businesses providing satisfactory customer services along their supply chain enhance their sales respectively. Benchmarking relates to measuring business performance against competitors in order to enhance the business and operational practices as well as reduce costs and streamline its services. Marketing and sales are concerned with informing buyers about products and services, encouraging consumers in purchasing them and thus facilitating the purchasing process, which involves product development, pricing, promotions and sales force management. After-sales services maintain products and services working for the buyer upon sales and delivery, including installation, training, maintenance, warranty response and repairs.

Procurement is concerned with acquiring raw materials and inputs for the products, managing relationships with suppliers and negotiating prices in collaboration with marketing and sales, inbound logistics and operations in order to source materials on-time and cost-effectively. Human resources deal with recruiting, hiring, training, developing, compensating and dismissing personnel that design, build and distribute products and services. Technology embraces equipment, hardware and software, procedures and technical knowledge, that is adopted to transform materials into products. The infrastructure of a business relates to activities such as administrative functions comprising accounting, business law, finance, planning, public affairs, government relations, quality assurance and general management. Differentiation strategies for optimizing customer value are concerned with product features, customer service and responsiveness, customization as well as complementary products. A value chain creates a competitive advantage and value for its customers, involving the supply chain relating product design, procurement, manufacturing, distribution and fulfilment. The supply chain is a component of the value chain. The supply chain involves transporting materials and products to their correct locations. On the other hand, the value chain constitutes of a series of interrelated activities, that a business adopts to create a competitive advantage. In terms of a supply chain, the range of activities is from the source to the consumer. Thus, it begins with raw materials and basic inputs and then follows the chain up to the end user, tracking the entire process. Whereas, in terms of a value chain, the analysis starts with the consumer. Hence, the process begins with the end user and assigns a high value to the activities that are of significance to the customer. While a supply chain analysis deals with costs of goods and services, a value chain is concerned with creating value for the customer.

A business aims to create connections among aspects that customers value and a company's activities. Therefore, value chains project a strategic approach by emphasizing innovation and technology, social trends as well as research and development. A company that competes on differentiation attains profitable margins and customer loyalty. Customer service is everywhere along the supply chain. It begins when products and services are sold to the customer and it is there when products and services are delivered to the end user. Through the processes of manufacturing, distributing and selling finished goods and services, companies direct their efforts on utilizing an excellent customer service by dealing with customer inquiries and counting on their feedback, in order to streamline their services. Thereby, firms measure customer responds to their products and services for further optimization of their customer services, thus leading to enhanced sales. In order to attain an efficient customer service throughout the processes of manufacturing, distribution and the end result of a customer purchase, it in fact starts with the management’s commitment to customer service throughout the supply chain. Sourcing is a balancing act. It is the process of requesting quotes for new products, obtaining vendor information and uploading into the procurement software, determining the lead time, pricing and minimum order quantities. Before sourcing can begin, purchasing requirements have to be assessed, a plan mapped out, market research conducted and potential suppliers determined. Once suppliers are evaluated, the appropriate once are chosen accordingly. The process is adopted for other purchasing needs as well until suppliers are in place for respective requirements. Strategic Procurement: Procurement is the process of sourcing and then adopting suppliers to gather the materials that are necessary for products and services.

It involves placing orders with each supplier, receiving the goods and paying for them. Procurement is an end-to-end process that covers everything from planning purchases to negotiating pricing, making the purchases up to handling inventory control and storage. Procurement is the process of placing purchase orders with each of the suppliers, getting order confirmation, following up with suppliers until materials are delivered and ensuring that the materials are paid for. Strategic sourcing is a procurement process that continuously enhances and re-evaluates the purchasing activities of a business in order to reduce costs and optimize stability. The process involves businesses working in-house or outsourcing their procurement model to professionals, to create the best strategic sourcing model. Thus, businesses are able to concentrate on their revenue-generating activities. As part of the sourcing process, what the organization buys, from whom, at what price and what volume are analyzed accordingly. Strategic sourcing differs from conventional purchasing as it places emphasis on the entire life-cycle of a product, rather than its initial purchase price. Strategic procurement is an organization-wide process that aims to ensure the timely supply of goods and services in line with an organization's commercial objectives, while eliminating risk within the supply chain. It involves functions such as managing budgets and researching as well as identifying and selecting suppliers. Strategic procurement requires co-operation from respective departments throughout an organization. A business can have a dedicated strategic procurement team in order to set the direction of the firm by adopting data from the existing procurement process in order to implement future plans. To develop a procurement strategy, needs and objectives have to be determined respectively. An assessment of the suppliers market has to be conducted.

Potential countries that are feasible sources of the required raw materials, components, finished goods and services are identified accordingly. For manufactured products, there will be potential countries from which to select. Services are reliant on technological requirements of an organization. Supplier information is vital for a business to select adequate suppliers. The business reputation and performance of the supplier is evaluated as well as financial statements, credit reports and references. A business may also inspect the supplier's site and communicate with customers about their experiences with the supplier. Agents are familiar with the markets and stakeholders who are beneficial to the process. A business selects more than one supplier to avoid potential supply disruptions as well as create a competitive environment. This strategy is effective for multinational organizations and allows for centralized control and regional delivery. Based on the information gathered an organization can devise a sourcing and outsourcing strategy. Direct purchase refers to sending a request for proposal (RFP) or a request for quote (RFQ) to select suppliers. Acquisition relates to purchasing from a preferable supplier. Strategic partnership is about entering into an agreement with a selected supplier. Determining the appropriate strategy depends on the competitiveness of the suppliers marketplace as well as the sourcing and outsourcing, organizations' risk tolerance, overall business strategy and motivation for outsourcing. Sourcing strategies that involve acquisition or strategic partnerships are major undertakings. For a direct purchase, organizations begin with an Expression of Interest (EOI), prepare an RFP or RFQ and solicit bids from identified potential suppliers as part of a competitive bidding process. The RFP includes detailed material, product and service specifications, delivery and service requirements, evaluation criteria, pricing structure and financial terms.

Strategic procurement involves the evaluation of responses from suppliers and conducting negotiations with selected suppliers. Transition plans are vital when switching suppliers. Assigning new suppliers requires the transfer of information, utilizing logistics services and communication systems as well as providing training. The implementation of such transfers takes time and expertise to set and start up. Expectations for this time frame are agreed upon at contract negotiations for operations and deliveries. How the transition to the outsourced service is handled and how it is perceived by staff and customers is crucial. Transparency and preparation are key to this aspect of the sourcing strategy. Adopting a strategic mindset is essential for executives with increasing profits, delighting customers and retaining talent. For remaining competitive, organizations need to manage according to changing conditions. In addition to the marketplace, businesses need to respond to changes in technology, economy, consumer behaviour, regulations and environmental constraints. Strategic thinking requires to view an issue or situation from various perspectives with the objective of a logical approach that delivers the optimal outcome. The result is a deeper understanding of a case, one which enables to evaluate solutions as well as the pros and cons of implementing each. Logistics services relate to the process of planning and executing the efficient transport and storage of goods from the point of origin up to the point of consumption. The objective of logistics services is to meet customer requirements in a timely and cost-effective manner. Firms specialize in logistics services, providing such services to manufacturers and retailers of various industries. Large retailers and manufacturers own certain parts of their logistics network, while the majority outsources to logistics services providers. Transport and warehousing are the two major functions of logistics services.

Transport management is concerned with planning, optimizing and executing the utilization of transport vehicles in order to transfer merchandise between warehouses, retail locations and customers. A transport is multimodal and involves seaway, airway, railway, roadway, inland waterway, pipeline as well as cable and satellite. Thus, transport management is a complex process that involves planning and streamlining routes and shipment loads, order management, freight auditing as well as invoicing and payment follow-up. Furthermore, logistics services extend to yard management, a process which oversees the operation of various transport vehicles through the yards outside manufacturing plants, warehouses and distribution centres. Carrier management is a crucial function relating freight rates, availability and capacity of transport carriers that offer a wide range of variety. Logistics services providers adopt transport management system (TMS) software in order to manage transport related logistics. In addition, there are niche applications such as yard management system (YMS). Warehousing or warehouse management involves functions such as inventory management and order fulfilment. It also involves managing warehouse infrastructure and processes such as a fulfilment centre, where orders for merchandise are received, processed, fulfilled and despatched to the customer. A warehouse management system (WMS) software is implemented to manage the flow and storage of goods and track inventory. Enterprise resource planning (ERP) software embraces both TMS and WMS modules as well as specialized components for inventory management and other logistics functions. Moreover, customs management or global trade management is considered as a part of logistics, since the documentation to comply with regulations has to be processed, where shipments cross national boarders or enter shipping ports.

Artificial Intelligence (AI), driverless vehicle technology and commercial drones play vital roles for logistics operations in the years ahead. Logistics services providers adopt AI to track consignments and predict transport related issues in the supply chain. Meanwhile, autonomous vehicles, driverless forklifts, delivery trucks and drones become commonplace in warehouses, warehouse yards and motorways. While on-time delivery of packages is vital throughout the supply chain, omni-channel commerce with its same-day home and retail delivery of customized products ordered from smart phones plays a crucial role in online trade. Suppliers, manufacturers, distributors and retailers streamline their logistics operations to meet the requirement for fast and convenient delivery of a wider variety of merchandise. They integrate their processes and systems to enhance supply chain visibility. Logistics is an eminent component of supply chain management (SCM). While both definitions are adopted interchangeably, logistics is concerned with delivering goods and materials efficiently. SCM embraces a variety of supply chain planning (SCP) functions such as demand planning (DP), sales and operations planning (S&OP), supply chain execution (SCE), strategic sourcing and transport management. The terms inbound and outbound logistics are adopted to denote logistics services for shipments arriving at or leaving a facility. Another crucial function constitutes reverse logistics, where logistics processes return a product for servicing, refurbishing or decommissioning and recycling. Supply chain management comprises the planning and management of activities involved in sourcing and procurement, conversion as well as logistics management. It also includes coordination and collaboration with channel partners, which are suppliers, intermediaries, logistics services providers and customers. In essence, supply chain management integrates supply and demand management within and across businesses.

Supply chain management is concerned with the entire supply chain from supplier through to the consumer and review the core areas of staff, processes and systems in order to create value for customers. Choosing the mode of transport is a key factor to be considered, while making the decision for shipping goods from a supplier to destination. While determining the appropriate mode of transport reduces the logistics costs and any delays, competent management streamlines logistics services. Professional knowledge and experience in routing vessels, airplanes and trucks enables to make an adequate decision on selecting the appropriate mode of transport. The right mode of transport is reliant on the type of merchandise and its destination. General cargo, special cargo such as temperature controlled goods and chemical material require a specific mode of transport to prevent any damage and safety issues. The selection of the right transport mode is crucial to a business and logistics management. Choosing the right mode of transport saves money and time, eliminates any damages and errors as well as enhances efficiency. Major modes of transport are as follows: Airfreight utilizes the transport of cargoes by air. Shipping cargo by air is a high cost-to-weight form of shipment, countered by the fact that it is the fastest way to transport goods internationally. Seafreight facilitates the transport of shipments internationally by sea. Ocean-freight is an economical option for shipping goods internationally. Hence, about 90 percent of commodities are transported throughout the world by sea. Roadfreight is a versatile mode of freight carriage that provides speed, cost-efficiency and flexibility for door-to-door distribution services. Other modes of transport comprise railfreight, inland waterways, pipeline, cable and satellite. A supply chain is an entire network of producing and delivering a product or service from the very beginning stage of sourcing raw materials up to the final delivery of a product or service to an end user.

The supply chain lays out all aspects of the production process, including the functions involved at each stage, information communicated, natural resources transformed into useful commodities, human resources and other components that go into a finished product or service. A supply chain is concerned with the core activities of an organization that are required to convert raw materials or component parts through to finished products or services. The objective of supply chain management is to manage the entire supply chain from supplier through to the consumer and deal with core areas such as staff, processes, systems and customers in order to create value from those functions. Supply chain strategies concentrate on operational efficiency and responsiveness. Operational efficiency relates to the ratio of productive output to operational inputs. The supply chain is at the core of business processes, which involve transport, storage, manufacturing and customer service. This interconnected feature of the supply chain impacts the overall operations and processes. A responsive supply chain is agile and flexible to meet the needs of business and customers. Responsive supply chain functions are crucial for efficient operations. A responsive supply chain utilizes flexibility with labour management, streamlines warehouse operations and eliminates dock constraints amongst others. The benefits of responsiveness in the supply chain entail reduced inventory carrying costs, enhanced accountability throughout the supply chain network, optimized customer service and effeciency in just-in-time fulfilment. Digital supply chain refers to the implementation of digital technologies. Thus, Artificial Intelligence, Machine Learning, Internet of Things, Blockchain, 3d-printing, robotic process automation and predictive analytics are digital functions that streamline supply chains. A digital supply chain adopts electronic technologies to every aspect of the entire supply chain.

This involves end-to-end digitization of the complete process, from manufacturing up to transport, distribution and administration. The integration of electronic sensors and tracking capabilities utilizes real-time monitoring of shipments in transit for an end-to-end connectivity. This facilitates transparency and visibility throughout the supply chain operations. Sensors are placed in products, networks are created, processes are automated and operations are analyzed with the objective to enhance efficiency and create customer value and satisfaction. The transformation into a digital supply chain requires capabilities and environment. Hence, digital transformation in supply chain management entails organizational flexibility and business process automation as well as accelerates innovation in supply chain management. A digitized supply chain constitutes an integral part of the overall business and organizational structure. Moving from a traditional supply chain to a digital supply chain is a complex process. Digitalization starts with assessing the existing supply chain, which involves an evaluation of internal strengths and weaknesses as well as external opportunities and threats to a supply chain. For this, current issues, risks and bottlenecks need to be identified and analyzed accordingly. Automated forecasting and planning simplify tasks and derive meaning from large volumes of data. Routine and recurring tasks are replaced by automated processes. The shift to a digital supply chain integrates technologies with processes, staff and management in order to attain the desired results in the new business model. Visibility is a key concern in logistics and supply chain management. Digital supply chain provides visibility into its elements and moving parts. Businesses obtain real-time visibility into supplier performance to identify gaps that may cause disruptions and then address them. A digital supply chain provides up-to-date information about performance, status and requirements.

Understanding freight costs and how they impact profit margins is an essential part of logistics management. Digitally automated logistics processes entail lower freight rates, fees and expenses, reduced hidden costs and excessive fees and thus augment customer experience. Digital supply chain, shared and up-to-date data enable to anticipate issues and respond quickly before any complication escalates. Moreover, digital supply chain management makes it easy to plan and coordinate supply chain workflows such as sourcing, procurement, conversion, inventory and logistics management. Sales and operations planning is a process led by senior management on a monthly basis. Revised time phases projection for supply and demand as well as the resulting financials. It involves a decision making process that entails the tactical plans in business functions and thus are aligned as well as in support of a business plan. The objective of a sales and operations plan is to reach consensus on a single operating plan that allocates the resources of staff, capacity, materials, time and money in order to effectively meet the marketplace in a profitable way. An effective supply chain integrates demand and supply planning procedures, which refer to the sales and operation planning process. The outcome of a sales and operation process provides executive guidelines on how to adopt resources such as skilled labour, safety stock, contracted manufacturers, finished goods inventories, facility locations, supplier’s capacity and capability as well as business options such as outsourcing, subcontracting, third parties, inventory control and planned shortages in order to meet the expected market demand. The process balances the cost, customer service levels, opportunities, constraints and profit of both a business organization and its supply chain partners. An integrated sales and operations process consists of two major planning components, which is demand and supply planning.

Demand and Supply Planning. Demand planning is driven by sales and revenue targets and is a multistep process adopted for utilizing forecasts to guide business decisions. Factors that affect the quality of demand planning include forecasting accuracy, responsiveness of business processes, effectiveness of customer order management, inventory management policies and order cycle time. Key steps in demand planning process include analysis of demand data involving sales, request for services, demand for resources, devising statistical forecasts, collaborating with customers, suppliers and other supply chain trading partners to finalize the forecast and share with key supply chain stakeholders such as contract manufacturers and suppliers. Supply planning is concerned with procurement, supply capability and supply capacity. Supply planning is driven by profit and is affected by purchasing price, supply quality, supplier's capacity and performance, capability, responsiveness and willingness to collaborate. The objective of supply planning is to facilitate a seamless supply to meet demand in a cost-effective manner. Demand forecasting is a process adopted by businesses to predict future demand for a product or service. Through demand forecasting businesses estimate future demand effectively. Balancing demand and supply is considered to be a challenge of any supply chain management. Demand forecasting is crucial in a supply chain for managing inventory and capacity planning. Fleet management is a fundamental process for the efficient functioning of logistics operations. It involves the overall costs of transport, fleet and resource utilization as well as the regulatory compliance of a fleet, which is instrumental for enhancing customer satisfaction, increasing revenues and facilitating agility to a fleet. For this, deliveries need to arrive at the right destination and on-time. In logistics industries vehicles are the essential source for business development, which entails vehicle maintenance crucial. Trucks and trailers are adopted for the

transportation of freight. Regular maintained vehicles perform well and give a good result. Since businesses depend on transport, this makes the performance of a vehicle a key factor. Fuel represents a significant cost-factor for transport businesses. Truck drivers play a key role in the transport business. Their task is not limited to the transport, loading and unloading of consignments, but they also need to care for the freight and customs documentation, check their shipments and plan for the transport route. As the key link between business and customers is the truck driver, who represents a company's image. An effective driver management system leverages safety and productivity for the truck driver. Fleet management comprises a range of functions to manage transport vehicles and assets. Logistics businesses implement a fleet management software to attain visibility into vehicle and asset utilization, enhance maintenance planning and manage cost of ownership. Fleet management is concerned with a wide range of operations involving driver management, compliance management, operational efficiency and environmental impact. Fleet management software provides real-time visibility into fleet location and performance, cost analysis and enhanced driver behaviour. Fleet management software goes beyond location tracking by providing insight into vehicle performance and efficiency. Administrative duties such as quoting, invoicing, identifying and despatching drivers, expense management and keeping customers informed are streamlined and automated. Fleet management tracks fuel consumption, checks vehicles and drivers relating fuel overuse and monitor driver behaviour. Fleet management software comes equipped with workflow automation software, thus providing managers regular service and maintenance reminders in terms of date, mileage and time of use. Regulatory and legal compliance is monitored as relevant information is recorded up to date and notifications on expiry dates are provided.

Fleet management products integrate with other software providers, making further tasks seamless such as payments, route optimization and human resources. The objective of logistics management is to assess and execute solutions for the transfer of merchandise from shipper to consignee. Enhancing overall efficiency requires the management of both inbound and outbound transports. Besides product quality, a business needs to minimize its response time in order to optimize customer satisfaction, because customers prefer fast service. Through supply chain technology, managers are able to assign and postpone operations at the click of a button, such as shipping replacement items or ordering inventory. With a stock ordering software it becomes possible to minimize the inventory onsite and anticipate emerging demands, which enables to operate in real time for each order instead of stockpiling merchandise. Firms cannot completely eliminate the risk of unexpected events disrupting their operations. Information technology monitors processes and streamlines the response time to malfunctions, thus eliminating the impact of unexpected issues. There are risks in a supply chain that induce waste of valuable time and funds, from disrupted production lines up to goods damaged during shipment. For this, the access to advanced software enhances logistics control in order to eliminate any bottlenecks. Optimizing inventory levels requires to balance out overstocking and understocking products. A lack of merchandise entails stock outs and lost sales, hindering profits and customer satisfaction. On the other hand, overstocking accumulates storage and shipping costs as well as decreasing profits. Thus, an inventory needs to be at levels that both meets customer demand and minimizes logistics costs. By assessing minimum stock levels, a business maintains efficient inventory turnover rates and availability. Total quality management (TQM) plays a vital role in the logistics industry and overall business landscape.

By enhancing product quality, companies increase sales and customer satisfaction. Businesses need to take a proactive approach to enhance the quality of their operations. Hence, improving the production quality accommodates customers to obtain quality items, minimizing returns and additional logistics expenses. Supply chain analytics streamlines operational efficiency and effectiveness by utilizing data driven decisions at strategic and operational stages. Supply chain analytics is a complex process that involves various industries and organizations with different goals and objectives. Such a process comprises the adoption of mathematics, predictive modelling, statistics and machine-learning techniques for designing and managing a supply chain. Supply chain analytics contains a complete value chain of sourcing, distribution, manufacturing and logistics. It enables to make data driven decisions at both strategic and operational levels. The purpose of supply chain analytics is to enhance the operational efficiency and effectiveness of industries. Supply chain analytics aims at strengthening operational efficiency and overall effectiveness by enabling informed data driven decisions throughout an organization. Descriptive analytics provide supply chain visibility, thus facilitating both internal and external real time data analysis. Descriptive analytics is concerned with the average supplier lead time and the amount of investment in an inventory to keep an operation running efficiently. Predictive analytics are the supply chain analytics that utilize future scenarious and business implications such as disruptions in the supply chain and inventory issues in order to eliminate any risk and advise about future decisions. Prescriptive analytics are supply chain analytics that solve problems and advise about collaborations to attain efficiency. Business solutions provided by prescriptive supply chain analytics come both internally within an organization and with a logistics or manufacturing partner along the supply chain.

Prescriptive analytics is adopted to create an inventory management system or to streamline lead times as well as to devise a lean supply chain. In addition, prescriptive analytics utilizes operational capabilities. Supply chain analytics adds value by facilitating a clear and efficient picture of a business operation. Thus, predictive analytics is adopted for forecasting future demand. Previous order data is combined with real time market analysis for dynamic demand forecasts at predicting changes in the demand landscape. Inventory management plays a key role in this concept. Predictive analytics forecasts future trends, whereas prescriptive analytics analyzes processes to identify factors of waste or any inefficiencies. Predictive analytics accommodates logistics and supply chain businesses to meet increasing demands. The trend towards anticipatory logistics is accepted among industry decision makers. Data driven decision making is crucial for supply chain activities to attain quality through efficiency. Predictive models use historical and transactional data to identify patterns for risks and opportunities within a particular set of conditions. Predictive analytics promotes cross functional collaboration by creating visible and shareable forecasts. Logistics management oversees and coordinates key aspects of logistics in relation to a business. It collaborates with the sales and customer service teams for supplies to be stocked and delivered to customers in a timely manner. Implement and maintain operating policies on logistics and product procedures. Optimize and streamline inventory related demand and supply chain activities. Strategically plan and manage logistics, warehouse, transportation and customer services. Coordinate transportation activities, storage of goods, managing information from point of origin up to delivery at destination, orchestrate transport operations and arrange for additional services as per order. Manage and track shipments in transit.

Execute logistics plans to forward consignments in order to reach their destinations according to schedule. Review freight rates and any additional transportation costs to keep operating costs under control. Sustain service quality throughout the logistics processes. Direct, streamline and manage the entire order cycle. Liaise and negotiate with suppliers, manufacturers, retailers and consumers. Keep track of quality, quantity, stock levels, delivery times, transport costs and efficiency. Resolve arising issues. Supervise, coach and train warehouse staff. Meet cost, productivity, accuracy and timeliness objectives. Maintain metrics, analyze data to assess performance and accommodate optimization. Manage outbound and inbound shipments. Coordinate truck drivers, trailers, freight and transports. Integrate IT systems to manage timings, costs and stock levels. Analyze data to assess performance, detect logistical bottlenecks and devise plans for any enhancements accordingly. Negotiate and agree contracts. Plan for and negotiate technical constraints. Prepare relevant freight and customs documents. Liaise with and manage staff and respective working hours. Track stock and manage waste. Ensure relevant health and safety precautions are met both for staff and workplace. Supply chain management is concerned with a businesses supply chain comprising procurement, vendor relations, production, logistics and distribution. It devises and executes plans for managing supply chain processes for production and operations. It manages demand forecasting, supply planning and procurement to accommodate that resource requirements are met. Communicates with parties involved regarding business needs to secure resources needed and thus to satisfy customer demand and management as well as ensure delivery. Identifies and drives continuous enhancement opportunities to streamline processes and optimize accuracy as well as efficiency throughout operations.

Collaborates with departments and stakeholders to identify and attain resources needed to facilitate an effective supply chain. Implements performance metrics for measurement, comparison and evaluation of factors affecting the supply chain. Manages inventories of supplies in the business, at sites and in the factory. Maintains required quantity of supplies to streamline production. Analyzes inventories and procedures, suggests enhancements to optimize the efficiency of a supply chain and profitability of a business. Devises policies to increase efficiency throughout the supply chain, while facilitating quality and safety. Implements subsequent changes to processes. Assesses optimal shipment and transportation routes with emphasis to consolidation of warehousing and distribution. Machine Learning is an advanced technology due to its various capabilities that is crucial for business efficiency in terms of accurate forecasts and identification of specific patterns. Machine Learning is applicable in setting up computers to imitate human thought processes, which entails generating solutions in case of large amounts of data. Machine Learning relates to two sets of data, which is training data and test data. Training data is adopted to configure a computer in order to review the data correlations, while creating a mathematical model afterwards. Test data is a dataset required to be analyzed as it includes unknowns that need to be understood for further evaluation. The supply chain is becoming complex. Even with the support of latest technologies making their way to the industry, businesses need to be aware of risks and thus understand how to act appropriately. Supply chain management encounters challenges such as fluctuation in demand, inadequate inventory planning, backlogs of orders, uncertainties in logistics, communication gaps within the supply chain and shortages in supply. Hence, advanced technologies such as Machine Learning as a branch of Artificial Intelligence are the solution in addressing business issues

throughout industries. Machine Learning is versatile, but not a general purpose solution that can be adopted for every data. Instead, Machine Learning effectively works in cooperation with data scientists and business leaders for accurate data selection and validation. Implementing AI and Machine Learning algorithms in the supply chain for a business proves to be effective in transport management. Firms acquire transport management systems for freight savings and competitive service, while assessing the impact on performance. Machine Learning accommodates a business the opportunity to access insightful data and explore solutions to enhance efficiency and performance. Following questions arise within this context: Are service level standards met in terms of delivery and schedule? Which lanes are associated with delays in the service? What are the challenges that cause delays to shipments? This entails a business to find solutions to potential conflicts as Machine Learning promotes high service levels and an understanding for shippers on how to deliver results effectively. Machine Learning provides inventory management to predict demand. It is adopted in warehouse optimization to detect any excess and shortages of stocks in storage. This is instrumental in preventing any sales losses. Accommodating Machine Learning in supply chain planning streamlines decision making processes by applying AI algorithms from analyzing datasets, which in turn facilitates planning functionality and thus producing accurate results and making it a reliable tool for the business. Machine Learning powered demand prediction algorithm utilizes an enhanced demand forecasting function. By analyzing customer behaviour tendencies, businesses match buying habits and thus shape the customer portfolio accordingly. With predictive analytics in the supply chain, a business monitors manufacturing and logistics in order to prevent any supply shortages and excesses.

It is eminent to integrate Machine Learning for route optimization to analyze routes for streamlining deliveries of merchandise. This prevents any delays in deliveries and thus enhances customer satisfaction. Through the analysis of production data, Machine Learning accommodates precautions to hedge against conditional changes, which is adopted in recruitment, retention, employee development and performance management. Automation of the processes in gathering data, making inferences and generating insights are implemented when Machine Learning is utilized in workforce management for enhancing efficiency. Machine Learning algorithms play a key role in providing end-to-end visibility from suppliers and manufacturers to stores and customers and thus eliminating any conflicts as technology identifies inefficiencies that require immediate response. There is a significant amount of data involved with a network of IoT sensors in combination with advanced analytics. With the assistance of Machine Learning hidden interconnections between various processes in the supply chain are discovered accordingly. Customer service is instrumental for the efficiency of any business, because it is an eminent factor in retaining customers and increasing profits. An increase in customer retention of five percent can lead to an increase in profit of at least twentyfive percent. With its power to analyze numerous files, businesses invest in Machine Learning to detect any threats in order to get rid of them before they wreak any havoc. Supply chain is getting complex as the requirement for visibility, agility, flexibility, risk mitigation, technological innovation and expectation from customers for excellence constitute a challenge for supply chain management, which needs to oversee aspects of a business, that is from internal capacities and capabilities up to external supply chain operations and thus understand how these serve evolving business models.

Supply chain management needs to deal with complexity, understand markets and work effectively throughout multiple cultures and nationalities. Supply chain management needs to understand end-to-end supply chain processes. In a manufacturing supply chain, it would refer to all processes from initial sourcing of raw materials through to product manufacture and value-adding activities that take place up to the point where the product reaches its destination. It is about collaboration amongst key partners that understand their value offerings and thus align on purpose and objectives. Supply chain management needs to recognize the reality and understand the capabilities, needs and objectives of each key supply chain agent, so that supply chain processes continue efficiently. Experience, skill and knowledge throughout the supply chain is eminent. Supply chain managers spend certain periods of their working lifes in manufacturing, logistics, distribution and retail, which in fact make them competent to understand and oversee an entire supply chain, identify any risks and address issues as they arise. To foresee market changes and adapt to new business models is crucial. Leading the changes with visibility and identify them coming in order to act and adapt is vital. Being able to change as well as utilize staff and capabilities to adapt and innovate is instrumental. Being critical, questioning, provoking different thinking as well as assessing markets and opportunities are fundamental features. Both the internal as well as external supply chains need to be monitored accordingly. Collaboration throughout the value chain is a core driver in creating a cross organizational platform for sharing supply chain insights and fostering innovation as well as the development of new and existing operational models or methods. Hence collaboration is a key factor of operational processes, which leverages a competitive advantage over other manufacturing firms.

Any changes, disruptions, alterations and variations are factors of instability and daily elements of a global supply chain. On the other hand, change also means turnover in personnel, variances in availability of raw materials, access to adequate facilities or production sites or any other physical aspects of supply chain management. Planning for changes by creating comprehensive safety nets to address any changes, that could impact production and supply logistics is another matter of concern. Transformational change is required to utilize digital capabilities throughout a business. A digital supply chain eliminates the trade off between costs and customer satisfaction. Demand forecasting and planning is the process of making estimations about customer demand over a defined period, adopting data and various other information. Demand forecasting provides businesses valuable information about their potential in their market and other markets, so that supply chain management makes informed decisions about pricing, business growth strategies and market potential. Demand forecasting is instrumental for products and target markets, inventory holding costs, customer satisfaction, supply chain management and profitability. Demand planning is a supply chain management process of forecasting the demand for products to ensure that they are delivered and satisfy customers. The objective is to attain a balance between sufficient inventory levels to meet customer needs without having a surplus. Supply Chain Planning and Optimization: Supply chain planning and optimization adopts technology and resources such as Blockchain, AI and IoT in order to enhance efficiency and performance in a supply chain network. An effective supply chain accommodates business efficiency and responsiveness, so that customers get what they need, when and where they want it, in a way that is both profitable for the business and contributes to supply chain sustainability.

A supply chain design relates to the network design processes concerning location of warehouse facilities and product flows between such facilities and strategic objectives like demand forecasting, establishing supplies as well as the planning and scheduling of manufacturing operations. Supply chain planning is concerned with the creation of a strategic supply chain deployment plan, inventory planning and the coordination of assets to streamline the delivery of goods, services and information from supplier to customers, thus balancing supply and demand. Supply chain execution relates to the execution oriented applications and systems such as warehouse and inventory management, transportation management, global trade management and other execution applications relating real time decision support, supply chain visibility and order management systems. Supply planning and optimization involves inventory optimization, which is the practice of having the right inventory to meet target service levels, while tying up only a minimum amount of capital in inventory, which requires to account for both supply and demand volatility. Inventory optimization constitutes the next stage of inventory management for warehouse and supply chain. Production and capacity planning relates to a production environment, where capacity is a combination of the capabilities and limitations of equipment and machinery, staff and their skills, management and logistics. Logistics begins with getting adequate supplies into facilities, moving them through the production process and then getting them to the customers. Monitoring capacity, managing it and effectively planning the output capacity is beneficial for a business. Besides optimizing utilization of available resources, it increases the efficiency of operations. Managing capacity increases output when needed, while eliminating the risk of excess inventory. All of this reduces costs, while accommodating the ability to respond to spikes in demand.

Sales and operations planning is an aspect of supply chain planning, of which objective is the creation of a unified, consensus based business plan. It draws input from an organization's key functional areas, including sales, marketing, manufacturing, distribution and finance. Cross functional collaboration results in plans that stakeholders understand and are committed to supporting. Logistics analytics is concerned with analytical procedures to analyze and coordinate logistics and supply chain procedures and thus to accommodate efficiency in a timely and cost effective manner. Shipments with their weights and sizes, contact details and returns generate a significant amount of data that need to be managed. The trend towards anticipatory logistics is accepted among industry decision makers, because data driven decision making is crucial to supply chain activities and big data enhances quality and efficiency. Predictive models adopt data to identify patterns for risks and opportunities within a particular set of conditions to guide decision makers and thus anticipate future events. Both shippers and suppliers have visibility into a shipment's lifecycle. Predictive analytics creates new supply chain visibility by assisting logistics service providers to prevent any delays with shipments through monitoring devices, enhancing visibility of shipment status and location, minimizing costs related to late or off schedule shipments and creating new business opportunities by meeting visibility requirements. By adopting predictive solutions to generate supply and demand forecasts, it is possible to make the right operational decisions in a proactive manner, which accommodates rebalancing of assets throughout a logistics network at a minimal cost. Logistics service providers depend on transportation management systems to track and manage shipments and lead times. By means of predictive analytics, a transport management system (TMS) predicts future disruptions before they occur and thus assists a logistics firm to manage its operations proactively,

rather than reactively. Hence, predictive analytics provides visibility into seasonal buying patterns and forecasts to support suppliers for making informed decisions. Utilizing predictive analytics models to detect unexpected conditions enables to adjust shipments and inventory in response to specific and time sensitive changes in routes and inventory. Predictive maintenance is a cost effective solution gained by implementing predictive AI algorithms. Suppliers and logistics services providers detect failure patterns and anomalies, learn from such patterns and then predict failures of machine components so that they can be replaced before they even fail, which enhances the supply chain's efficiency and optimizes equipment uptime. Last-mile delivery is an area in which predictive analytics creates an impact relating solutions for route optimization, robotics and anticipatory shipping, real and quantifiable enhancements on sustainability. Advanced transport analytics adopts data to advise about planning, managing transport networks, enhancing operations, minimizing costs and serving travellers. Scalable databases leverage geospatial analysis to act on real time transport data in order to streamline freight movement and routing, optimize inventory management and capacity, fleet operations, enhance customer experience and safety, eliminate environmental impact, optimize transit schedules by predicting the impact of maintenance, congestion and accidents. Fleet managers integrate data from vehicles, scanners, sensors, personnel, live weather and traffic reports to manage and deploy assets. Machine Learning and advanced analytics accommodate insights to optimize delivery routes in real time, which assists in data analytics driven fleet and personnel schedulling, route planning, re-routing and supply chain optimization, thus saving time, minimizing fuel and overtime costs as well as enhancing customer experience. Businesses need real time insights into logistics and transport systems to view and track deliveries for stores.

They also require inventory systems that react swiftly to data feeds for instant routing and inventory decisions. Customer sentiment data assists in inventory management and supply chain decisions to manage workforce, supply chain, inventory, overstocks and spoilage as well as prevent stockouts. Fast, actionable and intelligent data utilizes a long-term relationship with the customer. Data processing time is streamlined, data visualized and patterns analyzed to reveal knowledge and insights. Businesses get tracking visibility and notifications of deliveries, to provide their agents with just-in-time insights. By simultaneously ingesting, analyzing and visualizing real-time sensor data from aircrafts, cars, trucks and ships and thus combining that with static data such as maintenance schedules, logistics organizations gain insight into the condition of their vehicles and assets. Predictive analytics on data in real-time assists businesses to detect patterns, anomalies, deteriorating efficiency and future failures. Hence, they proactively maintain equipment, enhance fleet effectiveness and prevent downtime. Businesses throughout industries are reliant on fleet management for uninterrupted flow of merchandise and services. Organizations adopt real-time fleet analytics to simultaneously ingest, enrich, explore, analyze, visualize and act on data instantly to make critical decisions, as well as explore efficiencies, eliminate risk, enhance productivity, minimize cost, generate revenue and create customer experience. Order processing relates to the process of fulfilling the order of customers, which consists of picking, packing and loading the consignment onto a carrier. The carrier then effects the transport of the goods to the customer’s place. Order processing fulfilment involves each individual step that a business takes from the initial point of receiving an order to getting that order to the customer. Each organization responds to and ultimately accomplishes an order.

The first step to order fulfilment is taking an order, which is effected by phone, in person, EDI or through an online process. Once an order has been submitted and received, it is processed and the product retrieved from the inventory for fulfilment. This involves of first making sure that the order is entered into the correct online system. During the processing, customers are provided with the status of their online order. They can see that the online order has been placed and is in the processing stage. The customer is given an approximate arrival date for the product they ordered and they see updates throughout the entire delivery process and thus are accommodated with an optimal delivery order customer experience. Picking methodologies comprise batch picking, cluster picking and zone picking. Weighing, packing and labelling ordered items are all part of the item and inventory preparation process that occurs before an actual shipping process takes place. These are detailed operations and services that come together during this phase. A system is in place to track a consignment throughout the processes from shipping up to the delivery to a customer. Customers receive tracking information for their orders to enable them to control the order fulfilment process and the time it takes to receive their ordered items. A delivery item that is returned needs to be inspected for any damage and returned to the inventory. Return policies are posted on e-commerce websites.

Data and Methodology

Supply chains consist of all the steps involved in getting a product from a raw material into the hands of the customer. A supply chain begins with the vendors or suppliers who provide raw materials. Next in the supply chain is manufacturing, which is the process of converting the raw materials into products that are ready to sell. The final step is distribution, which involves various intermediaries such as wholesalers, retailers, distributors and e-commerce. The stages within a supply chain are referred to as upstream or downstream. Upstream operations are those in which the materials flow into the organization. Downstream operations are those in which materials flow from the organization to the customers. The term logistics is adopted when talking about a business's supply chain. Inbound logistics is related to upstream activities and involves the process of the product before manufacturing, which comprises receiving materials, storing them as well as the manufacturing processes required to produce the product. Outbound logistics is related to downstream operations involving the movement of merchandise once it is a finished product. There are three types of flows that proceed in a supply chain, which are flow of materials and goods, flow of funds as well as flow of information. There is a forward flow of materials and goods from higher tier suppliers (upstream) to the end-consumer (downstream). In the case of any returns, there is then a reverse flow of products in the opposite direction. The flow of money takes place from downstream to upstream, when for example, a retailer pays to the distributor for the merchandise received from them. The flow of information proceeds both ways in the supply chain. Hence, businesses share information with each other to enhance efficiency.

In a supply chain there are key aspects requiring management accordingly, which involve supply management, internal operations management, distribution management as well as general management. Supply management relates to purchasing and managing the suppliers as well as respective relationships with them. Internal operations involve production management, inventory management and human resources management. Distribution management deals with customer relationships. When designing a supply chain, efficiency and responsiveness are among key aspects that require consideration. Sustainability in a supply chain is the practice of minimizing environmental impact and optimizing social and economic values, within the full life cycle of a service or product, that is from sourcing raw materials to delivery of the final product. This involves eliminating waste, enhancing energy efficiency and adopting renewable resources. Ensuring that suppliers and agents adhere to ethical standards and labour laws is crucial. Sustainability standards are the starting point for supply chain sustainability transformation. By employing standards to evaluate a supply chain, action is taken in choosing and validating suppliers, identifying gaps, updating the supply chain strategy for being sustainable. Sustainability standards are aligned with globally accepted standards. Supply chain planning relates to measurement and understanding of the stresses that exist within a network. Any changes in a supply chain entail procurement decisions and induce price fluctuations. Supply chain stability embraces the overall volume of goods shipped, the speed at which goods reach their destination, the cost of transporting goods from the source to the ultimate destination and the variability of these factors. Key trends with an impact on global supply chain management are the digital supply chain, Big Data and analytics, Artificial Intelligence, investment in systems and people, visibility, traceability and location intelligence, disruption and

risk management, agility and resilience, cybersecurity, green and circular supply chains, geopolitics and the deglobalization of supply chains. The 5-PL Logistics System: Globalization has created an expansion in international trade, resulting in an increase relating the flow of merchandise worldwide. Consequently, logistics has gained importance. The 5-PL logistics system is a comprehensive service provided by logistics providers whereby the customer outsources its entire supply chain management. The levels of party logistics, which span from 1 to 5, encompass various services such as raw material management, warehousing, transportation, distribution, implementation of connected information systems and various logistics consulting services. The market for 5-PL solutions is expected to grow in the years ahead due to increased automation in industries and the expansion of the e-commerce sector. A 5-PL service provider is responsible for evaluating logistics service providers who develop, coordinate and execute logistics solutions on behalf of clients, specifically in relation to information systems. The 5-PL represents the final stage in the evolution of logistics for a company and is crucial to achieving maturity in the supply chain, as it brings together the expertise of major logistics players 3-PL with that of consulting firms and IT service providers, 4-PL and 5-PL. The 5-PL provider is dedicated to customer oriented services that prioritize satisfaction, such as consulting, auditing, assistance and customized solutions. They utilize advanced automated and intelligent systems to optimize the performance of the transport supply chain. 5-PLs specialize in logistics engineering services, specifically in the development of automated systems that enhance supply chain efficiency. These systems comprise order management, inventory management and shipping management tools. 5-PL logistics services providers not only provide end-to-end logistics solutions for client companies, but design the logistics process from scratch.

They leverage dedicated information systems and incorporate an engineering aspect to their services. 5-PL services providers source and provide all the services that a company requires while also negotiating the most favourable contracts. 5-PL services providers utilize cutting-edge technologies such as Order Management Systems, Warehouse Management Systems, robotics and AI to build and operate effective supply chain networks. These advanced technologies enable them to guarantee precise optimization of every step in the supply chain, resulting in accurate and streamlined operations. Fast and accurate deliveries are achievable through efficient supply chains. When supply chains are optimized and streamlined, they are able to operate at efficiency, resulting in fast and accurate deliveries to customers. Efficient supply chain management accommodates customers with time and resources in order to concentrate on their core business activities. The fifth-party logistics (5-PL) model has emerged as an effective solution to manage supply chain complexities. By partnering with a 5-PL services provider, businesses can have their logistical needs handled from start to finish, which comprises identifying requirements, planning, executing and managing the supply chain network. A 5-PL services provider manages complexities such as customs rules and regulations, freeing up time for businesses to concentrate on selling. Logistics services providers have adapted to meet changing demands of businesses and consumers alike. As e-commerce has surged, logistics providers have continued to streamline their services, culminating in the development of the cutting-edge 5-PL model. Initially, logistics services providers offered basic transportation services, moving goods from one place to another. Over time, they added warehousing services to their offerings, allowing businesses to store their inventory and manage their supply chains efficiently.

The next step was the 3-PL (third-party logistics), which offered comprehensive logistics services such as order fulfilment and distribution. As the complexity of logistics grew, the 4-PL (fourth-party logistics) emerged. 4-PL providers acted as logistics consultants, managing and optimizing the entire supply chain for their clients. The 5-PL takes things even further, offering end-to-end supply chain management that includes not only logistics services but also engineering and IT services. With their advanced technology platforms and engineering expertise, 5-PL services providers are well positioned to manage the complex and fast moving world of modern e-commerce. A First Party Logistics (1-PL) services provider is responsible solely for the transportation of goods. These logistics services providers are considered as the first level of outsourcing for a firm's logistics operations. Customers subcontract the regular transport of their goods to a 1-PL services provider, who utilizes a carrier on the basis of either the shipment's total volume, gross weight or the distance of transport covered, which is suitable for companies that do not prioritize transport as their major business in their operations. 1-PL logistics services providers operate at the first level of the logistics subcontracting chain, thus concentrating on transport. These services providers have their own fleet of vehicles and offer transport services at the local, regional and national level. Their responsibility is limited to transport merchandise to consignees, service providers or agents. 1-PL services providers serve only within a certain geographic area, while others specialize in transporting a particular kind of commodity. Assigning a 1-PL logistics services provider relates to firms, whose major business is other than transport. Second Party Logistics (2-PL) services providers offer transport equipment, infrastructure, storage and warehousing services.

This level of outsourcing involves more activities than 1-PL services providers, who essentially are carriers with the capability for storage and warehousing. The compensation for 2-PL services relates on the cost per pallet for transport and storage. Second Party Logistics (2-PL) services involve the outsourcing of a wider range of logistics activities than 1-PL, such as storage and warehousing and thus requires a logistics service provider with storage capabilities. Payment for 2-PL services follows a cost-per-pallet model, including transport and storage costs. Therefore, a logistics services provider offering 2-PL needs to be a carrier with storage capabilities to meet the needs of their customers. Third Party Logistics (3-PL) services providers are responsible for overseeing and coordinating transportation operations, along with identifying suitable agents for 2-PL logistics services. A 4-PL logistics services provider offers an advanced level of outsourcing of a firm's logistics activities, thus exceeding the scope of 1-PL, 2-PL and 3-PL logistics services. They develop and implement comprehensive solutions for the entire logistics process or specific parts. The 4-PL logistics services provider organizes, manages and streamlines the logistics chain to attain efficiency, thus not just delivery but throughout the entire process. They remain adaptable to changing market conditions and customer requirements. This level of logistics services outsourcing requires a high degree of competence, skill, expertise and knowledge in the logistics industry. A 4-PL logistics services provider takes responsibility of assigning and overseeing logistics service providers, who perform certain tasks, thus ensuring that the best price-to-quality ratio is maintained. This task is streamlined by information and communication technology (ICT) and the Internet for seamless collaboration between the parties involved in the logistics chain.

A 4-PL logistics services provider is responsible for coordinating and optimizing the logistics activities of the relevant parties in a firm's supply chain, which requires leveraging their resources, capabilities and technologies alongside other service providers to create and manage supply chains. Businesses with complex or international supply chains benefit from partnering with a 4-PL services provider. The emergence of 5-PL logistics services is due to e-commerce and information technology (IT). The Internet plays a crucial role in enabling this type of logistics services. 5-PL logistics services providers facilitate online payments, making transactions more convenient for customers and offer a call centre service for feedback and suggestions, which enables customers to provide valuable input that assists to enhance service quality. The concept of 5-PL logistics services reflects the growing need for sophisticated supply chain operations and logistics related implementations. As technology continues to advance, it is expected that 5-PL logistics services will become prevalent and offer benefits to businesses and consumers alike. The first industrial revolution took place in the eighteenth century with the introduction of mechanical production machines powered by water and steam. The second industrial revolution started at the beginning of the twentieth century with mass production powered by electric energy. The third industrial revolution came in the 1970s with production automation using electronics, computers and information technology. The 4th industrial revolution began in the early of this millennium with autonomous production using Cyber-Physical Systems (CPS), Internet of Things (IoT) and Internet of Services (IoS). This digitization not only enables the integration of processes and systems across firms and industrial sectors, but also creates new business models and value generation opportunities.

Digitalization, visibility, connectivity and interoperability are the essence of Industry 4.0. With rapid growth of Industry 4.0 technologies, inventory systems and optimization are being transformed to a new state. With advancements in analytics and Machine Learning (ML), companies now proactively examine transactional data in real-time and use the insights derived to plug the gaps and revenue losses. From driverless transport to intelligent containers, smart warehousing and smart ports, all these are incorporated from the fourth industrial revolution. Industry 4.0 has been defined by its use of machine-to-machine communication and Internet-of-Things (IoT) devices to accommodate factories that operate like smart homes. An array of appliances and machines are utilized to communicate in order to facilitate a cohesive and transparent network. There is a new concept in logistics, which is known as Logistics 4.0. Logistics 4.0 is the planning, through the use of enabling technologies, of the storage flow of raw materials, semi-finished and finished products in order to meet customer requirements. It makes use of smart containers, vehicles, pallets and transport systems in order to create a fully networked supply stream that offers supply chain managers, shippers and freight forwarders the visibility to route transport and perform logistics tasks in an optimal way. Logistics 4.0 has the objective of creating a transparent network, in which all the systems involved can expose relevant data. People, machines, sensors and devices are able to share the data necessary for the supply chain to operate efficiently, which utilizes end-to-end visibility and control, which assists management decisions by providing in advance insights and forecast about any delays, breakdowns and interruptions to the stakeholders involved in the supply chain. Smart shipments and transports, such as smart pallets and containers transmit relevant shipment data and thus it becomes possible to obtain end-to-end visibility of the occurrence of events such as

slowdowns, failures and interruptions, which mitigates the impact on processes. AI starts from the analysis of large amounts of data related to logistics processes and thus supports the analysis of these processes by finding anomalies, making forecasts with respect to events that may occur and then provides recommendation for resolutions. The advantage of adopting Blockchain derives from the fact of being able to create a decentralized network facilitating automation, traceability and security. Logistics 4.0 has the potential to pave the way to the creation of an advanced and safe system that connects the parties that take place in the supply chain and where value is given by data flow that involves logistics operations and opens doors to collaboration and experimentation among businesses to create new services and innovative solutions. A digital supply chain is a set of processes that adopts advanced technologies and insights into the functions of each stakeholder along the chain to let each participant make decisions about the sources of materials they need, the demand for their products and the relationship in between. Digital supply chain integration strategies harness innovations such as Big Data, the Internet of Things, Artificial Intelligence, Machine Learning and Augmented Reality in order to streamline operations, increase production uptime, lower parts acquisition costs. By digitizing and collecting data from a business, supply chain integration creates a single version of a firm’s performance, that is sales, efficiency, cost allocations and profit centres. Dashboards that process and present this information empower decision makers to pinpoint production bottlenecks, transform maintenance activities from reactive to preventative and predictive, identify parts redundancies and consolidate sources of supply. Cutting-edge information technology embraces Internet of Things (IoT), Cloud Computing, Blockchain, Big Data, Artificial Intelligence, Predictive Analytics, Machine Learning, Virtual Reality, Augmented

Reality, Voice Activated Technology, Robotics, 3D-Printing, Additive Manufacturing, Cyber Security, Autonomous Vehicles, Drones and Software as a Service (SaaS). Integration of Lean and Six Sigma utilizes enhancement. In this management approach, traditionally the lean methodology is adopted first to remove the waste in a process. Later, the Six Sigma tools are utilized to enhance process variations. These two methods go hand in hand and their combination assists to streamline processes with high quality and results. It optimizes bottom-line profits and supports to meet business objectives. Lean and Six Sigma both signify a system for enhancement of business processes. While Lean focuses on waste reduction and elimination, process simplification, value stream mapping and reduce rework in the value chain, Six Sigma focuses on setting up a set of systems and people aligned processes to optimize the quality in outcome to customers. Lean increases process efficiency by focusing on speed and cost optimization, which ensures the stability of processes. Six Sigma focuses on quality enhancement by reducing variation as well as adopting statistical sources and methods. Six Sigma employs the DMAIC model, that is Define, Measure, Analyze, Improve and Control for existing products and services, while DFSS, that is Design for Six Sigma, is deployed for new product and service design. Lean Six Sigma has evolved as a convergence from both of these methodologies, which blends both of the methodologies and thereby creates a pragmatic approach to process enhancement within a business. It is characterized by a multi-pronged approach to problem-solving, thereby fixing value chain blockages and ensuring consistent delivery of quality products and solutions. The advantage of a blended Lean Six Sigma approach is that it relates to customer goals and caters for optimizing efficiencies. Lean Six Sigma enhances supply chain efficiency in the following areas.

Perfect Order Fulfilment is measured in the percentage of orders meeting delivery performance with complete and accurate documentation and no delivery damage. Six Sigma methodology streamlines order fulfilment by identifying bottlenecks, such as outdated planning processes and inefficient execution systems. Lean is adopted to target areas of waste and thus enhance performance. Reduce Order Fulfilment Cycle Time. A Lean Six Sigma review of a firm's order fulfilment system detects any weaknesses that need to be addressed. Enhancement requires system integration, automated picking, automated shipping planning, automated shipment verification and eliminated paperwork. Increase Supply Chain Flexibility. Supply chain performance requires fast response to changes in supply and demand through the ups and downs of business cycles, as well as during recessions. Businesses with agile supply chains are tailored to the needs of the customer. Establishing Critical to Quality (CTQ) customer requirements in the define phase of Six Sigma entails customer focus and thus flexibility into their supply chains. Zero Errors. Any supply chain that is losing efficiency because of a high error rate in the system is a prime candidate for lean enhancement. The mistake proofing lean approach prevents failures by forcing the user to do a task one way. Implementing the 5-S Lean method. Sort Out, Set in Order, Shine, Standardize and Sustain eliminates errors that interrupt the supply chain efficiency by providing a clean, safe, efficient and uncluttered environment. Zero Waste. Lean methodology was created to eliminate waste, which is defined as activities that do not add any value to the product or customer. Lean accommodates supply chains to function efficiently by targeting and eliminating non-value added processing. Over-production. Producing more ahead of demand as the result of a speculative forecast results in high inventory costs.

Transport. Movement of materials adds to production cost and cycle time. Lean seeks to eliminate unnecessary transport. Non-value added processing. Poor production facility layouts cause additional work that adds no value to the product. Lean simplifies production to make the supply chain operate more efficiently. Increased Revenue. Organizations that use Lean Six Sigma to make their supply chains operate more efficiently are able to provide a consistent service level to their customers. Dependable service leads to satisfied customers, which gives organizations more pricing power and higher revenues. Organizations that apply Lean Six Sigma principles to their supply chains attain a competitive advantage, increase revenue and enhance employee morale. Six Sigma Phase. In this stage, project objectives are outlined. A project charter is a crucial component of this phase, which is a blueprint document for a six sigma project. A typical charter contains the following information: Business case, problem statement, goal statement, project scope, resources, timelines, estimated benefits. Measure. Process variables are measured at this stage. Process data is collected. The baseline is obtained and metrics are compared with final performance metrics. Process capability is obtained. Analyze. Root cause analysis is done at this stage. Complex analysis tools are utilized to identify the root causes of a defect. Tools like histograms, Pareto charts, fishbone diagrams are adopted to identify the root causes. Hypotheses tests are conducted to verify and validate root causes. Enhance. Once the final root causes are identified, solutions need to be formed to enhance the process. Steps to identify. Test and implement the solutions to eliminate root causes are part of this stage. Simulation studies, design of experiments and prototyping are some of the techniques used here to streamline process performance. Control. After implementing the solutions, the performance need to be recorded.

A control system must be in place to monitor the performance post improvement. A response plan is developed to handle solution failure. Process standardization through control plans and work instructions is typically a part of this phase. Control charts show the process performance. Project benefits are discussed and verified against the estimated one. The main purpose of this phase is to hold the gains. Lean Methodology. Waste. Definition of waste. Defects. The efforts involved inspecting for and fixing errors, mistakes through reworks. Overproduction. Producing more products or services that the customer needs or downstream process can use. Waiting. Idle time created when material, information, people or equipment are not ready, which entails high job set up time in manufacturing and excessively high data processing time in the service industry. Non–Utilized Talent. Not adequately leveraging personnel's skills and creativity. Employee empowerment counter waste. Transport. Moving products, equipment, material, information or people from one place to another without any value addition to the final product or service. Inventory. Unnecessary and unwanted stocking or storage of information and material. Motion. Unnecessary movement of people or machines that takes time and uses energy, which entails fatigue to staff. Extra Processing. Process steps that do not add any value to the product or service including doing work beyond a customer's specification. Big Data is useful. There are different ways where Big Data is adapted to optimize supply chains. Big Data makes supply chains efficient and optimized to increase their bottom line. Planning and Scheduling. Planning and Scheduling are a crucial part of any supply chain. Big Data optimizes a process. Big Data creates end-to-end visibility and quality decision support is facilitated. Enhanced Responsiveness. Enhanced Demand Planning. Big Data predicts and determines what items are going to be needed as it pertains to demand.

It visualizes what items are selling well and what items are not selling well. Order Optimization. Supply Chain Execution in Real-Time. Orders and supply chain are visualized in real-time. Items are tracked and status of shipment is checked. Inventory Planning and Development. Big Data accommodates to plan, forecasts and optimizes inventory. Consumption rates and inventory levels of the supply chain are traced accordingly. Replenishment Planning. Supply chain management is a system of tracking the life cycle of commodities as they move in and out of an organization, from manufacturing to distribution and returns. Among the factors of supply chain management are procurement, sourcing of raw materials, manufacturing and production, shipping and receiving, storing and fulfilling, managing returns and exchanges as well as optimizing the strategy for supply chain profitability. The functional objective of supply chain management is effectiveness, that is functioning efficiently. Supply chain management facilitates effective processes throughout an organization's supply chain, that is procurement and production, receiving and storing, picking and packing, fulfilment and ultimately reverse logistics. An optimized performance creates significant financial gains for an enterprise. As operations become productive, cost efficiency is achieved accordingly, that is money, time and energy. Effective transparency, demand forecasting and management reduce the drawbacks in a supply chain, such as redundancies, overstocks and stockouts. Furthermore, supply chain management enables to create reliable and valuable relationships with external partners of the supply chain. As vendors and suppliers recognize the on-time nature of reorders, customers appreciate that the products they purchase are always available, that is in stock and ready to be delivered.

Features of Supply Chain Management. Customer Needs. Increasing customer requirements lead to supply chains that have to innovate and optimize each phase of the process to meet those expectations. Streamlining the supply chain is of importance for businesses that intend to continue to meet and exceed customer value. Developing Demand Forecasts. Ascertaining market signals and performing demand planning across the supply chain accommodates consistency in forecasts and effective resource allocation. Flexibility need to be integrated into supply chain activities in order to manage any adverse conditions that may arise during time. Demand and Supply Management. In order to plan a supply chain strategy, demand forecasting need to be adopted accordingly. The objective is to ascertain the agility and responsiveness of a firm to fluctuations in demand. Hence, demand volatility necessitates demand planning and inventory streamlining. Certain functions need to be adapted respectively, which are optimal maintenance of stock levels, even under volatile market conditions, coordination of distribution networks, optimization of warehousing and inventory cost efficiencies, making data based decisions about sales and marketing, scaling up and expanding into new markets, being agile and responsive towards fluctuations in market conditions, maintaining budgets, bookkeeping and accounting and reduction of safety stock. These functions utilize an efficient supply chain, optimized sales and effectiveness in customer satisfaction. A Complex Global Network. As the business world developes, so does the supply chain too. Hence, the supply chain becomes increasingly complex over time. To meet on demand service and overcome competition, firms relocate production to countries with low labour costs. It has become the norm for organizations to cooperate in a complex global network with producers, suppliers, distributors, logistics services providers and other agents across the world.

Firms also have to deal with multi-channel sales and fulfilment. On the one hand, e-commerce and mobile enabled consumers create a significant impact in the increase of revenues and on the other hand, companies need to ensure that their supply chain operations run optimally. Supply Chain Analytics. Analytics features are synchronized with data in real-time. Insights are wide ranging and rapid. Latency is eradicated from the supply chain. Productive analytics functions customer oriented, acting quickly with accuracy and integrity. Organizations require supply chain analytical solutions that utilize fast analysis of extensive quantities of data from various sources and unstructured natural language based data. Supply chain analytics are expected to forecast various supply chain criteria such as external forces like climate, political unrest, labour and regulations. With the support of AI (Artificial Intelligence) supply chain software identifies volatile process flows and forecast requirements for necessary changes. Sales and Inventory Forecasting. Sales and inventory forecasting is paramount to the success of any organization. By adopting a sales and inventory forecasting plan, it is possible to refer to sales data and relevant information for upcoming volumes. It will be possible to foresee how much stock is required and when to order to meet consumer requirements. The objective is the prevention of stockouts and overstocks to control holding costs and avoid poor customer experience. To utilize a forecast, certain aspects need to be taken into account respectively, which are previous sales data, market research and advertising expenditure, product types and categories per channel, sales to new customers versus repeat customers, how long the firm plans to sell each product, how long it takes from placing a purchase order to being ready for sale. Risk Management. Risk is inevitable, however, it is crucial to have a proactive plan in place.

An adequate risk management strategy is significant in mitigating the risk of damage. Moreover, a plan may also assist in turning adverse effects into positive experiences for both the firm and its customers. Supply chain management is concerned with planning, creating, receiving and fulfilling products and services. Furthermore, it comprises monitoring, maintaining and optimizing a range of internal and cooperative procedures. Segmentation. Consumers need to be segmented according to their service requirements. In order to serve each segment efficiently and profitably the supply chain has to be adapted respectively. Thus, consumers' purchasing habits need to be observed, that is how often they purchase and so on. In this way, it will be possible to be prepared for the provision of value as required. Customization. The logistics network has to be designed according to service requirements and profitability of each segment. When consumers have been segmented, relevant procedures have to be designed to meet their individual requirements. This has to be effected, while attaining optimal profitability for the business. Differentiating Products. Product differentiation is vital in order to determine real demand metrics. To fulfil individual customer orders, customized products have to be created and provided accordingly. Product Development and Commercialization. Products are manufactured according to consumers' needs. Hence, consumers have a need for products that provide the required value. However, individual consumers' needs differ in various ways. Thus, it is essential to ensure that products meet consumers' requirements. Therefore, specific factors need to be considered accordingly, which are making modifications to products, changing the branding and packaging, providing bulk orders and discounts and creating additional features for future product versions. Competitive Advantage. Supply chains used to be concentrated on network construction, warehouse location and distribution management.

Supply chains meanwhile have reached a stage where optimization is key to creating competitive advantage and protecting the brand through effective implementations and real-time decision making. Supply Chain Design. It defines network design procedures such as the location of warehouse facilities and product flow within the supply network, strategic targeting like demand forecasting, facilitating supplies as well as the planning and scheduling of production procedures. Supply Chain Planning. It comprises the utilization of a strategic supply chain schedule, stock control, the management of assets to streamline the delivery of cargoes, services and information from agent to consumer while balancing supply and demand. Supply Chain Execution. It concentrates on the execution oriented implementations and systems like warehouse and stock management, transport organization, global trade management and various other systems like real time decision support, supply chain visibility and order management systems. Supply chains are complex networks, however this entails technological dividends, especially when Blockchain is related to AI and IoT. The Planning Process. The first stage of supply chain management is about planning. The plan and strategy are devised to meet and satisfy customer expectations and requirements. Furthermore, maximum profit and cost-effectiveness are other crucial aspects that need to be considered. Among other key factors are resources for creating products and services that also have to be taken into account in the planning process. Developing and Sourcing. The developing phase comes after the planning stage. Efficient relationships with suppliers of raw materials and commodities are established and developed that are necessary for manufacturing. Suppliers are assigned and shipping, delivery as well as terms of payment are determined accordingly. Process monitoring and control are then integrated respectively.

Operations are combined for the handling of goods and services that involve receiving and inspecting consignments, forwarding to the production plant and confirming supplier payments. Supplier Relationships. Supplier relationship management is a significant aspect of the supply chain. Hence, suppliers play a crucial role for businesses, thus they are paramount business partners. An effective relationship with suppliers streamlines the firm's supply chain, optimizes the proficiency in delivering value to customers and enhances competence. Efficiency in relationships with suppliers is eminent. Transparency in Communication. Requirements and expectations need to be communicated explicitly. Hence, the supplier tailors their service respectively. The Significance of a Contractual Agreement. A contractual agreement constitutes the fundamental basis for an effective business relationship. A Plan for Cooperation. An effective relationship is facilitated through a systematic and strategic engagement with the supplier to attain a mutually beneficial outcome for both parties. Connectivity. The ability to access unstructured data from the social media and structured data from the IoT (Internet of Things) and conventional data obtained from ERP (Enterprise Resource Planning) and B2B (Business-to-Business) integration. The Establishment of Cooperation. The establishment of cooperation with agents through the integration of cloud based business networks to utilize multi business cooperation and synergy. Visibility. This entails instant stock control monitoring and continuous availability of data. Agility. In the supply chain network fastness is vital in response towards change. These are consumer demands, competition and supply chain disruptions. Thus, supply chain networks have to be agile and resilient in order to proceed in front of the competition.

Integrating Technology. To assist decision making and maintaining visibility over products, services and information, a supply chain wide technology strategy has to be developed. For this, relevant agents of the supply chain need to have access to respective information at any time. Operational Costs. To facilitate a lean production and distribution system, does not necessitate to save money at the cost of productivity or quality. An emphasis on cost reduction may induce detrimental effects on a firm's supply chain. It can influence a company's agility towards demand and supply shifts adversely. Fluctuations in the manufacturing plan may lead to unexpected results in the supply chain. Thus, it is crucial to be flexible in order to be responsive to deviations relative to orders, demand and product. It is imperative to keep costs at the lowest possible level. While doing this, it is significant to trim out unnecessary expenditures without creating any risk to efficiency and effectiveness. Reducing Costs. The cost of owning materials and services has to be reduced. Thus, sources of supply have to be managed strategically. Sustainability. Supply chains create remarkable environmental and social influences. The consumer expects that goods are produced in a sustainable and ethical way, adopting renewable and low impact extraction techniques. Production. The manufacturing of products constitutes the third stage of supply chain management. Goods are designed, manufactured, examined, packed and prepared for despatch. The process of operations is tabulated on a progress schedule accordingly. Quality control, manufacturing output and labour performance are executed and inspected during progress of procedures. The Manufacturing Process. Manufacturing process management is concerned with the utilization of the manufacturing of products in an economical and profitable way.

Manufacturing process management comprises the knowledge about how much of a given product is to be prodcued at a given point in time and manufacturing sufficiently so as not to encounter any risk in wasting storage space and spoilage. Adequate manufacturing process management mitigates the risk of stock outs due to insufficient orders. Manufacturing process management deals with the initial stages of the supply chain and anything that occurs during these phases affects subsequent links of the supply chain. Order Management. This entails standardisation of pricing, provision of quotes, monitoring orders and coordinating returns. Order Fulfilment. Order management and fulfilment is a vital element of an effective supply chain. The efficiency of order fulfilment is determined by the utilization of information technology. Automation constitutes a significant factor in e-commerce, since consumers place their orders at the touch of a button. Therefore, information about incoming orders has to be adequately transmitted to relevant links in the supply chain to fulfil tasks effectively. Hence, a strategic plan needs to be in place for picking, packing and fulfilment procedures. The streamlining of order fulfilment accommodates crucial benefits for the supply chain, which are economizing on financial and other resources, mitigating the rate of failures, facilitating real time information across relevant channels, providing visibility to customers as well as individualization of customer experience. Delivery. The following stage is about delivery. The goods are despatched to the consumer. Customer orders are received and the delivery is executed. Relevant agents collaborate respectively, a network is established, carriers are assigned and invoicing is effected for payment. Lead Time. A shipment can get delayed, damaged or lost due to unforeseen incidents. Drawbacks are prevented through shortening and maintaining consistent lead times. Return Shipments. Return shipments constitute the final stage of supply chain management.

Defective and damaged articles are returned to the producer. Customer service for enquiries and complaints is established. An agile and flexible method for accepting damaged and defective items is facilitated relating the return process. Customer Relationship. To extend a company's customer portfolio, it is imperative to create consistent relationships with customers. Successful customer relationship relates to communication and trust. The firm has to be visible with information that might have an influence on the customer. Relating trust, the customer needs to have confidence towards the company they do business with. It is vital to keep the customer advised relative to their order status. The firm has to ensure that the customer receives their order as required. Hence, supply chain procedures have an impact on the customer. Thus, they have to be streamlined consistently to provide a satisfactory experience to the customer. Hence, the customer is the centre point of supply chain operations. Customer Service. Customer service management constitutes a vital function in customer relationship management. Thus, customer service management comprises streamlining communication and provision of information to the customer, provision of technical and operational support to the customer as per request and optimization of procedures to keep technical and operational issues at a minimum level. Therefore, supply chain management and customer service management are two significant components that complement each other, since any arising issue affects both areas. Thus, when supply chains are in place, customer service issues evolve inevitably. Reporting and Analytics. This includes the evaluation of motives in procedures in order to predict future demand and supply. Analyzing Performance. To reach the consumer effectively, efficiently and economically, channel spanning performance measures have to be adopted in order to gauge the firm's overall competency.

In this way it becomes possible to determine areas that need to be enhanced in addition to areas where supply chain procedures are operating efficiently. It is significant to understand that each function is equally vital to a well rounded supply chain. There are persistently supply chain related drawbacks that need to be overcome during time. Managing challenges requires to be prepared at all times. Cyber Awareness. The supply chain protects its network from cyber intrusions and hacks. Cognitive Dexterity. The AI (Artificial Intelligence) system functions as the supply chain's control device by collating, cooperating, guiding decisions and actions across the chain. Therefore, this makes the supply chain automated and self-learning. Intelligence. This relates to the enhancement of composable data and AI utilities for real time intelligence. Stock Control. This is about knowing precisely where inventory is located across the supply chain network. The supply chain used to focus on investments relative to construction, that is stipulating trucking costs, the strategic location of the warehouse and the utilization of inventory in the right place and at the right time. This was manageable because the business world proceeded slow and change evolved accordingly. Then IT (Information Technology) has led to AI (Artificial Intelligence), Cloud, Blockchain and IoT (Internet of Things) that created a new environment. Consumer demand has unfolded. Sustainability has become eminent. Therefore, SCM (Supply Chain Management) requires answers in real time. In a dynamic and complex global network actions evolve rapidly. Traffical impediments, natural disaster impacts and customer complaints induce an impact upon business prestige and image. This ultimately causes uncertainty about how to deal with emerging issues. It does not matter how well the plan is because predictions might mislead. Supply chain optimization utilizes supply chains to be on schedule even when circumstances are complicated.

These can be economic uncertainties that may cause unexpected disruptions or natural advers conditions that impact the distribution process or a medical disaster that urges organizations to reconstitute their global business operations. Supply chain optimization utilizes sustainable processes despite complications. Supply chain optimization adopts IT to facilitate optimal management. Thus, it is the key factor of being competitive. Organizations have effective visibility throughout the supply chain and optimal decision making skills in real time in their business and across the entire supply chain network. Globalization, IT and customers have an impact upon organizations and their supply chain management. IT is leading supply chains to self-regulate and make adequate decisions. In turn, human capabilities develop and augment. IT like AI-powered control devices provide significant insights into productivity and coordinate operations across the supply chain ecosystem. They are capable of predicting variances in logistics costs and efficiency before they emerge and have insights into whether automation is able to provide scale advantages. Silos. In this instance supply chains cannot gain any insight they need due to siloed data and therefore are not capable of facilitating end-to-end visibility. This in turn impacts their function in meeting customer requirements. The solution for informational silos is a supply chain that is supported by interconnected IT. The Supply Chain Network. The efficiency and effectiveness of a supply chain network has an impact on how fast goods are delivered to the end user. A supply chain network encompasses various locations and departments, processes and resources. A supply chain network needs to be in balance with a firm’s objectives. A supply chain network is concerned with the movement and flow of both commodities and information. It also involves the assessment of programmes and strategies that has an impact on the supply chain.

For efficient supply chain operations a supply chain network records interactions, traces developments and sets objectives. Firms collect quantitative measures that support their strategic decision making by analysis of their supply chain network. The supply chain network embraces plant locations and capacity, pricing level fluctuations, distribution locations and capacity, supplier and product aspects, inventory management and customer service. Companies integrate supply chain network designs to enhance profits and create a difference to stay ahead of the competition. The supply chain needs to be resilient in order to create changes because new procedures lead to infrastructure changes. Factors that have an impact on the supply chain involve acquisitions, reducing the carbon footprint, changes in the customer base, consolidation and deconsolidation, divestment, expansion, growth, inventory, mergers, new markets, new product lines, sourcing and strategic planning. A supply chain network constructs the current supply chain and its future state that comprise enhancements to reduce costs, save time and deliver merchandise to consumers faster. Resource and location constraints are managed in the way of new warehouses and suppliers. Supply chain network designers deliver the services in a cost-efficient way. Supply chain networks support decision makers in ascertaining optimal sourcing and inventory processes to meet demand. A supply chain network utilizes efficiencies, meets customer requirements and facilitates low costs through an efficient network. Accommodating a supply chain network provides certain advantages. Supply chain costs are reduced, services are enhanced and return on investment is raised. It requires diligent evaluation in relation to cost of changes versus the advantages of attaining them. It is worthwhile to devise a supply chain that supports growth in a sustainable way. A smart supply chain network reduces the total cost of the supply chain by eliminating inefficiencies.

A well organized operation process facilitates visibility that optimizes service level efficiency. Supply chain networks utilize a reusable mechanism for commercial changes and constitute a template for evaluating various operating models. Supply chain network enhancement enables organizations to benchmark current and future state concepts with one another. By adopting various scenarious, potential concepts assist planners in designing strategic objectives and realistic metrics. Hence, supply chain network development enables organizations to proceed with confidence upon implementing a definite plan. Before making a decision on a supply chain network improvement plan, its feasibility has to be tested on the basis of specific criteria. By adopting detailed analysis and scenario based testing, individual functions and their performance can be recognized accordingly. The optimal concept is then determined in order to attain the objectives. Systems may be developed that comprise the cost of the current supply chain as a benchmark of comparison to the new concept. The following stage is to create scenarious to evaluate the new network whether it achieves the objectives as expected. A thorough evaluation of the concept and supply chain reveals deviations in the distribution channels and other supply chain functions. The Components of a Supply Chain Network. Risk Analysis. Having a view on changes to the supply chain relating to unforeseen fluctuations and disruptions. Problem Solving. Proceeding according to a certain method assists in determining effective channels to consumers based on multi channel e-commerce or marketplace locations. Project Mentoring. Facilitating a project infrastructure relating to internal resources assists in determining the optimal software for the supply chain. Streamlining the supply chain network enables organizations to effectively view their current supply chain and to create ideas for optimization to be integrated accordingly.

An efficient supply chain involves various organizations with different objectives, cooperating well to attain the same goals. A supply chain needs to benefit from integration so that companies can gain an insight into each other's strategies. Hence, an incorporated supply chain functions in unison to attain mutual goals through integrated business procedures and consistent sharing of information. Organizations that adopt supply chain integration take advantage in optimizing procedural effectiveness and reducing costs. The objective of supply chain incorporation involves external suppliers collaborating well with an organization's internal departments. Thus, vendors need to have network access and the ability to operate as a separate department. There are certain components of the supply chain that are integrated to enhance a firm's procedural effectiveness and optimize its profit margins. The initial phases of the supply chain are crucial. Determining a vendor involves various aspects. Assigning suppliers and producers entails the provision of commodities in a timely manner. The delivery of merchandise at the accurate time and place is an imperative factor of the supply chain. Warehousing and shipping need to be incorporated accordingly. Effectiveness in logistics is in relation to meeting deadlines and managing expenditure. The integration of logistics to a business involves working towards an organized, fast and adequate warehousing system. Ensuring the delivery of the right goods to the right place and at the right time is essential. This is realized effectively through an integrated supply chain. There are various aspects why supply chain integration is advantageous for an enterprise. It facilitates corporations with a single channel of contact for outsourced operations. It becomes complex and time consuming for a company with connections to various vendors to manage the links and maintain efficient operations. Thus, through supply chain integration cooperating with a single firm creates an advantage.

Working through a single point of contact for the supply and logistics procedures within the supply chain is an effective method of optimizing a company's operational efficiency. Integration enhances the knowledge and resources that are available at each phase of the supply chain. Knowing how to manage potential drawbacks before they arise enables a firm to cope with complex issues. Through an integrated supply chain, the workflow is coordinated to maintain current stock without incurring any loss or failing to meet requirements. Optimized efficiency is realized as a result of supply chain integration that has a significant outcome for a business which is a high profit margin. Supply chain integration reduces costs when outsourcing is adopted to various suppliers. A successfully integrated supply chain reduces occurrences that could be costly for a firm. Hence, supply chain integration is an effective method of attaining profitable procedures for a business. Therefore, collaborating with competent suppliers is crucial to ensure that the supply chain integration process performs efficiently. When a firm extends its supply chain horizontally, it means that it has acquired similar businesses in the same field of the supply chain. For instance, when a retailer opens new outlets at other places. Vertically integrated supply chain means when a company acquires various elements of its supply chain, like suppliers, distributors or retail locations. For example, a producer acquiring a factory, so that they can manufacture and source a crucial component at a low rate. Supply chain optimization streamlines the industrial and production supply chain by adopting automation, strategies and other methods. Supply chain optimization involves the adoption of predictive methods that analyze scenarious and assist in the planning for future events. For optimal outcomes proactive organizations implement supply chain optimization across the supply chain, that is from raw materials to the production plant through to distribution of products to end users.

Localized optimization streamlines a single aspect without using other elements of the supply chain. Global optimization examines the supply chain for opportunities to attain optimization without raising costs. Through global optimization it becomes possible to balance moving components and recognize how each change influences anything else. It is possible to avoid problems that may arise due to tracing items through the supply chain and maintaining an adequate record up to the stage of delivery to the customer. Data driven supply chain facilitates end to end transparency on the flow of information, services and merchandise, from procurement to production and delivery to the consumer. The Objectives of Supply Chain Management. Supply chain partners collaborate to create resource productivity, establish standardized procedures, eliminate repetitive processes and diminish stock volumes. The minimization of supply chain costs is crucial, especially at times of financial upheavals. Cost efficiency is as vital as value creation for the customer. Meeting and exceeding customer expectations are key components of supply chain management in order to attain customer satisfaction. Variety of product range, customized products and services, availability of stock and instant order fulfilment are further essentials of supply chain management. SCM contributes to the financial efficiency of organizations. SCM creates diversification, increases sales and expands into new markets in order to enhance competitive advantage. SCM is an organization that facilitates efficient and cost-effective operations. SCM includes functions that are designed to transform raw materials into final products. Supply chain management plays a vital role, because organizations are reliant on efficient supply chain operations. SCM is concerned with an effective movement of materials, products and relevant information among suppliers, organizations, retailers and consumers.

SCM deals with three different categories of flow and movement, that is, material flow, information and data flow as well as monetary flow. Information Flow. Interactive communication among involved parties is fundamental. Distributors, dealers, retailers and logistics services providers play a key role in the information network. Monetary Flow. The invoice is raised by the producer and respective payment is effected by the customer. Material Flow. A seamless flow of merchandise is essential. For this, warehouses, distributors, dealers and retailers play a vital role in the network. Time management is crucial for timeliness and optimal lead times. These three flows play a crucial role for an efficient performance of supply chain management. Economic fluctuations and instability, volatile fuel prices, customer requirements, globalization, developing technologies, evolving transport industry and labour regulations have all an impact on supply chain management. Material movement, capacity, frequency, seasonality, product features and handling instructions need to be taken into consideration for optimal logistics transactions. On the other hand, warehousing constitutes another vital factor. The organization of warehousing operations requires competent engineering and architecture, IT (Information Technology), human resources and dexterity. SKUs (Stock Keeping Unit) are coordinated by WMS (Warehouse Management System). Functionality is eminent for the performance and optimization of receiving, storing and shipping operations. Moreover, after-sales service is a vital component of supply chain management. It includes the provision of spare parts and components, installments and upgrading, inspection, maintenance, repairs, training, coaching, mentoring and consulting services. An effective strategic management requires the consideration of factors like production and manufacturing, plant and warehouse location.

Supply chain performance is measured relative to two criteria, that is, the first criteria relates to qualitative measures like customer satisfaction and product quality. The second criteria relates to quantitative measures like order-to-delivery timeliness, supply chain agility, resilience, resource implementation and delivery efficiency. Within the quantitative measures there are two further types. These are the financial and non-financial measures. The non-financial measures include cycle period, customer service standard, stock levels, resource implementation, competitiveness, resilience and quality. In the cycle period or lead time are various types, which are supply chain process lead time, order-to-delivery lead time, distribution lead time, order management lead time, supplier lead time, manufacturing lead time and logistics lead time. The lead time at each stage of the supply chain management is vital due to the organization of stock capacity, relevant costs and customer service standards. The efficiency in customer service is related to the increase of the order fill rate, the decrease in the stock out rate and the decline in back order levels. In supply chain management stock is categorized in four different inventory groups. These are raw materials, work-in-process (unfinished and semi-finished commodities), finished goods stock, spare parts and components. In supply chain management varieties of resources are utilized, that is, different types of resources are deployed for certain operations, which are production resources. These are capital equipments like machinery, material handlers, devices and tools. Warehousing resources comprise warehouses, automated storage and retrieval utilities. Logistics resources include various types of transport modes like roadfreight, airfreight, seafreight and railfreight. Human resources embrace labour as well as operational and administrative personnel. Financial resources relate to working capital and stocks.

The objective in the utilization of resources relates to the organization of assets and resources in order to optimize customer service quality, the management of stock and reducing lead times. Financial measures relate to the optimization of the revenue through attaining low costs in the supply chain. There exists a persistent volatility in prices relative to stock, forwarding services, utilities, transactions, IT, commodities and labour. The financial performance of a supply chain is attained through considering the cost of raw materials, revenue from sales, operational costs like handling, production and assembling, storage costs, forwarding costs, cost of perishable goods, cost of delayed deliveries, cost of credits for late deliveries from suppliers, cost of returned goods from customers and cost of credits relating returned goods to suppliers. Financial performance criteria are entities like operation based costing, stock based costing, forwarding based costing and inter-organizational financial transactions. Supply Chain Analytics. Analytics generate an impact relative to quality, delivery, customer value and satisfaction as well as profitability. It has the potential to create data-driven decisions on the pattern of a summary of trusted data with a visualization in form of graphs and charts. Supply chains create large amounts of data. Supply chain analytics create a sense of the data, revealing patterns and producing insights. Supply Chain Optimization. Supply chain optimization creates optimum use of IT (Information Technology) and resources like Blockchain, AI (Artificial Intelligence) and IoT (Internet of Things) to streamline efficiency and productivity in the supply chain network. It is about optimizing the supply chain system relative to efficiency and performance to provide customers what they need, when and where they need it, while leading the business to be profitable and sustainable. An organizations supply chain is a vital commercial process that is dominant for an effective customer value.

An optimally performing supply chain facilitates commercial efficiency and agility, so that customers obtain what they need, when and where they require it, in such a way that is profitable for the business and enhances the supply chain consistency. The Advantages of Supply Chain Optimization. Enhanced Quality. Supply chain optimization utilizes quality management through streamlining the supply chain from raw materials through to delivery to the end user. The emphasis on quality reduces waste and focuses on meeting KPIs relating to each phase of the process. Each element of the supply chain planning is crucial. Optimization enhances the visibility and improves transparency through efficiency at each stage. Adequate data means accurate forecasts that optimizes the supply chain planning process across locations and facilities. The traditional supply chain used to be focused on warehouse location and the distribution of goods. Meanwhile, supply chain optimization has to attain competitive advantage and represent the brand effectively. Hence, real-time decision support and tools that drive the process have to be maintained accordingly. Digital supply chains raise the data relating to relevant suppliers. Supply chain optimization means that there is transparency about who makes late deliveries and who delivers substandard quality articles. Thus, suppliers have to be held accountable in order to manage supplier relations effectively. There are environmental and social influences upon supply chain optimization. Manufacturing products in a sustainable and ethical manner influences the marketability with conscious consumers. In order to optimize the supply chain, certain components relating to the business may need to be outsourced respectively. Through outsourcing logistics, procurement and customer service, a business accommodates the opportunity to focus onto their main processes of competence. It is imperative to maintain the communication with retailers and suppliers, since this is an essential part of the supply chain optimization.

Also the transparency in communication with producers and sellers prevents confusion and facilitates goodwill. A crucial factor of supply chain optimization is the utilization of distribution channels and suppliers. It is vital to maintain the emphasis on technology. In the retail sector, mobile technology utilizes direct sales through marketing and the provision of information to consumers. Furthermore, the internet media facilitates the establishment of community and authority through internet channels. This in turn constitutes an opportunity in tracing trends that might have an influence on product development. Technologies offer location based discounts and effective ranking among target demographics. An adequate management software implements networks that is adopted by departments in order to gain relevant data across the organization. Through an appropriate software, it is possible to combine a firm's inventory, financial records, sales and marketing in one place. Through the utilization of data in a centralized repository, the management software enables to retrieve reports, data and security requirements. A multichannel method requires an agile supply chain that is mobile friendly, widespread and reachable by consumers on their smart devices and the places they are in order to effect the purchasing process. Supply chain optimization needs to integrate inventory management that updates respective networks in real time so that consumers can obtain accurate information in relation to product availability. The use of a multi channel network facilitates simplicity in accurately forecasting future sales and product demand. Centralizing data facilitates transparency about consumer demand and their shopping behaviour because up to date and real time data enables effective navigation of crucial decisions. Artificial Intelligence and Business Intelligence systems constitute significance in the strategy of supply chain optimization.

Supply chain metrics indicate on which to ascertain the overall condition of an organization's supply system. Thus, there are metrics that facilitate data transparency through the analysis of KPIs (Key Performance Indicator). Hence, metrics constitute a vital aspect relating to KPIs that accommodate visibility over facets of an organization's supply chain. Types of Metrics. Perfect Order Rate is the Goal. The perfect order rate relates to incidents that can occur during the picking process. It indicates to issues like despatching the wrong product, damaged articles or late deliveries. Firms adopt the perfect order rate metric to ensure that the order picking is effected appropriately. Order Fill Rate. The order fill rate is concerned with the percentage of a customer's order that is filled upon order placement. The order fill rate is a metric that indicates the ability to meet instantly consumer demand. A low fill rate may influence customer satisfaction while indicating drawbacks in the delivery process of a supply chain. On-Time Shipping Rates Mean Happy Customers. Customer order fulfilment needs to be effected seamlessly for a company to succeed. On-time shipping rates indicate to meeting customer expectation relative to on-time delivery. This metric identifies the percentage of goods ordered that are delivered as per ordered distribution date. Keeping the Customer Happy – Customer Order Cycle Time. This is to measure the time it requires customers to receive their consignment. It is measured in days from the point of order delivery. Rapid and reliable distribution is vital to consistent customer satisfaction. This key metric detects the drawback and utilizes rectification to facilitate rapid delivery. Moving Goods Quickly. Inventory Velocity. Inventory is the stock available for instant purchasing by a customer. When measuring inventory velocity, management pays attention to individual sales items with the purpose of tracing the amount of inventory as it relates to consumer demand.

Attaining equilibrium in demand and supply is the objective of a supply chain and inventory velocity is a method to determine whether that goal is achieved. Inventory Turnover. This is a ratio that indicates the number of times a firm has cycled through inventory sold and replaced the merchandise on the shelf within a certain time. This metric identifies how much of a firm's inventory is held in the warehouse before it is sold. An efficient supply chain is indicated by a high inventory turnover. Cash to Cash Cycle and Company Success. Cash is vital for a firm meeting its invoice obligations to its suppliers and receiving sales revenue from its customers. GMROI / Gross Margin Return on Investment. Each item of inventory brought into an enterprise constitutes a cost above the price of purchase. Shipping, storage and labour to get the goods on the shelves add to the overall cost of a product. The ability to gain a profit over the respective costs constitutes the expected level of supply chain economics, that is a satisfactory return on investment. GMROI identifies a firm's ability whether it can transform that inventory into cash effectively. Three aspects relate to the transformation of the method merchandise gets to the market. The global economy has expanded the chain. Furthermore, technology has transformed the possible in terms of tracing and ascertaining each factor of the supply chain. Consumers require high reliability in relation to sustainable economics on the basis of social justice and environmental awareness. A modern supply chain constitutes a high standard of technology and business. Various elements contribute to a modern supply chain. As the global economy expands, so does the modern supply chain. It is a complex network of resources, manufacturers, warehouses and retailers that manage the process to bring a commodity to the market. It is made up of high technology and informed by an instantaneous communication network.

Such an immediacy utilizes company decision makers to give a response in real-time against threats towards their supply chain in order to eliminate drawbacks and process stoppages that create an impact on customer deliveries. Technological innovations like supply chain automation and digitalization constitute a crucial factor to the effectiveness of a supply chain. Satellite technology, accurate weather forecasting and communication facilitate an opportunity to monitor a consignment from despatch up to arrival at its destination. Moreover, technology has created changes in inventory management. Optimization in software technology made it possible for organizations to monitor resources and inventory. Streamlined labour management, data capture and real-time decision making capabilities constitute an advantage of technology on the supply chain. Optimized technology provides firms with a system that facilitates transparency and access to each agent of the supply chain, thus reducing risks in case of upcoming drawbacks that would disrupt a well processing supply chain. Modern organizations need to meet the requirements of consumers.

Hence, consumers expect a variety of value added services like same or next day delivery. In order to meet these requirements, firms need to be nimble in the way they act, pack and distribute products to their customers. Digitalization has created a fast transformation from mechanized inventory controls to computer enhanced inventory management. Meanwhile, sophisticated methods make it possible to meet customer expectations. There are certain factors that influence the digitalization of business. Those factors facilitate various advantages such as inventory management, warehouse management, brand protection and delivery infrastructure. The expansion of digital selling facilities has changed the way people do business. The outcome is e-commerce. The digitalization of the shopping experience creates a versatility of alternatives for consumers looking for an alternative purchasing experience. The extension of digitalization of the modern supply chain makes it possible for merchandise to arrive rapidly at the market and the consumer. Nimble distribution and flexibility towards changing market conditions is crucial to the modern supply chain. Digitalization enables an organization and its management to attain those objectives. Supply chain automation facilitates a continuous flow of supplies. Hence, automation constitutes a vital factor across the supply chain. Warehouse automation reduces the rate of manual picking of orders respectively. Warehouse efficiency and reliability accommodates a continuous flow of supplies across the supply chain relative to voice based information technology and automated storage and retrieval systems. In an automated warehouse environment inventory control is effected efficiently which in turn reduces operating costs and utilizes orders to be rapidly fulfilled and despatched to the customers.

Blockchain technology facilitates organizations the use of information to utilize transparency and traceability of the supply chain. Through visibility, firms use the information to identify any flaws in the supply chain and thus take precautions against supply disruptions. The modern supply chain is consistently developing in order to meet dynamic market conditions. The leverage of technological advances optimizes the supply chain and the globalization of business contributes to it as well. The enhancement of technology evolves with the future of the supply chain. Newly developed devices and technology are crucial for the survival in a dynamic market. Furthermore, the use of AMRs (Autonomous Mobile Robot) is adopted by organizations. Hence, firms automate and optimize picking and packing procedures. Thus, robotic technology is taking over operations across the supply chain. Nevertheless, there is a necessity for human supervision in specific phases of operations. New devices and technologies that are adopted by supply chain partners become integrated with each other. The WMSs (Warehouse Management System) perform a wide range of functions, while AMRs (Autonomous Mobile Robot) handle supplementary tasks. In terms of functionality, supply chain partners need to adopt both methods in order to streamline their operations. Supply chain partners make use of integrated, specific technology, hence efficiency and productivity across the operations is achieved. The more effective a firm’s pre-fulfilment operations are, the faster the end user receives their consignment. Organizations adopt rapid prototyping with 3D and digital printing in an effort to reduce lead times and optimize supply chain agility. This in turn induces companies to capitalize on trends and events through developing new products and launching them to the market accordingly.

Organizations serve a range of customers, each having their own needs and requirements. Thus, integrating segment based and account based varieties to the supply chain operations is eminent. DIO/Days Inventory Outstanding. Days Inventory Outstanding is a metric that identifies how many slow days a company is suffering. DIO identifies the number of days on average that a firm sells an item of inventory. The rate varies according to the sector. It is a useful management method to measure whether inventory is lying idle. For example, a retail store is likely to have a lower DIO than a firm that sells industrial machinery. DSO/Days Sales Outstanding. The Days Sales Outstanding metric shows how effective a firm's credit and collection performance is at the collection of outstanding debts. Developing Segments on Specific Features of Customers. Geographic Location. The closeness to sourcing and manufacturing. Product Related Needs. The individualization of a product. Order Related Needs. The product quantity that is required by the customer. The point of time a product is expected by the customer. The interval of time a product is needed by the customer. Organizations customize their supply chain operations according to their customers' requirements. Through the investment in localized forward fulfilment centres and the cooperation with logistics service providers, firms are capable to utilize rapid fulfilment for their customers. Having too much of inventory means a waste of capital on rent, maintenance and other related costs to storage space. Having too little storage space means that available inventory cannot be sold easily and there is no space for goods that can be sold. The solution is to have the adquate capacity of inventory space in order to fulfil customers' requirements. Hence, visibility in terms of inventory related information is vital to supply chain partners. In order to benefit from inventory and storage assets it is crucial to maintain both a macro and also a micro perspective view over inventory data relating to current and forecasted

stock. While operations run efficiently, it is crucial that operational costs are kept as low as possible. Through technology it is possible to optimize the working capital. Modern technology enables to gain wide ranging information about supply chain performance. This allows to identify redundancies, drawbacks and other pitfalls across the supply chain. Technology also facilitates streamlining of working capital that enables dynamic decision making on real time basis. It also accommodates insight into trends, forecasts and incidents, which makes it simple to determine efficient and cost effective methods. In order to enhance strong and mutually beneficial relationships with suppliers, a supply chain needs to establish and maintain clear lines of communication and cooperate to support the firm's missions. Blockchain technology accommodates a positive impact on supply chain operations in three vital areas which are the provision of accurate and relevant information on a consistent basis, facilitating transparency of data and information for the stakeholders, ensuring security of information that is comprised by the Blockchain. Capacity crunch is the definition of the increase in demand that stretches a company's capability to store and despatch orders. When capacity crunch influences a firm the following instances may arise: Do nothing and fail to serve customers. Invest more capital into logistics related resources. In any case, the customers will pay more. According to the first case, the firm does not have the capacity to effect any delivery to customers. In the second case, the firm has to raise its rates to compensate the increased cost of doing business. Hence, evolving technology and innovative methods entail supply chain optimization. Thus, rising efficiency accommodates high levels of capacity to fulfil customer orders. Streamlining each phase of the supply chain leads to efficiency in capacity performance and keeping costs at the lowest possible level.

Hence, it will be possible for the enterprise to keep fulfilling their customers' requirements. Supply chain procedures are not only about fulfilling orders. The data, information and knowledge that flows across operations is used to the advantage of the company overall. The use of supply chain related data and information is virtually limitless. Common practices encompass the use of demand forecasting to plan for marketing promotions. Streamlining sales activities through concentration on fulfilment speed and performance data. Considering the financial effect of a transformation to supply chain operations, that could be for the better or the worse. The bullwhip effect, which is also defined as the whiplash or the whipsaw effect in a supply chain relates to the phenomenon of evolving fluctuations in the inventory due to shifts in consumer demand. Inventory fluctuates in increasingly bigger waves due to inconsistent consumer demand that functions like a whip. The impact of the whip affects the supplier of raw materials, causing them to experience a shift in demand due to changing consumer demand. The bullwhip effect is induced by certain factors. Common causes of the bullwhip effect include the following aspects: Order Batching. Placing frequent orders in small amounts induces less of a bullwhip effect than placing large orders less frequently. With order batching a retailer places orders to their supplier once per month rather than frequent times during a month which entails an inconsistent demand in relation to the supplier over time. Lead Time. Lead time is the period between when an order is placed and when it is delivered. Failing to consider the lead time when managing inventory may induce an overstocking of goods which leads to a shift in supplier demand over time that constitutes the bullwhip effect. Sales and Price Discounts. Sales and discounts create a boom and bust cycle.

A great amount of merchandise moves during the promotional stage which is followed by lower levels of sales. This cycle proceeds through the supply chain, leading to a bullwhip effect. A bullwhip effect may evolve in a supply chain and constitutes the reason of the boom and bust cycles which may cause detrimental effects on a firm. Thus, it requires to be managed proactively. Like fluctuations in demand, the bullwhip effect has its consequences to an enterprise which may be too much stock on hand, causing an increase in inventory holding costs, unfulfilled orders, poor customer service, lost revenue, misguided demand forecasts and missed production schedules. Supply chains experience the bullwhip effect to a certain extent of which the consequences are an outcome of long term mismanagement. Nevertheless, there are methods to mitigate and control the influences. Decreasing the number of suppliers and tiers in the supply chain facilitates an effective communication throughout the links and mitigates fluctuations that cause the bullwhip effect. Adopting automation technology creates cohesiveness among the links of the supply chain and consolidates the communication network. Monitoring stock levels, orders and demand with inventory management software enables accurate ordering from suppliers, thus mitigating the bullwhip effect. The maintenance of a steady pricing strategy during market fluctuations reduces the bullwhip effect through encouragement of a constant flow of consumer demand. Encouraging orders according to consumer demand instead of bulk discounts mitigates the bullwhip effect. In order to avoid a bullwhip effect, it is vital to enhance the flow of information along the supply chain and streamline supply chain operations. Thus, to prevent the bullwhip effect and consolidate customers, forward thinking and establishing value pricing relating to less expensive merchandise is crucial.

As demand patterns shift and the bullwhip effect is persistent, demand forecasting constitutes a vital function. Hence, forecasting methods, relating to future scenario planning instead of statistical data relating to the past, rise in importance. The supply chain is significant for organizations to manage. There is a range of supply chain tools that assist firms to operate effectively. By adopting such tools as a part of operations, organizations will be able to reduce costs, eliminate waste and streamline the supply chain. Following tools facilitate firms efficiency in their operations and enhance performance. Order processing is a vital function of the supply chain and one that companies streamline efficiently. From the initial procedures and invoicing of sales right across to order fulfilment is streamlined with the appropriate devices. Order processing devices automate operations by adopting technology to obtain information and trace the inventory and order catalogue in one location. Through adopting freight handling supply management devices, an enterprise can simplify its distribution process. Freight is complex and there are ways it can be streamlined. There is no single norm that fits every solution for firms that intend to streamline their cargo handling processes. There are two objectives that are significant. The first is to reduce the cost it takes to fulfil each order and the second is to diminish the amount of time that customers wait to receive their consignments. An effective warehouse distribution and an efficient coordination of shipments will solve the issues. The first stage of an effective supplier relationship management is to determine relevant suppliers. This can be a vendor that supplies material which is not available elsewhere or a supplier that it’s fulfilment time is lower than others. The next step is to establish a method of how relationships with the suppliers are to be managed. Supplier relationship management may be streamlined in various ways. Long term and mutually advantageous relationships need to be maintained.

For example, supplier management software is an effective method for optimizing relationship with a supplier. This system utilizes a database that both parties can update as and when it is needed. Forecasting demand is data based and relates to analysis of previous demand for a product or service in an identical or similar market environment. Demand forecasting enables firms to make decisions in relation to market conditions that lead to increased profit margins. For example, forecasting the demand for a seasonal commodity enables firms to order adequate amounts from their suppliers instead of ordering excessive amounts. Diligent planning is fundamental for organizations to reduce their costs and eliminate losses and thus make profit and achieve efficiency. Working with experts optimizes ones business and supply chain and increases profit and efficiency. Supply chain software provides firms up to date transparency and control over inventory, which are bills of materials, purchase orders, stock takes and adjustments. Tracing package sizes, batches and expiry dates throughout various warehouses and manufacturing sites is also applicable. Forecast Errors. Decisions about each phase of the supply chain are made according to demand forecasts. Errors in forecasting induce false calculations that become influential. The Advantages of Supply Chain Management. Supply Chain Management optimizes customer relationships and customer services. Furthermore, it utilizes efficient delivery systems for products and services with a short timeliness. It enhances productivity and business operations. Moreover, it reduces warehouse and transport costs and decreases direct and indirect expenses. It performs the shipment of right cargoes to the right place, at the right time and creates efficiency in stock control. In addition, it guides organizations in adapting to the challenges of globallization, financial volatility and meeting customer expectations.

It leads companies in eliminating waste, reducing expenditure and attaining economies of scale through efficiency in performance throughout the entire supply chain process. Purchasing. The purchasing process encompasses the conducting of negotiations relating pricing, respective terms and conditions. It involves the placing of a purchase order to begin with the respective purchasing process and includes the effecting of payment according to terms of payment. Thus, the purchasing process is concerned with the mechanical aspects of the supplier and buyer relationship. Purchasing and Procurement. Procurement relates to the factors involved in acquiring the ideal product from the best supplier on optimal terms. Hence, procurement embraces the procedures that take place before the act of purchase, during the process of purchase and after the actual process is accomplished. Pre-purchase procurement includes defining a firm's requirements, carrying out research on alternatives offered by other vendors and determining the alternative that constitutes the optimal opportunity for success. On the other hand, procurement during a purchase involves negotiation of terms with the supplier, placing the purchasing order, fulfilling relevant liabilities on the basis of the contractual agreement. Procurement also entails engaging with suppliers on the basis of a continuous relationship over time. Order Management. Order management is about the follow-up of orders from inception to accomplishment and organizing the personnel, procedures and data relating to the order as it proceeds through its life cycle. Order management begins with a customer order and ends when the customer receives the product or service. Order management facilitates the organization of a process, from receipt of order, stock and despatch visibility, up to service provision. Each workflow is unique relative to customer needs and requirements.

The process flow starts with an automated customer order. The operations team checks the information and confirms the order. The warehouse team advises about shipping details, accomplishes the order and raises the invoice, retrieves, packs and despatches. Stock levels are tracked as they fluctuate with the requirements of the business. Inventory management is about the control of stock from producers to warehouses and from these units to the process of final delivery to the end user. Inventory includes the commodities and components that an organization plans to provide to the market for profit. Inventory management is a fundamental element of the supply chain. The objective of inventory management is the provision of the right product at the right place and time. This entails inventory visibility, that is the knowledge about the time of order, the quantity to order and the place of storage. Ready-to-sell products are procured and despatched to the warehouse or direct to the end-user. Stock is stored until it is required. Merchandise is forwarded through the accomplishment process up to the point of distribution. The quantity of goods for sale is checked. Finished products are retrieved in order to accomplish customer orders. Merchandise is distributed to customers. Multi channel order accomplishment procedures distribute stock towards various locations across the supply chain network. Inventory visibility provides information about which stock is available at which place. Organizations need to have an explicit insight about stock in order to execute customer orders, diminish shipment turnover periods and reduce stockouts, oversells and mark downs. Inventory is an organization’s crucial element. Inventory management is the centre point where functions of the supply chain converge. The balance of inventory is vital because it needs to be continuously at optimum level, that is neither less and nor too much, but just at the right amount.

Inventory has its own responsibilities, that is the cost of storage and insuring the stock, the risk of perishability, theft and damage. Organizations with complex supply chains and production procedures have to ascertain and adjust the accurate balance consistently. The periodic inventory method is a system of stock valuation for audit reporting purposes in which a tangible control of the stock is executed at specific intervals. This technique takes stock at the beginning of a term, adds new stock purchases during the term and deducts closing stock to obtain the COGS (Cost of Goods Sold). Organizations deploy barcode inventory management methods to specify a certain number for each product to be sold. Various criteria is related to the number, like the supplier, product measurements, weight and variable data like current quantity in stock. RFID (Radio Frequency Identification) is a system that wirelessly transacts the identity of a product in the way of an individual serial code to monitor items and facilitate detailed product information. The WMS (Warehouse Management System) relating to RFID utilizes performance, stock visibility and executes rapid self-recording of the receiving and despatch procedures. The Functions of Stock Management. Stock management or stock control tracks precisely about where inventory is located across the supply chain. Customizing pricing, providing quotes, monitoring orders and coordinating returns are key features of order management. Transfer management is concerned with the flow of goods to where it is most valuable. Reporting and analytics are related to the evaluation of patterns in operations to foresee future demand and supply. Purchasing is about the creation and management of purchase orders. The automation of shipping functions eliminates faults like late delivery or the delivery of incorrect cargoes. IMS (Inventory Management System) facilitates the process of ordering, the storage and implementation of inventory through automation of end-to-end production, business

management, demand forecasting and finance. Globalization, technology and customers create an impact on IMS. Supply chain technologies facilitate insights into the supply chain performance and how it is utilized optimally. Volatilities in logistics costs and performance are anticipated before they emerge and provide insight into where automation utilizes advantages. Technologies continue to enhance inventory management. The Functions of Stock Control. Stock control provides and facilitates the balance of supply and demand efficiently. The organization of forward and reverse merchandise flows in the supply chain. Upstream supplier transactions and downstream customer requirements entail the maintenance of the balance between customer demand and product supply. This balance is managed through stock control. In the push system of a supply chain the products are pushed with the support of a medium, from the start point, that is the manufacturing plant to the retailer, which is the destination point. The manufacturing volume is determined according to former ordering patterns by the customer. This method relates to customer demand. It aims to push merchandise into the market. Hence, forecast and prediction are key elements of the push system. The ideal volume of goods is manufactured on the basis of long term forecasting. The push system entails high production cost, high stock and forwarding costs. It also engenders high stock levels and high volume of batches. The pull system relates to demand managed methods. Thus, purchasing, manufacturing and despatch are demand oriented. Limited stock is held and accumulated as it is consumed. In this system demand is real and the firm reacts to consumer demands. It leads the organization in manufacturing the adequate amount of products demanded by the market. Stock and product variety are kept at minimum levels. The lead time is also kept at minimum level throughout the process.

The Differences between Push and Pull Methods. In the push system the process starts by forecasting of customer demand, whereas in the pull system the process initiates as per customer order. In the push system demand is uncertain. On the other hand, in the pull system demand is certain. While the push system relates to speculation, the pull system is reactive. Apart from that, the push system involves high complexity, while the pull system entails low complexity. The push system deals with resource implementation and the pull system acts on responsiveness. Furthermore, the push system results in a long lead time and the pull system entails a short lead time. The push system is oriented in supply chain planning and the pull system concentrates on order accomplishment. Moreover, the push system's goal is to diminish costs and the pull system's target is to optimize its services. Vendors and merchants deploy the push system towards the consumer. Consumers induce the pull system for the products they demand. The manufacturing in push systems relies on demand forecast, whereas the manufacturing in pull systems is focused on definite or consumed demand. The development in technology entails rapid availability of goods and services with various offers and discounts. This in turn induces a decline in costs of goods and services. The advancement of IT creates efficiency in productivity due to inventions of modern equipment and computer software. This makes manufacturing easier and less time consuming. With new technologies, markets keep growing as well. New marketing strategies engender customer interest and demand. New ideas are created and implemented for product development. IT constitutes a crucial element of supply chain management. As technologies get further developed new products and services are introduced to the market creating further demand.

Electronic commerce embraces a wide range of devices and methods that are implemented in order to manage business in a paperless environment. E-commerce encompasses electronic data interchange, e-mail, electronic fund transactions, electronic publishing, image processing, electronic bulletin boards, shared databases, magnetic and optical data capture. Thus, e-commerce assists organizations in the automation of procedures relative to transmitting records and documents, data and information electronically within the network of suppliers and customers. This in turn creates advantages in the communication process, making it easy, cost-effective and less time consuming. EDI (Electronic Data Interchange) includes the exchange of business documents within a specific concept from one computer terminal to another. It facilitates the interchange of information among organizations electronically instead of traditional methods like mail, courier and facsimile. Creating a Resilient and Agile Supply Chain. In a world of upheavals, resilience and agility become imperative. Thus, organizations concentrate not only on sole cost savings, but also on adaptability, speed, risk reduction and sustainability. Enterprises adapt flexible sourcing and distribution policies, shifting to suppliers that are close to ones place. Hence, the move towards regionalization continues. Companies realign processes and supply chains to keep up with the prevailing reality. They collaborate with remote workers and communicate with consumers in new and virtual environments. Omnichannel ordering and fulfilment services assist in optional solutions to manage through uncertainties. Evolving technologies and systems prevail the new era of resiliency. New information technologies enable people to cooperate through supply networks, accommodating the trust that firms need in risk-laden commercial environments.

Innovating and Scaling Fast. Amid a worldwide disruption, it is imperative to launch new products to the market rapidly, necessitating firms to innovate and flex in a fast pace. Accelerating innovation necessitates an understanding of the product lifecycle, that is from ideation to commercialization. Modern information technology assists firms to innovate rapidly through facilitating access to new capabilities. Swift innovation and agile production execution support companies in quickly proceeding to remote cooperation, reconfiguring production lines to accommodate a safe working environment and rerouting shipments to maneuver trade barriers. Planning and Executing Continuously. In a relentless volatile business environment, companies consider how to manage sales and operational procedures. Devising plans according to consumer demand makes sense, however to stay agile in the face of perpetual change, firms update their forecasts and policies constantly. This necessitates a deep insight and collaboration between commercial partners, suppliers and business planners. Enterprises have the possibility to continuously plan, forecast, adjust their course with unprecedented speed and precision. Planners adopt modern technologies to manage and prevent potential disruptions. Through predictive strategies, firms smartly anticipate and plan for what comes next. Advanced technologies enable people to smart planning as well as fast and effective decision making processes. Attaining Visibility and Trust. Decisive action is crucial to capture opportunities and managing the business in any market environment. It requires quick access to information and insights that managers need in order to make accurate choices in complex and critical business conditions. Access to a unified data concept within business functions assists significantly, thus facilitating planners with transparency that is paramount in deciding where to source materials, make products and deliver goods.

Global process transparency enables business partners to cooperate efficiently and create reliable relationships. New systems take transparency a step further, facilitating firms to track the movement of goods and services between firms down to individual units. The technology is integrated into the supply chain to accommodate reliability and fast proceedings among trading partners and customers who require traceability of goods they purchase. Integrating Sustainability. There are environmental and social consequences for every supply chain. Issues embracing sustainability are prevelant in times of global disruption, from the carbon emissions of transport networks to the industrial waste from manufacturing plants and to the ethics of organizations. In a world of scarce resources, sustainable supply chain activities become paramount. The optimal concept is to accommodate sustainability within the supply chain, to make decisions ranging from product design and production plant configuration up to procurement and logistics. Hence, sustainability and a healthy concept are compatible even at difficult times. The Significance of Logistics in the Supply Chain. Logistics is concerned with the movement, storage and distribution of goods from manufacturing up to ultimate delivery, accomplished in a way so as to meet customers' requirements. Logistics is about utilizing procedures, so that customers receive the goods that they ordered. Logistics is mechanical in essence, with emphasis on determining the efficient route when delivering to the end user. The Global Supply Chain and Logistics. Logistics is a major part of the supply chain. Hence, it is a crucial part of an extensive network. Logistics is concerned with supply chain procedures. On the other hand, supply chain management adapts a holistic and contextual approach. While logistics is concerned with how a consignment is to be delivered to the customer, supply chain management is concerned with how supply chain procedures can be streamlined to provide value to customers and

create difference to outperform the competition. Logistics is paramount for supply chain operations, whereas supply chain management embraces more than the physical carriage of goods. In fact, it includes the optimization of intertwining and tangential aspects in relation to production, storage, delivery and fulfilment in a way that streamlines a firm's productivity and thus enables the business to expand its market share in a competitive commercial environment. International Business Logistics. If a company intends to enter into international trade, then a 3-PL can manage relevant documentation, customs procedures and other relevant operations that come up with international logistics. Logistics Services Providers. Every successive logistics provider offers extensive engagement in the supply chain. According to business concept, infrastructure, budget and degree of control over the supply chain, an appropriate logistics service provider is chosen respectively. For example, e-commerce businesses cooperate with logistics services providers, because they utilize an effective combination of support, flexibility and cost efficiency. 1-PL/First Party Logistics. A first party logistics services provider is a firm that carries shipments and consignments that may relate to both, either the consignor like a producer distributing to consumers or the consignee like the retailer collecting freight from their suppliers. The transport and distribution is handled internally by the firm. Hence, it maintains the control over the logistics and fulfilment process. Furthermore, it has control over quality procedures, packaging and transport. In this category the firm owns and is in charge of the entire logistics process. This type of logistics is cost sensitive and necessitates infrastructure, staff and equipment. Hence, the 1-PL concept is adopted by corporations that possess the capacity to handle their supply chain internally.

2-PL/Second Party Logistics. A second party logistics services provider manages the transport aspect of the supply chain and is in charge of transferring a firm's consignment from A to B. 2-PLs lease or charter their transport like vessels, trailers or aircrafts to firms and they can also be contracted to transport shipments. A logistics services provider that transports freight over a certain part of the supply chain is categorized as a 2-PL. Any freight forwarding firm is a provider of transport services to and from anywhere in the world. 2-PLs are suitable to firms that need a part of their supply chain handled externally like a transport from a warehouse to a logistics hub. However, other segments of the supply chain are managed by the company internally. 3-PL/Third Party Logistics. 3-PL is a logistics service that enables a business to outsource operational logistics, that is from warehousing up to delivery and hence facilitates an organization to concentrate on their actual core business. Third party logistics services firms provide services that encompass the logistics activities of the supply chain. These are transport, warehousing, picking and packing, inventory forecasting, order fulfilment, packing and freight forwarding. Cooperating with a 3-PL services provider accommodates certain advantages. By handing over the logistics, an organization can focus on major aspects of its main business like sales, marketing and product development. Outsourcing 3-PL facilitates an enterprise valuable time and resources. 4-PL/Fourth Party Logistics. With 4-PL (Fourth Party Logistics) the logistics services provider takes 3-PL (Third Party Logistics) a step further by coordinating resources, technology, infrastructure and manages also 3-PL to devise, perform and facilitate supply chain services for organizations. 4-PL services embrace 3-PL activities plus the following services in addition, which are logistics strategy, analytics relating to transport, analysis, capacity utilization and carrier performance, freight sourcing strategies, network analysis and

design, consultancy, business planning, change management and project management, control and network management services, coordinating suppliers across various modes and geographies, inventory planning and management, inbound, outbound and reverse logistics management, outsourcing logistics services for the organization as well as provision of strategic advice and operational support. 4-PL is suitable for organizations that seek a complete logistics solution from both an operational and strategic perspective. Penetrating into New Markets. With an international 3-PL, a company gains flexibility to enter global markets. Gaining Expertise and Knowledge in the Field. Fulfilment, warehousing and transport have their own challenges. Thus, working with the experts makes a difference in the way a firm acts. Furthermore, it enables a business to concentrate on enhancing overall value to its customers. Accommodating Customer Value and Experience. Consumers expect next-day or even same-day delivery as a standard. By adopting a 3-PL provider it is possible to utilize fast delivery by means of the 3-PL's extensive distribution network. Scaling Up or Down as Required. Corporations may experience fluctuations in demand. By collaborating with a 3-PL services provider it becomes possible to manage uncertainties effectively without investing any capital into logistics activities. Generating Cost Savings. Warehousing and inventory forecasting services by a 3-PL can assist in streamlining inventory levels and cost reduction on inventory holding. Cost Reduction. 3-PL services providers have wide ranging connections with freight organizations. They cooperate with carriers on behalf of their customers and negotiate freight rates based on total volume and gross weight of their shipments and order frequency. Cooperating with a 3-PL services provider to manage the supply chain creates the possibility to concentrate on crucial areas to enhance and develop business.

The Smart and Connected Supply Chain. Connectivity comprising data and AI is vital for retailers, producers and other global organizations that require information and flexibility as they target an efficient delivery of goods and services. It is no longer sufficient to know when goods will arrive from a supplier. Furthermore, businesses expect insight into their suppliers' production procedures and inventories in order to ensure an on-time delivery of their merchandise. IoT-tracking enables businesses to monitor a producer's system of creation and delivery in order to plan their own production. The visibility enables a producer to refer to their support plan when they realize that a supplier needs exessive time to manufacture and despatch a required component and to accelerate their operations to attain a unit that can be delivered on-time. As in another case, if an agent is not capable to deliver a shipment due to noncompliance, an AI-empowered recommendation device identifies a replacement source somewhere else along the supply chain network. Whether partially or completely automated, firms require this standard of insight. An automated, AI-empowered and Blockchain utilized supply chain enables the network to benefit from the shared platform of insights. In the light of data, stakeholders are motivated to cooperate in order to enhance procedures and satisfy customer demand. Retailers track the sources of their food products and assert that they are produced according to environmentally adhered practices. And producers can provide evidence that their goods were created according to accepted labour practices. When information is centralized, automated and enhanced, agents in the supply chain smartly collaborate. The sustainability of commercial transport firms relies on the fact of being flexible towards consumer demand.

The investment in modern IT (Information Technology) raises the operational effectiveness and reduces the cost of shipping. New IT like IoT (Internet of Things), AR (Augmented Reality), VR (Virtual Reality) and Blockchain technology have evolved as solutions in the world of transport and logistics. They supplement the unproductive gaps that have been disrupting the sector. Blockchain technology has been the most implemented technological innovation in the transport and logistics industry. Fleet management businesses regard Blockchain as an efficient investment for the organization of multidisciplinary services. Reports indicate that the transport sector has billions of US dollars tied up in disputes and settlements. In addition, due to excessive paperwork, processing and administration costs have increased to as high as 20 percent of overall transport costs. This also results in slower invoice transmission which eventually leads to a delay in financial settlements. Surveys also reveal that businesses have to wait up to 45 days on an average invoice before receiving payment. This slow procedural period is costly for quarterly profits that are a crucial criteria in business investments. Transporters also encounter complications with the conditions of cargoes during transit. Remarkable quantities of sensitive pharmaceutical products face temperature volatility and due to this reason, such products loose their commercial value as a result. A B/L (Bill of Lading) is a legitimate agreement that is issued by a transport company. This legal document comprises three principle criteria, which are Document of Title of Goods, which is the possession of the B/L that is equivalent to having the ownership of respective merchandise; Contract of Carriage, which indicates that the carrier will transport the cargo in accordance with the business contract; Receipt, which is the proof of shipment that the carrier has received, verifying the quantity, quality and other relevant information.

Some drawbacks with the conventional B/L standards are fraud, which relates to the modification of the B/L to disguise liability due to cargo damage or other similar cases; theft relates to the B/L, which is a bearer document of title and anyone who possesses the B/L has claim to the merchandise; inefficiency relating to B/Ls, that are issued to three different agents. One is handled by banks, which manage the trade finance, one is sent to the consignee of the cargo and one remains with the carrier. Three original copies of the B/L entail the procedure to be complex and the courier charges are expensive when operating globally; Physicality, because of the fact that the original B/L only exists in a tangible form, where the shipper has to send one of the original B/L to the recipient, hence, there is the risk that the shipment arrives at destination before the consignee receives the B/L; Amendments referring to all B/Ls that need to be sent back to the carrier who in turn issues a new set of B/L and transmits them back to the relevant parties. If the complications of excessive administration is induced by paper-based documentation, then paper should be eliminated out of the procedures. Digitization enhances administrative efficiency, however there can be cases of file duplication. Blockchain technology eradicates this fact with the possibility to create a digital file that cannot be altered or duplicated. With smart contracts, rights and obligations are automatically transacted as soon as agents reach a consensus and comply to the terms of contract. Smart B/Ls enforce specific terms in the shipping agreement. Enforcement of the conditions remains irrevocable as the smart B/L is transacted on each computer of the system. It utilizes the agreement not to be manipulated. This advantage eradicates the versatility of contractual disputes. The transaction of smart contracts will not just trigger payment, but rather be a precaution for potential breach of contract. Instead of straight legal action, relevant agents will be advised if any of the terms relative to the shipment

does not meet. IoT has evolved principly in utilizing transparency into the transport of shipments and in the instance of adopting a smart contract into the transport process. Hence, IoT integration becomes a necessity. With the implementation of both Blockchain and IoT, a smart B/L is combined with smart agents. These agents are the attached sensors that are specified under the B/L terms to control specific tractable conditions of the agreement. IoT and Blockchain assist a shipping cargo by facilitating advantages that can be adopted for transport and logistics operations; Code of Conduct, Violation and Fraud Detection. It is fundamental that the code of conduct is adhered to across the supply chain. The transparency and liability features of Blockchain technology utilize the fraud detection procedures; Link between Physical Activity and Information. IoT facilitates the possibility of where the information is linked to the merchandise in every phase of the supply chain; Consistent Information Flow. The immutable and irrevocable utilities of Blockchain technology facilitate efficient information sharing among stakeholders that take part in the agreement. Information Accessability. The seamless connectivity of IoT combined with Blockchain facilitates the necessary access to the information that is processed across supply chain procedures. The transport and logistics sector is undergoing fundamental developments. The need for real-time transparency and liability has increased as the market for transport and logistics is expanding. Blockchain and IoT technologies continue their development and need to be integrated by transport and logistics organizations in order to manage the challenges they are facing. Technology Enhances The Supply Chain. Intelligent Order Management. Supply chains manage stock visibility with enhanced demand prediction and automation. Blockchain. Confirms authenticity, enhances traceability and visibility as well as optimizes operational reliability.

IoT / Internet of Things. Information from IoT sensors provide insight into stock placement and status. AI / Artificial Intelligence. Intelligent and self-correcting AI utilizes stock control accurately and reduces waste material. Digital Twins. Intangible representations of complex systems monitor items across life-cycles. Supply chain data is not always visible, available or reliable. Blockchain supports supply chain agents sharing reliable data through authorized Blockchain solutions. Consumers require brands to ensure product authenticity, whereas supply chain agents expect responsible sourcing and clear visibility to eliminate discrepancies. EDI / Electronic Data Interchange. EDI is a routine system that interchanges commercial information between companies electronically in place of using paper documents. EDI is the interorganizational communication of commercial documents in a routine system. Paper based documents like purchase orders or invoices are replaced by EDI as a standard electronic pattern. The automation of paper based procedures facilitates firms in saving time and eliminates errors induced by manual transactions that are expensive to amend. EDI procedures facilitate the flow of information straight from a computer system in one company to a computer network in another firm. The EDI system identifies the location and order of information in a document pattern. This automated system utilizes data to be shared faster instead of longer time required with paper documents. Industries make use of EDI integration to share various types of documents, that is, purchase orders, invoices, requests for quotations, loan applications and others. Organizations are trading partners that interchange products and services as part of their supply chains and B2B (Business-to-Business) networks. EDI procedures are fundamental to B2B transactions and remain to be the ultimate method of exchanging documents and transactions among organizations of every scale.

The advantages that EDI technology accommodates by means of automation and B2B integration are express information processing, customer service, minimum level of paper work, efficiency in productivity, developed tracking and expediting, cost effectiveness, competitive advantage and enhanced invoicing. EDI technology utilizes automation of processes that saves time and money. These processes used to be previously manually transacted with paper documents. EDI solutions enhance performance and productivity. More commercial documents are shared and transacted in less time with optimal precision. EDI data transfer eliminates errors. EDI's system ensures the accurate formation of information and data before it is applied to commercial transactions. EDI integration enhances traceability and reporting. Electronic documents are integrated through various IT systems to utilize data collection, visibility and analysis. EDI automation creates customer value and satisfaction. It facilitates optimal process execution and instant, reliable delivery of products and services. EDI facilitates standards that are established across commercial partners to gain consistent benefits. Through the utilization of EDI, integration with organizations, extensive budgets and strong influence are attained. EDI is a document transaction system that assists innovations like IoT (Internet of Things), Blockchain and AI (Artificial Intelligence). EDI utilizes IoT sensors that are integrated into the goods' packaging and tied to periodic EDI messages to facilitate packaging visibility. EDI utilizes Blockchain technology, that is, EDI information flow for cargoes facilitates a shared version of the truth in order to resolve and avoid chargeback issues. EDI utilizes the Artificial Intelligence agent that controls events and information in relation to a cargo and identifies any non-compliant issue. It determines whether a reshipment is requested, analyzes the source of replacement, organizes a new consignment and an authorized return shipment.

ERP / Enterprise Resource Planning. ERP (Enterprise Resource Planning) constitutes the basis of the IT infrastructure. It is the processing device of organizations. The system stores data and diminishes manual procedures and tasks relative to transacting financial, stock and customer order information. With the development of technology the world is getting smaller. Customer expectations are on the increase and organizations are prone to uncertainty. In dynamic market conditions organizations need to continuously update themselves through the integration of new technologies. Strategic and technological adaptation in the supply chain is eminent for organizational and commercial transactions. With support of the Internet a clear vision, effective planning and an operational insight are fundamental elements of commercial activity. This is eminent for an effective supply chain management and optimal competitiveness. Internet technology, World Wide Web and electronic commerce are the new concepts in global trade. Hence, IT creates a new type of supply chain management. Supply chain management is the process of the manufacturing flow of a product or service in order to optimize quality, delivery, customer satisfaction and ultimately profitability. Supply chain management starts from raw materials all the way through the chain up to delivery of an end product to the customer. To accomplish the procedure a network of suppliers is established that constitute the relevant links of the supply chain, where the product is processed along from suppliers of raw materials to the firms that interface with consumers. To meet customer demand for products and services the planning and organization of respective resources is fundamental. Upon establishment of the supply chain, metrics are determined to measure the efficiency and effectiveness of the supply chain, that is the creation of value to customers and the achievement of business targets.

Suppliers are selected for the provision of goods and services that are necessary to produce new products and services. A network is devised to monitor and coordinate supplier relationships. Relevant procedures involve ordering, receiving, managing stock and transacting supplier payments. Operations are performed to accept raw materials, produce the products, execute quality control, packing for despatch and plan for delivery. Customer orders are managed, deliveries are scheduled, shipments are despatched, customer invoices are raised and payments received accordingly. Defective, excess and unwanted products are taken back. For this, a separate network and process system is created. The efficiency of supply chain management reduces costs, waste and time in the cycle of production. Industrial performance creates a just-in-time supply chain where retail sales determine replenishment orders automatically for producers. Thus, retail outlets are replenished as merchandise is sold. To optimize the network system, data from supply chain partners are analyzed to identify where optimization can take place. In the analysis of partner data three concepts are significant for the efficiency of supply chain management in order to streamline the value of the supply chain process. The execution of data analysis enables producers to foresee any shortages in the stock before it causes an impact on consumer demand. Organizations that deal with perishable products adjust their prices constantly to meet demand. Profit margins are optimized through the implementation of analytic software and similar forecasting methods. Sales forecast, actual orders and the delivery of raw materials create a platform for the allocation of resources and schedule of procedures by means of analytical software tools. Hence, the producer confirms respective shipment delivery date when the order is placed. The supply chain is vital in the business with customers and consumers.

Business reputation and sustainability are reliant on efficient supply chain management. ERP (Enterprise Resource Planning) and B2B (Business-to-Business) integration devices provide access to unstructured data from the social media, structured data from the Internet and traditional data sets. Effective cooperation with suppliers leads to the implementation of cloud based business networks that utilize multi enterprise collaboration and engagement. The supply chain network protects its system from cyber intrusion and hacks. Supply chain management is concerned with control and monitoring collation, coordination and conducting decisions as well as performance throughout the chain through the utilization of automation and self-learning. An analytical approach is scaled with real time data, providing comprehensive and rapid insights, thus eliminating latency in the supply chain. Supply chain management is not solely concerned with the availability, movement and cost of goods and services. It is also concerned with the management of data, services and goods that are bundled into solutions. Supply chain management is about much more than just where and when. Supply chain management influences the quality of products and services, delivery, costs, customer value and satisfaction as well as ultimately profitability. The value of crucial and time based data like weather conditions, labour shortages, political unrest and inclines in demand is analysed accordingly. Supply chain management curates large quantities of data that is processed by the chain operation. Analytical experts and data specialists analyse the data. Supply chain management concentrates on streamlining the usefulness of data, analyzing it in real time with minimal latency through the implementation of ERP systems. Quantum Computing. Unprecedented IT masters complex issues.

The Functions of Blockchain. Distributed Ledger Technology. Network members have admission to the distributed ledger and its immutable record of processes. Through the shared ledger, procedures are recorded only one time, thus eliminating the duplication of effort that is common with conventional business networks. Records are Immutable. No member can alter or tamper with a process after it has been recorded to the shared ledger. If a process record entails an error, a new procedure must be executed to eliminate the error and both procedures are then visible. Smart Contracts. To fasten procedures, a range of regulations defined as smart contract is adapted on the Blockchain and implemented automatically. A smart contract determines conditions for corporate bond transfers, incorporates terms for freight insurance and other functions. Types of Blockchain Networks. There are different types of Blockchain network. These are public, private, permissioned or established by a consortium. Public Blockchain Networks. A Public Blockchain is one that anybody can participate in. Among disadvantages are fundamental computational power required, no privacy for procedures and little security. These are critical factors for organization usage instances of Blockchain. Private Blockchain Networks. A Private Blockchain network, that is similar to a Public Blockchain network, is a decentralized peer-to-peer system with the difference that one organization manages the system. The business coordinates who is admitted to take part in the network, implements a consensus protocol and sustains the shared ledger. According to usage, this enforces reliability and confidence among members. A Private Blockchain is managed with the protection of a corporate firewall and hosted on premises.

Permissioned Blockchain Networks. Organizations that establish a Private Blockchain network, also create a Permissioned Blockchain system. Public Blockchain networks may also comprise a Permissioned Blockchain network, which entails restrictions on who is admitted to take part in the network and only in specific procedures. Those who want to participate, need to obtain an admission or permission to take part. Consortium Blockchains. Firms share the liabilities of sustaining a Blockchain. Pre-determined companies decide about who can perform procedures or access data. A Consortium Blockchain is optimal for commerce when members are permissioned and have liability for the Blockchain. Blockchain facilitates effective visibility, transparency and efficiency throughout the supply chain, hence merchandise is traded with confidence. IoT and Blockchain: IT for Universal Cargo Monitoring. Innovative technologies have utilized significant advancements. Artificial Intelligence and Machine Learning facilitate automation and technologies like AR (Augmented Reality) and VR (Virtual Reality) that accommodate kinesthetic interfaces and numerous touchpoint experiences. Emerging technologies provide more than what was expected from them. They utilize innovation to the routine procedural systems of various branches and thus facilitate advancements to logistics and supply chain organizations, especially in the area of cargo monitoring. The logistics and transport business is in a significant area for advanced technologies with more that 95 percent of merchandise forwarded by container at some period during their shipping lifecycle. IoT (Internet of Things) and Blockchain are innovators due to their remote monitoring and decentralization functions. IoT facilitates organizations to track the status and condition of a cargo that is forwarded. Blockchain on the other hand utilizes a reliable and rapid system for digital contract storage and fast procedures.

Both of the IT systems complement and enhance each other. IoT provides a wide-ranging network of interconnected devices and Blockchain facilitates the ingestion and sharing of data among appliances through a reliable platform. This combination provides an optimal solution for logistics firms to remotely coordinate their fleets, monitor status of shipment and ensure on-time delivery of a cargo to the end user. The Role of IoT in Cargo Monitoring. IoT utilizes visibility in fleet management enabling organizations to monitor the location and status of the shipment on transit. The system is especially useful when adopted to track the route and condition of a cargo. Technology like GPS (Global Positioning System) and temperature sensors are integrated with the consignment that facilitate tracking of a cargo's location and condition. This information refers to gateways of a pool where fleet management and freight operations monitor and coordinate shipments. They benefit from the transparency of their forwarding operations that facilitate them to make intelligent decisions in order to optimize efficiency of the supply chain and facilitate on-time delivery of a cargo. They have access to vital information about the location and status of the goods while the shipment is on transit from the the place of departure up to the place of arrival. The sensors also guide them to organize the disposition of their vehicles relative to trends in demand and supply, weather conditions, route options and the nature of merchandise forwarded. They are capable of making intelligent decisions to ensure that shipments are on their way and follow up the location and status of the goods in real-time on the monitor screen of their computer or smart phone. This facilitates to predict when the shipment arrives at the destination. Concerning perishable goods the ETA (Estimated Time of Arival) is crucial for the recipient. Because they expect the merchandise to be fresh and undamaged at the arrival of shipment.

Throughout the transit time, shipment monitoring technology enables operators to ensure that goods are fresh until final delivery to the consignee. Criteria like airflow, temperature, humidity and condensation are monitored in the container to ensure that the merchandise is all right. On the other hand, an interactive IoT enables fleet operators to remotely control specific procedures on the containers themselves. For instance, the emergence of moisture, water and condensation causes damage on the goods and thus induces the creation of mold and bacteria. Hence, fleet operators remotely control an evaporator that is attached to the cooling system to eliminate condensation and moisture from the storage area and thus prevent any degradation of goods without any manipulation of the system's cooling degree. IoT technology is also applied to prevent theft of cargo from the trailer. Weight control sensors that are fitted on the trailer's axles control the cargo weight and advise accordingly. In case of any unexpected decrease in the shipment's total gross weight, then an alert signal is sent to the fleet management, indicating on a potential cargo theft. Blockchain facilitates the issuance of a smart B/L (Bill of Lading) document that is digitally recorded and shared with relevant agents. The agents in turn check on the terms and conditions of the digital B/L with the data that is obtained from IoT sensors. Since Blockchain saves information in a decentralized and immutable ledger, there is no possibility that data is altered once it is recorded. There is no need for agents to use their credit cards for any payment, since they make use of their crypto currency wallets. Standard paper based procedures are digitized, eliminating the tangibility of contracts and diminishing procedural costs relative to shipment supervision. The combination of IoT and Blockchain systems facilitates advantages for shipment monitoring and security.

The connection of IoT to Blockchain optimizes the efficiency of supply chains and assists fleet managers to manage their shipment handling operations seamlessly. Supply chains are sophisticated and decentralized, embracing various agents. Supply chain organizations are upgrading their commercial procedures by implementing technologies like IoT and Blockchain to monitor their assets effectively. IoT sensors are adopted to gather information relating environmental conditions, indicate the duration of the merchandise remaining in a trailer or at a particular terminal and whether or not it is tampered with or affected in any way that violates the handling instructions. This type of information is processed to clarify invoice disputes by presenting proof for insurance matters. It also assists organizations by leading them in the optimization of their supply chain procedures. The economic efficiency from IoT relates to the visibility and remote monitoring capability that it provides to industries, that leads to optimal effectiveness and safety. A Blockchain centred supply chain management system relates to a shared decentralized ledger that provides a record of information concerning shipment status, trailer status and storage conditions. The organization and their customers track the product life cycle throughout the supply chain with the assistance of Blockchain and IoT systems. Blockchain facilitates accurate data record where communications between IoT appliances are saved chronologically. Hence, it facilitates instant access to data about the merchandise. Blockchain and IoT combined utilize safe shipment forwarding also in global trade. The technology functions on the basis of an online arrangement between relevant agents. The terms and conditions of the contract are stated in digital codes, facilitating financial procedures between agents without any dispute. Eliminating paperwork is another beneficial function that Blockchain and IoT provide.

The transfer of a container from one place to another encompasses various intermediaries. Blockchain and IoT enable organizations to save on personnel costs and utilize data protection through the elimination of paperwork. IoT is about ingestion and relation of large amounts of data. Major concern is how to record and save the data. Data passes through appliances and integrated systems, including data analytics, IoT devices and platforms. It is complex to utilize its safety, due to information that is related through administrative borders with their own regulations. In addition to information security, data transmission is executed at the right time, form and location. Since Blockchain is a decentralized distributed ledger, no central administration or authority is necessary for data record and transmission. Due to cryptography algorithms, the Blockchain network is designed to facilitate the prevention of data alteration for safety purposes. Each block of the Blockchain system is connected to the previous block. Therefore, none of the blocks can be changed or substituted. When combined with IoT, Blockchain provides logistics organizations instant services with diminished operating costs across a range of systems. Firms adopting Blockchain technology facilitate transparency and accountability in their supply chain. Through the implementation of autonomy and visibility, logistics operations become safe and efficient. Hence, Blockchain and IoT combined take SCM (Supply Chain Management) further. Smart and centralized insights shape a modern and global supply chain. The modern global supply chain is the platform of insights into manufacturing, sourcing, procurement, purchasing, inventory and the delivery of goods and services. However, information must flow efficiently between B2B (Business-to-Business) systems of the supply chain so that integrated agents can promptly take action on information, thus enhancing quality, cost efficiency and delivery services.

Businesses rely on EDI (Electronic Data Interchange) standards to exchange documents due to its reliability and cost effectiveness. On the other hand, for an effective management of a complex supply chain, the integration of Blockchain becomes significantly necessary. Effective management of information in the supply chain utilizes a cohesive and transparent flow of data due to Blockchain that ultimately enhances the cooperation among partners of the supply chain creating customer value and satisfaction. Firms that implement AI (Artificial Intelligence) into their supply chains benefit from insights that proactively detect potential production failures, inventory shortages and other drawbacks. Hence, cohesion and insight are what companies require for a seamless navigation of a global supply chain. EDI (Electronic Data Interchange) has a significant value to firms that need seamless communication with their supply chain agents. Furthermore, they regard EDI as eminent to their omnichannel operations. Thus, EDI remains as a utility for agent to agent supply chain systems. However, it cannot manage advanced digital input, like information from IoT sensors or advice about an alteration in the delivery of merchandise. While the information exchanged within an EDI constitutes a vital stage of the supply chain, it is not the only function in it. Hence, the modern global supply chain has to manage the entire and consistent digital business process. The next level constitutes the workflows that link to the process, fusing EDI-data to the data from systems of IoT sensors and APIs (Application Programming Interfaces), which results in Blockchain. With Blockchain, a supply chain proceeds beyond the limitations of an agent-to-agent network or one-source-to-numerous network and evolve into a transparent system that efficiently links many to many. Blockchain facilitates a standard of visibility between the members of a supply chain and holds them liable for their end of a process bargain.

EDI still acts as the main medium for document exchange, however the information from the reliable system facilitates efficiency when it is integrated to a Blockchain empowered B2B network. Within that facility network a shared version of true data, gathered from EDI, IoT and APIs (Application Programming Interface) creates upon the limited exchange on EDI and utilizes each member to collaborate on production and delivery. Information from IoT-sensors assist organizations to evaluate the creation and delivery of commodities across the supply chain. Information from APIs that record sales and other procedures assist decisions like as one to quickly scale up or down production due to information that provides explicit real-time customer demand. The information is processed through an automated AI (Artificial Intelligence) empowered device to utilize forecasts and advice that provide insight about how firms communicate with their supply chain partners. The Role of Blockchain Utilized Trade Finance Networks. The world is in the fourth industrial revolution. As per the World Economic Forum, the world's economy is changing rapidly since the advent of the Internet age. To respond to the increasing power of the consumer based economy, supplying products and services at an equilibrium price level including shareholder interests in focus, have developed supply chains to a global standard. Hence, efficient and effective flow of raw materials, partially and completely manufactured products and perishables are meanwhile eminent. To utilize global trade, public and private sectors are constantly cooperating to optimize the flow of merchandise, documents and funds. Attention has been on the tangible barriers to commerce, which comprise also tariffs and quotas. Both factors induce straight and immediate impacts to the cost of commerce among countries. Major reactions aim to decrease cost, however with ongoing geopolitical uncertainties costs may rise or fall.

The attention is also on intangible areas of commerce, that is procedures, paperwork and various administrative formalities that induce remarkable costs. However, new technologies assist global commerce by reducing the cost of business activities. In this way, global business expands and especially in key market segments like small and medium sized enterprises and B2C (Business-to-Consumer) where prevailing business costs constitute impediments for the economy's main source of development. The world trade is valued at roughly USD 100 trillion. An up to 20 percent decrease in trade costs equates to a rise in global business of up to 1 percent. Global value chains can enhance the flow of merchandise by up to five percent with enhanced trade utilization. New technology reduces costs by up to 30 percent and raises the commercial finance market by up to 20 percent. Three crucial components in business are the flow of goods, the documents to realize this and the funds deployed in their exchange. Within each of these components there are interactions between agents and the settlement of payment in the exchange of merchandise. It is complex and agents continuously strive to be competitive. The end-to-end process in the exchange of goods has still place for optimization. This enhancement is necessary at a higher standard, as the controls and devices in place to reduce the risk of commerce become the source of disrupting the evolvement in business. By pulling down intangible barriers to commerce regardless of hard or soft trade borders, Blockchain facilitates new horizons of trust for business. The world is entering a new era of remarkably less friction for participants across the trade network and that is a significant new evolvement in the fourth industrial revolution, to accelerate economic growth with Blockchain enabled trade finance, creating solutions for freight management with AI, IoT and Blockchain.

Logistics and transport in today's world is established upon a platform of old fashioned supply chain principles. Data in the sector is not trustworthy, because information points are not confirmed in real-time by decentralized sources. In addition, logistics is inherently complex, with several touch points, stakeholders and intermediaries. The essence of logistics and transport is a conventional operation that is underlined with manual communications, that is phone, e-mail, fax and others. Hence, data is not connected and has no reliable basis. In addition to the freight logistics procedures is the fact of verification of contractual conditions, rate negotiation, documentation of modifications to agreed contracts and where applicable, settlement, where alterations to agreed contracts are expected, because of issues like damage, late fees, loss or cancellation. Digitizing assets utilize the system in which agents and intermediaries cooperate. The key advantages comprise decrease of procedural collisions, possibility to automate instantly and seamlessly, decrease of associated freight risk, standardization and immutability, procedure ubiquity and ledger transparency as well as reliable private networks. Modern digitization embraces the introduction of a reliable and easy verification and certification platform on logistics transactions in the freight and transportation industry, facilitating users and stakeholders transparency into the supply chain, that is from quote to proof of delivery with decentralized Blockchain validation. This utilizes transparency on the stakeholders in the logistics sector, the complexities and details of freight, merchandise and necessary licenses, authorities and certification, adding value to the freight and operations. This technology has the potential to evolve to an essential and valuable product in the logistics sector, potentially becoming also widespread across other industry participants.

In the instance of a global integration it will add a myriad of information points to the supply chain, benefitting stakeholders throughout the process and value chain. The provision of decentralized, immutable Blockchain technologies with numerous real-time and validated data points to the logistics and transport sector will add value and transparency to the sector's supply chain and its major stakeholders. International supply chains create significant cost advantages. However, political and social instabilities reveal the weakness of global supply networks and indicate to the structural fragilities that evolve. Hence, it becomes certain that there is not a steady state of future ahead. When an unexpected global incident emerges, one has to work with the means that are at hand. Specific strategies assist organizations to create a resilient supply chain in order to manage a global environment of persistent uncertainty. The Benefits of Blockchain to The Supply Chain. Enhanced Supply Chain Transparency. Supply chain networks are restricted by variant visibility. Through disseminated ledger technology that utilizes a shared and individual form of the reality, Blockchain supply chain solutions enable authorized agents effective visibility across supply chain activities. Unforeseen complications induce supply chain disruptions. Blockchain supply chain solutions deploy intelligent contracts that directly activate when pre-determined business conditions are settled. This facilitates real-time visibility into processes and enables to make decisions rapidly. Streamlined Supplier Admission. New supplier admittance is a lengthy manual process for buyers and sellers in a supply chain. Blockchain supply chain solutions fasten the process through an immutable record of new vendor information that business network agents can rely upon. Blockchain is a shared, immutable ledger for recording processes, tracking assets and creating reliance.

AI / Artificial Intelligence. Intelligent and self-directing Artificial Intelligence makes stock control precise and reduces waste material. Types of Artificial Intelligence. Descriptive Analytics. It facilitates visibility and an individual source of reality across the supply chain relative to internal and external systems and data. Prescriptive Analytics. By means of Prescriptive Analytics companies solve issues and collaborate for optimal commercial value. Organizations cooperate with logistics agents in order to gain valuable time and reduce effort in operations. Predictive Analytics. It guides an organization to determine the outcome or future scenario and its commercial implications. Disruptions and risks are projected and mitigated through Predictive Analytics. Cognitive Analytics. It assists a firm in dealing with complex issues in a practical way an individual or a team would deal with. It guides organizations to work through complex issues. Supply Chain Analytics. Supply Chain Analytics are the principles for adopting cognitive technologies like AI (Artificial Intelligence) to the supply chain process. Cognitive technologies understand, reason, learn and interact like a person, however with an extensive efficiency and velocity. This advanced type of supply chain analytics automatically searches through large quantities of data to guide an organization, perform forecasting, discern inefficiencies, deal effectively with customer requirements, be innovation oriented with a focus on breakthrough ideas. Supply Chain Analytics guide a firm to make smarter, faster and effective decisions. This system comprises a range of advantages. It attains a remarkable return on investment and identifies risks. Supply Chain Analytics discern potential risks and forecast future risks through identification of patterns and trends across the supply chain. It streamlines precision in planning. Through analysis of customer data, Supply Chain Analytics forecast future trends optimally.

It guides the business in the specification of articles to be eliminated due to less profitability. It foresees consumer demands that are going to be on the rise upon initial customer order. It attains the lean supply chain. Organizations adopt Supply Chain Analytics to control warehouse management, agent responses and consumer demand for effective decision making. It prepares for the future. Organizations adapt Advanced Analytics for supply chain management. Advanced Analytics provide both structured and unstructured data to facilitate firms with timely alerts to make correct decisions. Advanced Analytics create correlations and patterns among various sources to diminish risks at minor cost. Information that has not been previously produced is now analyzed in real-time. AI (Artificial Intelligence) reads, identifies and correlates data from various sources, silos and systems, rapidly and in detail. It therefore facilitates real-time analysis relative to data interpretation. Organizations have a wide range of supply chain intelligence. They are productive and bypass disruptions. Supply Chain Analytics used to be applied only for statistical analysis and quantifiable efficiency indices for demand planning and prediction. Data was stored in spreadsheets that was derived from various agents throughout the supply chain. By the 1990s organizations were adopting EDI (Electronic Data Interchange) and ERP (Enterprise Resource Planning) systems to access and transact information between supply chain agents. This technology utilized easy connection to data for analysis and support to companies in their designing, planning and prediction. In the 2000s organizations began to adopt Business Intelligence and predictive analytic software solutions. These solutions guided businesses to attain in depth knowledge about their supply chain network’s performance, how to make correct decisions and optimize their network’s efficiency. Cognitive technologies and Artificial Intelligence are the new IT (Information Technology) in Supply Chain Analytics.

AI (Artificial Intelligence) solutions are beyond information storage and process automation. AI software thinks, reasons and learns in a person like approach. AI transacts extensive quantities of data and information that is both structured and unstructured data and produces summary and analysis of information instantly. Besides effective correlating and interpreting data from networks and sources, it also enables businesses to analyze supply chain data and intelligence in real-time. With the support of Blockchain technologies, organizations are able to proactively forecast and predict. The supply chain is the quintessential component of a company relative to customers and consumers. Efficient Supply Chain Analytics utilize the business to effectively protect its commercial reputation and long term sustainability.

Discussion

The Latest Trends in Global Supply Chain Management. The digital supply chain converts data from a physical to a digital format that accommodates the Internet of Things, Artificial Intelligence, Blockchain and smart contracts, cloud-based solutions and countless other emerging technologies that rely on high-quality digital inputs. Supply chain organizations are transforming their networks into connected, intelligent, scalable, customizable and nimble digital ecosystems. Hence, they either attain holistic digital transformation or just proceed step by step through balancing long-term investment in automation with an instant implementation of solutions that reduce repetitive tasks and cognitive fatigue, thus enabling staff to deal with areas where staff perform more effective than machines. Big Data and analytics in a supply chain entail businesses to identify inefficiencies, reduce costs, enhance customer service as well as strengthen resilience and agility in order to cope with any disruption. Applications embrace the adoption of standardized freight data exchange to facilitate operational efficiencies, streamline routes and port planning, reduce emissions and costs, sales and marketing data to forecast demand, enhance inventory management practices and customer experience, data from sensors and digital twins to detect any bottlenecks, predictive maintenance and optimized product performance. To accommodate big data and analytics, supply chains need to prioritize data exchange and information sharing. Advances in Artificial Intelligence (AI) are happening at an unprecedented rate and offering numerous immediate returns, particularly in the areas of intelligent sourcing, inventory management and logistical route planning. Robots drive warehousing efficiency through picking and packing, loading and unloading as well as moving heavy objects.

Computer vision utilizes defect detection and object recognition, robotics facilitate safe assembly and welding, augmented reality advances training, maintenance and quality control. Machine Learning (ML), which is a subset of AI, enables computers to learn without being explicitly programmed. It is adopted to make decisions about demand forecasting, quality control and new product development. The global supply chain management market is expected to reach US$ 31 billion by 2026 relating investment in systems and human resources. While the integration of supply chain technologies proceeds, it reveals key insights from enhanced automation, Internet-of-Things data, Blockchain, Supply-Chain-As-A-Service and cloud-based solutions. Hence, these technologies streamline networks, accommodate sustainability, enhance collaboration, utilize visibility and assist businesses to attain flexibility and agility. Investment in human resources through training and development on the latest technologies is creating a culture of innovation and encouraging staff to share ideas that lead to supply chain efficiency. Supply chain visibility, traceability and location intelligence enable businesses to track the movement of goods and materials through every tier of the supply chain, that is from product origin through its various stages up to final destination. Hence, stakeholders take advantage of access to real-time data relating orders, inventory, delivery and any disruptions. Location intelligence provides context about the current state of networks. AI and ML enhance the forecast of future trends based on past delays, traffic and weather patterns as well as port and motorway bottlenecks. Supply chain disruption and risk management is the norm with continued congestion of transport and logistics infrastructure, geopolitical shifts, natural disasters and extreme weather, raw material shortages as well as global pandemics. Instead of addressing issues as they arise, organizations are learning how to prepare for any disruptions through risk management.

This involves identifying and assessing both internal and external risks, developing mitigation strategies, such as diversifying suppliers, building up inventory and optimizing visibility, testing and rehearsing plans to identify any gaps and making adjustments, communicating with stakeholders about risk management, tracking and updating plans to ensure that they are up-to-date and effective. A consumer centric world requires a different type of supply chain, thus one that is capable to forecast, prepare and respond to evolving demand, product and channel mix. Supply chain agility and resilience require new capabilities and tools, including machines capable of fast changeovers and handling a wide range of products and shipment types, collaborative robots and smart packaging. Skilled and flexible workforces are essential, as staff programme and work along with advanced technologies and cross functional teams collaborate to overcome constraints in short and incremental stages. All of this fosters supply chain resilience, which is a strategic priority accommodated with digitization, optimization, sustainability and talent development. Modern supply chains are global and so are the threats they face. Cyber criminals are not bound by geography and can target any entry or access point in the supply chain, driving the need for cyber security to be a core part of digital and intelligent networks. An alarming increase in cyber crime is leading to more data breaches, delays and shortages, reputational damage, compliance issues, safety risks and financial loss. Supply chain professionals safeguard their networks by staying up to date on best practices, adopting a risk based approach to cyber security and investing in cyber security solutions, training and awareness. Supply chain participants set objectives to become carbon neutral, achieve net zero waste and water targets in the near future. At the same time, increasing pressure from consumers, employees, investors, governments and regulators compel to consider the sustainability of future

operations. To achieve green and circular supply chains, firms need to accommodate change to facilitate an end-to-end value chain, which requires collaboration, implementation of an adequate technology, training staff, setting tracking targets, measuring impact, identifying areas for improvement and reporting on progress in order to be held accountable. Geopolitical conflicts including war, economic and technological competition and related security concerns and the need for countries to mitigate the effects of climate change, all continue to cause supply chain disruption. Hence, regional supply chains turn to simple networks through near shoring and friend shoring, which are based on models of trust between nations that tend to share similar values and beliefs. The deglobalization of supply chains entails enhanced security and resilience, however, it raises prices, limits choice and reduces innovation due to smaller market sizes. The risks facing supply chains intensify over several years, signaling that we have entered an era of turbulence in which the impacts of geopolitical shifts, cyber threats, resource depletion and climate change will be with us every day. A pandemic brings the reality of doing business in a high-risk world into sharper focus, with businesses, the public and investors, all gaining unprecedented awareness of supply chain disruptions. Those firms that recover from the pandemic seek to build their supply chain resilience, not only enhancing their ability to recover from disruptions, but also to adapt to new conditions. The changing landscape of supply chain risk entails an era of turbulence and the risks faced by firms worldwide are set to intensify. They range from trade and geopolitical tensions, through cyber threats and pandemics, to resource depletion and the impacts of climate change, frequent and severe natural disasters, rising sea levels and gradual changes to weather patterns and water availability. Social effects, such as unrest, conflicts and mass migration, pose additional constraints for supply chains, as do the regulatory

regimes, which could emerge to tackle climate change, such as carbon taxes. Businesses have focused on the topic of supply chain resilience. Traditional risk management remains insufficient to protect firms against today's turbulent change and frequent disruptions. Hence, businesses foster modern and resilient supply chains by strengthening their tactical capabilities to prepare for and respond to disruptions. Furthermore, they need to embrace supply chain sustainability and circularity, thus recalibrating long and global supply chains in order to eliminate fragility and manage critical dependencies. With the environmental impacts and exposures that firms are confronted with, arising from their supply chains, an increasing convergence between supply chain resilience and supply chain sustainability is taking place. There is an emerging evidence that sustainable businesses not only perform better in general, but have been resilient as well. Confronted with frequent and severe supply chain disruptions, firms are reconsidering the balance they take between efficiency and resilience. An emphasis on maximum efficiency constitutes a disadvantage to resilience, thus causing vulnerabilities in long and complex supply chains that are frequently exposed in today's era of increased risk. The strategies in which businesses manage global supply chains and related risks entail opportunities to build resilience. Technology utilizes visibility and agility for businesses. Firms take steps to enhance data and analytics, process automation and system integration across their supply chains. Technological solutions work when they build upon mature supply chain risk management practices. Understanding a supply chain requires manual work. Corporate leaders and supply chain managers adopt a forward looking approach to supply chain resilience, developing the capabilities that enable them not just to bounce back from disruptions, but to position their supply chains for efficiency in

an era of turbulence. Real-time supply chain resilience is concerned with a firm's tactical capability to avoid, withstand and bounce back from supply chain disruptions and then recover to a normal state of affairs. To prevent any delays or interruptions, businesses need to understand their supply chains, dependencies and vulnerabilities, taking steps to proactively mitigate them. Surviving large scale disruptions requires to respond with flexibility and agility. Strategic supply chain resilience is an emerging concept that focuses on how firms adapt to a changed environment. Today, businesses need to adapt their supply chains to a new normal characterized by more frequent and severe disruptions they now face. Firms need to understand their vulnerabilities across an expanded risk horizon and adapt their supply chains by establishing relationships across the value chain, recalibrating long, global supply chains where necessary and through adopting sustainable and circular practices. Real-time resilience begins with preparation by identifying and mitigating vulnerabilities in the supply chain. A firm with risk management capabilities anticipates a crisis as it develops, receiving an early warning from which it can shape its response and activate plans to adjust its supply chain. The cornerstone for building resilience is understanding the supply chain. Visibility of key dependencies across all tiers of the supply chain is an effective way in creating supply chain resilience. To maintain a competitive edge, supply chain leaders need to leverage emerging technologies, beginning with the adoption of analytics to optimize anticipation and response. Responding to changing market conditions and needs during a disruption requires agility in planning, on factory floors, in product innovation and in customer service. A firm's resilience depends on the resilience of its suppliers. Buyers who are supportive partners to their suppliers benefit from visibility of upstream supply chains, early warning of potential risks and preferential treatment

during a disruption. A commitment to resilience needs to be integrated into supply chain management with corporate leaders and a risk aware culture. Businesses prepare for disruptions, updating business continuity plans and conducting regular scenario analysis to create an understanding of vulnerabilities and hidden risks in their supply chain as well as to enable decision making in the case of disruption. A fundamental aspect of resilience is the ability of company finances to absorb a shock. Demand uncertainty with economies locked down around the world entail firms to build up their reserves to weather the storm. Firms need to learn from supply chain disruptions, which they face and apply the lessons to strengthen their tactical and strategic capabilities. Thus, they need to expand their risk horizons and develop awareness of their strategic vulnerabilities and exposures. For this, they adopt methods involving trend analysis and scenario forecasting to anticipate how macro economic shifts and a transition to a low carbon economy might impact them. Businesses set targets for their supply chains with regard to waste recovery, recycling, greenhouse gas reduction and other key indicators of their environmental and social impact. Firms collect and report the data they need to regularly assess their progress towards their objectives. Relationships with supply chain agents are key to remaining competitive, as businesses work to adapt to strategic risks. In addition to joint innovation and supplier development programmes, it involves supplier collaboration for circularity and support for suppliers to access finance and expertise in order to invest for resilience, whether by adapting or moving physical infrastructure or decarbonizing to eliminate reputational damage and future carbon costs. The transition to circular business models, which include making use of waste streams as inputs and reverse logistics to enable product takeback, relies on productive partnerships within and across sectors as well as educating users about

their role in building circularity, sustainability and resilience. The Future of International Supply Chain Management. Throughout history, there are incidences that force change. Hence, the 2020s have brought the pandemic and its resulting component shortages, conflict in Ukraine and the Middle East as well as increasing geopolitical tensions. The interlocking impacts of these disruptions reveal that the future of supply chain is all about proactive risk management. Firms struggle to meet their business and operational goals due to the far reaching impacts of disruptions. They have to deal with component and material shortages. They encounter delays in their time-to-market and face complications in supply chain and procurement processes from geopolitical factors. To manage this new kind of supply chain, risk mitigation is a key area of enhancement for supply chain and procurement organizations. Optimizing risk mitigation and flexibility is the major objective of their procurement organizations. They focus on increasing adaptability and flexibility in their supply chain organizations. They face component shortages, limited materials and other sourcing issues. They see delays in their production, delivery and time-to-market. Geopolitical factors have complicated their supply chain and procurement processes. Businesses identify their weaknesses and risk factors, both internal and external and put plans into place to overcome those challenges and lower their exposure to risk. Creating a supply chain to withstand challenges consists of multiple layers of mitigation to accommodate continuity in the face of disruption. People began wondering if firms would start moving away from China. The pandemic created fear that businesses may be too reliant on China for everything from the key ingredients used to make cleaning agents to pharmaceuticals and personal protection equipment. It was alarming when the country shut down and everybody realized how dependent the globe is on supplies and workers from China, which is

and will remain a major global manufacturer. In addition, corporate sustainability goals increasingly being part of sourcing decisions are accelerating the movement of production to be nearer to the point of consumer consumption. China is facing these challenges in addition to rising labour costs and tariffs. Geopolitical tensions between countries are also leading firms to seek production bases elsewhere. Due to modern supply chain's complexity, it is unlikely that firms will make the decision or even have the capability to move their supply chains out of China completely. Firms maintain a presence in China, while building out a supply chain in at least one other region as a diversification strategy. Hence, they have a supply chain strategy outside of China, while others are working to develop one. Businesses that have or are building a China strategy are localizing their supply chain activities in three regions, that is Southeast Asia, the US and Canada and Western Europe. This strategy is most prevalent among companies in the consumer electronics, smart home, cloud, healthcare as well as energy and industrial industries. Relocating all or even just some of a supply chain is a tall order for even the most sophisticated organizations. Working with a strategic partner who can tap into their developed supplier and logistics across the globe is one way for companies to ease the transition to new regions while maintaining continuity for both internal teams and customers. In an era of disruptions, having efficient, resilient, optimized supply chain processes is crucial. Optimizing for resiliency is a strategic priority. Creating a customized technology is one of the most effective strategies for supply chain and procurement organizations looking to optimize their processes. The supply chain and procurement technologies that firms leverage are providing measurable results, like enhanced efficiency, cost reduction and other benefits. Enhancing visibility and communication across the value chain is a main goal of supply chain organization.

Reducing costs throughout the supply chain and contributing to a firm's financial success is eminent. Enhancing customer satisfaction through on-time delivery, process efficiency and high-quality service is vital. Enhancing visibility and communication across the value chain is fundamental. Increasing the use of data and analytics in supply chain decisions is instrumental. Optimizing the adaptability and flexibility of supply chain operations is essential. Contributing to a firm's sustainability objectives is eminent. Creating revenue and margin streams that contribute to overall company profitability is crucial. Visibility maintains up-to-date knowledge about inventory management and supply chain operations, enhances efficiency and reduces errors. However, visibility alone does not enable organizations to be proactive. Supply chains need predictive, actionable intelligence to essentially create visibility into the future. The objective is to create visibility into the future with predictive modelling of supply chains. Market intelligence made up of expertise from practitioners along with data and analytics plays a crucial role in making informed supply chain and procurement decisions in both the short and long term. From determining availability of supply to tracking pricing trends and slowdowns in logistics modes market intelligence is adopted in supply chain and procurement decisions to assess opportunity and risk. The key to actionable visibility is gathering usable data. The supply chain has continued to be reactionary, because people moved on from past challenges too quickly, thinking that the problem was solved until the next crisis. Now, with the significant changes in how we live and learn, we are realizing that managing the supply chain is not primarily about how well you can react, it is about how predictive you can be. Hence, businesses adopt Predictive Analytics and Artificial Intelligence or Machine Learning models to make strategic decisions about their supply chain activities.

Agility and flexibility are crucial features of a resilient supply chain. Furthermore, one needs data to predict. And the more specific and higher quality the data, the better the solution. Supply chains need to shift the conversation from how we can best respond to bottlenecks to how we can prevent constraints in the first place. Predictive supply chain modelling will create fast and less expensive supply chains. Automation and AI are commonplace in the production phase of supply chains, thus utilizing predictive manufacturing to prevent mistakes on the line before they happen. AI and Machine Learning (ML) are adopted for predictive supply chain management. Automation is not a replacement of, but rather a partnership with, skilled workers. Moving forward, expect to see routine tasks and tasks that require complex calculations become digital. The supply chain adopts AI and ML and thus technologies make a positive impact on organizations relating procurement efficiency and accuracy, visibility and reduced labour costs, effective risk management strategies and real-time insights into supply chain disruptions. Supply chain organizations are making shifts to reduce their environmental impact, thus sustainability and resiliency go hand in hand. Organizations develop processes to reduce waste and energy consumption throughout the supply chain. Sustainability efforts are made on procurement, thus sustainable procurement policies for suppliers are established and hence sourcing takes place for materials and components from validated sustainable suppliers. Processes are developed to reduce waste and energy consumption throughout the supply chain. Sustainable procurement policies are established for suppliers. Eco-friendly production processes are implemented. Materials and components are sourced from validated sustainable suppliers. Audits of logistics services providers are performed to assess their environmental performance.

Circular economy and its principles are incorporated for reverse logistics. Predictive Analytics and AI are adopted to identify potential sustainability optimization. A partner with specialized expertise in relevant areas of the supply chain and procurement assists organizations to assess and advise which tools and solutions will work best to monitor their sustainability progress and mitigate risk. The supply chain process has been altered by the disruptions of the previous years. The supply chain adopts the challenging times as an impetus for its future. Begin by creating a resilient supply chain and a strong business strategy. Key Topics Relating Global Supply Chain Management for Research and Discussion. Investigating the impact of change in demand and supply on supply chain functions and costs. Evaluating the significance of IT in supply chain management. Analyzing the influence of IT innovation on the effectiveness of supply chain management. Examining the development of supply chain capability through the integration of logistics. To study the integration of risk management techniques in the supply chain through logistics processes. To analyze the impact of supply chain performance of a firm on global business performance. Studying the supply chain workflows using database and RFID. To examine the impact of supply chain functions on the financial performance of organizations. Analyzing the role of value chain strategy in supply chain management. A study of challenges and opportunities related to the evolution in supply chain functions and processes. Evaluating the innovations and strategies for supply chains. A study of the role of supply chain management in the success of multinational corporations. Examining the role of supply chain management in the enhancement of SMEs (Small and Medium Sized Enterprizes). To study how the supply chain functions have evolved in the 21st century. Understanding the importance of the adoption of supply chain management principles and concepts.

Evaluating the relationship between supply chain management and logistics. To find out how the evolution of supply chain management contributes to operational effectiveness and strategic differentiation. Studying the challenges and opportunities related to the globalization of supply chain management. To find out the key differences between supply chain management and logistics in the light of different theories. Studying the impact of inbound and outbound logistics on the supplier customer relationship. Examining the role of technological advancements in the enhancement of supply chain management of multinational corporations. To study the role of information management in dealing with supply chain challenges. Examining the emergence of information technology and its impact on supply chain management. A study of the applications of the Internet of Things in the field of supply chain management. Investigating the role of supply chain management in dealing with emerging challenges and complexities. An examination of the procurement cost management in lean organizations of emerging economies. An investigation relating the relationship between supply chain management and procurement. Studying the procurement management of specialized projects in the commercial sector. A study on the examination of practical implementation practices related to green sustainable procurement strategies. Investigating the trends and challenges in the supply chain and its impact on the digital revolution and globalization.

Conclusion

Key Questions Relating Multinational Supply Chain Management for Research and Discussion. Define supply chain management (SCM) and its importance. Explain how SCM encompasses the flow of goods and services, from sourcing to delivery, highlighting its impact on cost, customer satisfaction and competitive advantage. Describe the core functions of SCM. Indicate procurement, warehousing, transport, inventory management and customer service by emphasizing their interconnectedness. Explain demand forecasting and its role in planning. Discuss predicting future demand by adopting methods to optimize inventory levels, production schedules and transport requirements. What are the elements of a transport strategy? Highlight cost, speed, reliability, flexibility and modal choice (road, air, sea) based on requirements. How do you facilitate warehouse management? Refer to methods such as ABC Analysis, safety stock calculations and just-in-time inventory for optimized storage and reduced stockouts. Why is communication crucial in SCM? Emphasize clear and timely communication between internal teams, suppliers and customers for efficient operations and effective problem solving. What are the challenges in SCM? Indicate globalization, technological disruption, economic fluctuations and natural disasters by emphasizing adaptation and risk management strategies. How do you stay updated on trends and technologies in SCM? Share your approach about automation, AI, Blockchain and IoT. Explain the difference between deterministic and probabilistic inventory models and when you would adopt them? Discuss how deterministic models assume fixed values like lead time and demand, while probabilistic models consider variability.

Highlight deterministic models for stable demand and lead times and probabilistic models for uncertain environments. How would you calculate safety stock and what factors influence its optimal level? Explain safety stock and its role in mitigating stockouts. Refer to factors like lead time, demand variability and service level requirements influencing its optimal level. Describe the advantages and disadvantages of different transport modes (road, air, sea, rail) and factors to consider when choosing the right mode. Compare cost, speed, reliability, capacity and environmental impact of each mode. Emphasize considering distance, product characteristics, urgency and budget when making the choice. Explain the features of a Warehouse Management System (WMS) and its benefits for supply chain operations. Discuss inventory tracking, order fulfilment, picking optimization and data analytics capabilities of WMS. Highlight efficiency, accuracy and cost savings from implementing a WMS. How would you implement Blockchain technology in your supply chain? Choose a specific area and discuss potential benefits such as enhanced transparency, fraud prevention and challenges like integration and cost. Explain the impact of Artificial Intelligence (AI) on demand forecasting and it's limitations in supply chain management. Highlight how AI analyzes data to enhance forecasting accuracy. Indicate limitations like data quality dependence and the need for human interpretation and adaptation. Describe supply chain risk management and how you would apply it to identify and mitigate potential disruptions. Discuss SWOT analysis and it's stages for identifying, assessing and mitigating risks. Explain Lean Manufacturing, it's benefits and drawbacks. Define Lean Manufacturing and it's focus on waste reduction and efficiency. Indicate the benefits such as costs and lead times, while referring to drawbacks like workload and quality issues if not implemented properly.

How would you design a sustainable supply chain strategy considering environmental and social responsibility factors? Discuss eco-friendly practices such as green packaging, sustainable sourcing, fair labour standards and responsible waste management. Highlight the importance of balancing sustainability with cost and efficiency. Explain the significance of data analytics in supply chain decision making. Emphasize data's role in identifying trends, optimizing processes and predicting future demand. Describe a sourcing strategy for a new product or service. Emphasize market research, identifying potential suppliers, evaluating capabilities such as cost, quality and reliability, negotiating terms and building long term partnerships. Highlight factors such as total cost of ownership and sustainability. How do you stay informed about market trends and supplier capabilities in your procurement area? Discuss industry publications, attending trade shows, networking with peers and utilizing market research tools to stay updated on trends, pricing and supplier performance. Explain the concept of Total Cost of Ownership (TCO) and how it influences your procurement decisions. Mention that TCO goes beyond upfront cost, considering factors like logistics, maintenance, warranty and disposal costs. Explain how optimizing TCO leads to long term cost savings and value. Describe a negotiation with a supplier and the strategies you adopt. Identify win-win solutions, build rapport, refer to data driven arguments and mutually beneficial outcomes. How do you manage the risk of supplier disruptions such as natural disasters and political instability? Discuss diversification of supplier base, establishing risk mitigation plans, monitoring potential disruptions and having contingency options in place. Explain how you would handle a situation where a supplier proposes a price increase. Emphasize open communication, understanding the cost drivers, negotiating alternatives such as volume discounts, payment terms and exploring other suppliers

if necessary. How are you staying up to date on emerging technologies in procurement such as e-procurement platforms, AI empowered sourcing? Indicate new technologies, attend relevant webinars or conferences and explore their applications in procurement processes. Describe how you would utilize data analytics to enhance procurement performance. Discuss analyzing historical data to identify cost saving opportunities, optimize pricing negotiations and predict supplier performance. Refer to relevant data visualization tools for effective communication. How do you ensure ethical sourcing practices within your procurement activities? Highlight your commitment to ethical sourcing standards such as fair labour practices, environmental sustainability and participating in relevant certification programmes. Discuss strategies to assess and monitor supplier compliance.

Bibliography

Abc Supply Chain 2024, ‘Supply Chain Management’,
Available at: <https://abcsupplychain.com/what-is-supply-chain/>.
Accessed: 22 May 2024.

AIMS 2024, ‘Supply Chain Management’,
Available at: <https://aims.education/supply-chain-roles-and-responsibilities/>.
Accessed: 29 May 2024.

Alpha Academy 2024, ‘Supply Chain Management’,
Available at: <https://www.alphaacademy.org/supply-chain-management/>.
Accessed: 20 May 2024.

AltexSoft 2024, ‘Supply Chain Management’,
Available at: <https://www.altexsoft.com/blog/supply-chain-management-software/>.
Accessed: 23 July 2024.

Analytics Steps Infomedia 2024, ‘Supply Chain Management’,
Available at: <https://www.analyticssteps.com/blogs/
supply-chain-management-scm-overview>.
Accessed: 27 August 2024.

Anaplan 2024, ‘Supply Chain Management’,
Available at: <https://www.anaplan.com/blog/what-is-supply-chain-management/>.
Accessed: 19 July 2024.

APS Fulfillment 2024, ‘Supply Chain Management’,
Available at: <https://www.apsfulfillment.com/contact/>.
Accessed: 2 July 2024.

ASCM 2024, ‘Supply Chain Management’,
Available at: <https://www.ascm.org/corporate-solutions/>.
Accessed: 15 August 2024.

Bain and Company 2024, ‘Supply Chain Management’,
Available at: <https://www.bain.com/insights/
management-tools-supply-chain-management/>.
Accessed: 28 August 2024.

bd task 2024, ‘Supply Chain Management’,
Available at: <https://www.bdtask.com/blog/
supply-chain-management-erp-modules>.
Accessed: 17 May 2024.

BitSight Technologies 2024, ‘Digital Supply Chain Management’,
Available at: <https://www.bitsight.com/blog/what-is-digital-supply-chain-management>.
Accessed: 12 July 2024.

Britannica Money 2024, ‘Supply Chain Management’,
Available at: <https://www.britannica.com/money/jobless-claims-jolts-report>.
Accessed: 24 August 2024.

Camcode 2024, ‘What is Supply Chain Management’,
Available at: <https://www.camcode.com/blog/what-is-supply-chain-management/>.
Accessed: 30 August 2024.

Cash Flow Inventory 2024, ‘Supply Chain Management’,
Available at: <https://cashflowinventory.com/blog/supply-chain-management/>.
Accessed: 21 July 2024.

Compliance Chain 2024, ‘Supply Chain Management’,
Available at: <https://compliancechain.com/what-is-supply-chain-management/>.
Accessed: 16 June 2024.

Coursera 2024, ‘Supply Chain Management’,
Available at: <https://www.coursera.org/articles/supply-chain-management>.
Accessed: 16 May 2024.

DDS 2024, ‘Supply Chain Management’,
Available at: <https://www.dds-supplychain.com/en/supply-chain-management-what-is-it/>.
Accessed: 7 July 2024.

Digital Supply Chain 2024, ‘Supply Chain Management’,
Available at: <https://digitalsupplychaintoday.com/>.
Accessed: 30 March 2024.

Dorks Delivered 2024, ‘The Role of IT in Supply Chain Management’,
Available at: <https://dorksdelivered.com.au/functional-roles-of-it-in-supply-chain-management/>.
Accessed: 3 May 2024.

Easy Ecom 2024, ‘Supply Chain Management in eCommerce’,
Available at: <https://easyecom.io/blog/supply-chain-management-in-ecommerce>.
Accessed: 15 May 2024.

Eden Enterprise 2024, ‘Supply Chain Management’,
Available at: <https://www.theprojectdefinition.com/p-supply-chain-management/>.
Accessed: 18 May 2024.

Extensiv 2024, ‘Supply Chain Management’,
Available at: <https://www.extensiv.com/blog/supply-chain-management>.
Accessed: 17 August 2024.

Fresh Logistics 2024, ‘Supply Chain Management’,
Available at: <https://freshlogistics.co.uk/supply-chain-management-and-ai/>.
Accessed: 19 July 2024.

Geospatial World 2024, ‘Supply Chain Management’,
Available at: <https://www.geospatialworld.net/prime/supply-chain-management/>.
Accessed: 16 July 2024.

Global Supply Chain Institute 2024, ‘End-to-End Supply Chain Planning’,
Available at: <https://supplychainmanagement.utk.edu/blog/end-to-end-supply-chain-planning/>.
Accessed: 29 March 2024.

Handover Mobility 2024, ‘Supply Chain Management’,
Available at: <https://www.handover.in/blog/
logistics-and-supply-chain-management/>.
Accessed: 20 July 2024.

Happay 2024, ‘Supply Chain Management’,
Available at: <https://happay.com/blog/supply-chain-management-process/>.
Accessed: 14 July 2024.

Inc42 Media 2024, ‘Supply Chain Management’,
Available at: <https://inc42.com/glossary/supply-chain-management/>.
Accessed: 11 July 2024.

Indiamart 2024, ‘Supply Chain Management’,
Available at: <https://www.indiamart.com/proddetail/supply-chain-management-software-6314583188.html>.
Accessed: 27 March 2024.

Info Edge 2024, ‘Supply Chain Management’,
Available at: <https://www.shiksha.com/online-courses/
what-is-supply-chain-management-st627-tg341>.
Accessed: 5 September 2024.

InTek 2024, ‘Supply Chain Management’,
Available at: <https://blog.intekfreight-logistics.com/
logistics-supply-chain-management-guide>.
Accessed: 22 August 2024.

Intellipaat Software Solutions 2024, ‘Supply Chain Management’,
Available at: <https://intellipaat.com/blog/features-of-supply-chain-management/>.
Accessed: 21 May 2024.

Investopedia 2024, ‘Supply Chain Management’,
Available at: <https://www.investopedia.com/terms/s/scm.asp>.
Accessed: 1 July 2024.

Jabil 2024, ‘The Future of Supply Chain Management’,
Available at: <https://www.jabil.com/blog/future-of-supply-chain.html>.
Accessed: 14 August 2024.

Jaro Education 2024, ‘Analytics in Supply Chain Management’,
Available at: <https://www.jaroeducation.com/blog/
what-is-the-role-of-analytics-in-supply-chain-management/>.
Accessed: 4 May 2024.

John Wiley and Sons 2024, ‘Supply Chain Management’,
Available at: <https://www.dummies.com/article/business-careers-money/
business/operations/supply-chain-management-dummies-cheat-sheet-246398/>.
Accessed: 19 July 2024.

Lading Logistics 2024, ‘Supply Chain Management’,
Available at: <https://ladingcargo.com/blog/the-costs-and-benefits-of-automated-
supply-chain-management/>.
Accessed: 10 July 2024.

Lark Technologies 2024, ‘Supply Chain Management’,
Available at: <https://www.larksuite.com/en_us/topics/
food-and-beverage-glossary/supply-chain-management>.
Accessed: 30 May 2024.

Lawcode 2024, ‘Supply Chain Management’,
Available at: <https://www.lawcode.eu/en/blog/supply-chain-management/>.
Accessed: 28 May 2024.

Layer 2024, ‘Supply Chain Management’,
Available at: <https://golayer.io/blog/business/
what-is-supply-chain-management-scm/>.
Accessed: 29 August 2024.

Logmore 2024, ‘History of Supply Chain Management’,
Available at: <https://www.logmore.com/post/history-of-supply-chain-management>.
Accessed: 16 July 2024.

Logos Logistics 2024, ‘Supply Chain Management’,
Available at: <https://www.logos3pl.com/
what-is-a-supply-chain-and-a-supply-chain-management-scm/>.
Accessed: 19 May 2024.

Lokad 2024, ‘Supply Chain Management’,
Available at: <https://www.lokad.com/supply-chain-management-definition/>.
Accessed: 8 July 2024.

Maersk 2024, ‘Supply Chain Management’,
Available at: <https://www.maersk.com/logistics-explained/
supply-chain-management/2024/02/23/essential-guide-to-supply-chain-
management>.
Accessed: 16 August 2024.

Mecalux 2024, ‘Supply Chain Manager’,
Available at: <https://www.mecalux.com/blog/what-does-a-supply-chain-manager-
do#supply-chain-manager-job-description>.
Accessed: 9 July 2024.

Medium 2024, ‘Supply Chain Management’,
Available at: <https://medium.com/@prosoai/here-is-the-basic-overview-of-project-
driven-supply-chain-management-675199cedc85>.
Accessed: 2 May 2024.

Monday 2024, ‘Supply Chain Management’,
Available at: <https://monday.com/blog/project-management/supply-chain-
management/>.
Accessed: 4 June 2024.

MRP Easy 2024, ‘Manufacturing Supply Chain Management’,
Available at: <https://www.mrpeasy.com/blog/supply-chain-management/>.
Accessed: 22 July 2024.

Navata 2024, ‘The Concept of Supply Chain Management’,
Available at: <https://navata.com/cms/what-is-supply-chain-management/>.
Accessed: 15 August 2024.

Next Gen Invent 2024, ‘Supply Chain Management System’,
Available at: <https://nextgeninvent.com/blogs/
supply-chain-management-ai-software-roles/>.
Accessed: 5 May 2024.

New Stream Enterprises 2024, ‘Supply Chain Management’,
Available at: <https://www.newstreaming.com/
supply-chain-management-how-it-works/>.
Accessed: 1 May 2024.

Nimbus Post 2024, ‘Global Supply Chain Management’,
Available at: <https://nimbuspost.com/blog/
global-supply-chain-management-gscm-a-comprehensive-guide/#>.
Accessed: 7 May 2024.

Oracle 2024, ‘Supply Chain Management’,
Available at: <https://www.oracle.com/in/scm/what-is-supply-chain-management/>.
Accessed: 24 August 2024.

PACK and SEND 2024, ‘Supply Chain Management’,
Available at: <https://www.packsend.com.au/blog/supply-chain-examples/>.
Accessed: 2 June 2024.

PAT RESEARCH 2024, ‘Supply Chain Management Process’,
Available at: <https://www.predictiveanalyticstoday.com/
supply-chain-management-process/>.
Accessed: 8 May 2024.

Pivot International 2024, ‘Supply Chain Management’,
Available at: <https://www.pivotint.com/blog/
supply-chain-management-infographic-2/>.
Accessed: 20 August 2024.

Qode Next 2024, ‘Supply Chain Management’,
Available at: <https://www.qodenext.com/blog/
3-stages-of-supply-chain-management/>.
Accessed: 22 July 2024.

Remira Group 2024, ‘Supply Chain Management’,
Available at: <https://www.remira.com/en/glossary/supply-chain-management>.
Accessed: 18 July 2024.

SalesBabu Business Solutions 2024, ‘Supply Chain Management’,
Available at: <https://www.salesbabu.com/blog/
8-essential-features-of-an-effective-supply-chain-management-solution/>.
Accessed: 18 July 2024.

SCMDOJO 2024, ‘Supply Chain Management’,
Available at: <https://www.scmdojo.com/what-is-supply-chain-management/>.
Accessed: 6 May 2024.

SCM EDU 2024, ‘Supply Chain Management’,
Available at: <https://scmedu.org/supply-chain-management-frameworks/>.
Accessed: 27 May 2024.

SER Solutions 2024, ‘Supply Chain Management’,
Available at: <https://www.sergroup.com/en/knowledge-center/blog/supply-chain-management-optimization.html>.
Accessed: 5 July 2024.

ShipBob 2024, ‘Supply Chain Management’,
Available at: <https://www.shipbob.com/blog/supply-chain-management/>.
Accessed: 3 September 2024.

Shiprocket Fulfillment 2024, ‘Supply Chain Management’,
Available at: <https://fulfillment.shiprocket.in/blog/logistics-and-supply-chain-management/>.
Accessed: 25 May 2024.

Silverbird 2024, ‘Global Supply Chain Management’,
Available at: <https://silverbird.com/blog/articles/global-supply-chain>.
Accessed: 19 August 2024.

Sprintzeal 2024, ‘Supply Chain Management’,
Available at: <https://www.sprintzeal.com/blog/supply-chain-management-guide>.
Accessed: 23 August 2024.

TechTarget 2024, ‘Supply Chain Management’,
Available at: <https://www.techtarget.com/searcherp/Guide-to-supply-chain-management>.
Accessed: 16 August 2024.

ToolSense 2024, ‘Supply Chain Management’,
Available at: <https://toolsense.io/glossary/supply-chain-management/>.
Accessed: 28 March 2024.

Unleashed Software 2024, ‘Supply Chain Management’,
Available at: <https://www.unleashedsoftware.com/supply-chain-management-guide>.
Accessed: 17 July 2024.

Vector 2024, ‘Supply Chain Management’,
Available at: <https://www.withvector.com/resource/types-of-supply-chain-management-6-models-to-know/>.
Accessed: 21 August 2024.

VNMT Solutions 2024, ‘Supply Chain Management’,
Available at: <https://www.vnmtsolutions.com/supply-chain-management-guide/>.
Accessed: 18 July 2024.

Wazobia Technologies 2024, ‘Supply Chain Management’, Available at: <https://wazobia.tech/blog/development/supply-chain-management-scm-software-process-and-roles>. Accessed: 21 July 2024.