

# Economic benefits for the integration of supply chain networks on the globe market.

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**ABSTRACT:** While the world economies are transitioning to globalization, but the challenges that supply chain management and its logistics management are also facing are many covering from market security to finding solutions based on the cost control, quality of the products, service delivery and speed of delivery. So, it is appropriate that with the innovations within the operations of the supply chain management linked to the supply chain networks should be applying basing on the new innovations with the advent of models and theoretical concepts. This write up for the paper was meant to look at literature complex characteristics of supply chain network and then avail invulnerability mechanism of supply chain network. The results for the approach was considered effective and efficient for a practical understanding of benefits and challenges from the analysis which further was to increase the invulnerability of supply chain network. This work has important practical significance drawn from the literature for the supply chain management and optimization in the supply chain network of the market.

**KEYWORDS:** Supply Network Analysis; Business process engineering; risk management, market security, optimization, Total quality management and modes of transportation.

## I. INTRODUCTION

Many organisations or firms are desiring to improve their competitive edge in the market place. One of the activities for the firms is to grow and remain competitivethrough investment in the supply chain management while improving its coordination with the market through their supply chain network. [7] defined Supply chain management as a philosophy which is integrating by nature to try and manage the movement or flow of the distribution channel moving the product from the supplier to the end user who is the consumer. The definition by Copper suggests that there should be proper management of the distribution channel of the products if the company is to be competitive and

reduce the lead time in order to create value to the consumers.

[15] stated that the supply chain management is a consistent management of business activities and relationships of suppliers at different levels of business which includes the management of customers along the supply and the whole or entirety of the supply chain. [15] further suggested that supply chain management is simply good planning and coordination of the suppliers at different level of the supply value chain, which also includes the management of customers and the whole supply chain in the quest to create value to consumers and improve on the competitive edge.

## INTEGRATED APPROACH IN SUPPLY CHAIN MANAGEMENT

The supply chain management should be understood as a process with both advantages and disadvantages when managed within a given market globally. [20], talks of how to enhance management of suppliers from the point of origin up to the point where consumers receive the products. Each and every organisation aspires to enhance the competitive edge in order to avoid falling into a strategic wear-out. One of the key areas that has the potential to improve the company's competitive edge is good management of the company's supply chain network [67]. What is becoming a common phenomenon is the integrated supply chain management [40]. Adopting an integrated approach in supply chain management helps firms achieve the economies of scale and manage satisfy the customers, of which this can be achieved by having the supplies ready on time.

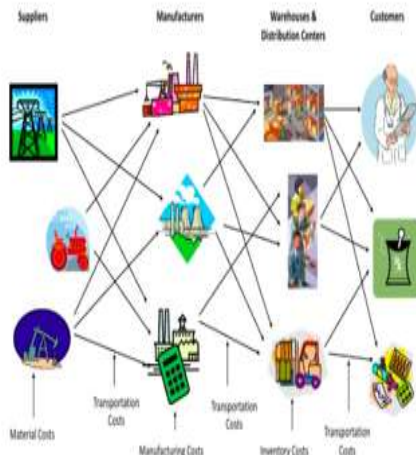


Figure 1: Supply chain management

In today's business environment, the management of the supply chain has become important in the enhancement of the firm's competitive edge and the satisfaction of the customers [42]. The other concept that has become common to be used is supply chain optimization. Many organisations are encouraged to collaborate through working in alliances in the quest to achieve customer satisfaction and subsequently increase the company's viability through profits [65]. Due to the globalization of the economies, the supply chain management has not been left out in this global phenomenon. It has become important to invest in the globalised supply chain by customers through globalization of markets to ensure that customers access markets to a reduced marketing costs, new market opportunities, and improvement of levels income stream, also for globalization of production to access lower-cost labor, access technical expertise and access production inputs. To achieve these, Better coordination and control through Email and videoconferencing, Improved communications and management through Internet, intranets, and extranets, more efficient Transportation advancements through more efficient, dependable shipping are required.

### RISKS OF MOVING THE SUPPLY CHAIN TO A GLOBAL MARKET.

The supply chain can either be done locally or on a global scale for a robust plan to ensure the global supply chain is successful. It becomes important to fully understand the risks and benefits of venturing into a global supply chain model of business. The local supply chain is one which only operates within a given country. The local supply model has risks, but not compared to the global supply chain strategy. [23], further stated that the

local supply chain ventures thrives on differentiating themselves through expanding on the production strategy which includes customer specialization. The common and known norm of local supply chain has been over taken by globalization commonly referred to as "global village [6]. The growth into global chain supply should be well planned for there are many risks involved. The following are some of the possible risks of moving the supply chain to a global market:

### CHALLENGES

Capacity challenges or constraints is a possible risk that can happen at every part of the chosen supply chain. Capacity constraints is simply the lack of ability by a given firm or system to produce a required quantity of goods or products in a given time [35]. The challenge with this type of a risk is that once it occurs, a company will have to transfer the manufacturing or production to other suppliers which further could exposes the company to many more complex risks. This move also has some benefits in that the firm that may stop depending on a particular supplier [5].

### CULTURE DIFFERENCES

Culture is another serious risk an organisation may face, with the planned strategy of venturing into a global market. Companies embarking on the global supply chain investment do face challenges with regard to language and practices [24]. [25] stated that the said differences in culture has the ability to affect the efficiency of commercial processes such as demand predicting and material forecasting or planning. Therefore, the possible solution to avoid such cultural challenges is to venture into uncompromised collaborative sharing of important information and facts which should include the use of best professional practices within the supply value chain [18].

### NATURAL DISASTERS

It should be realized that supply chain networks are prone to a variety of risks arising from frequent disasters and other natural attacks. So, when venturing into a global supply chain, the particular market might be struck with the natural disasters. Disasters can be classified into many categories like natural disaster and/or terrorism [45]. While considering that more and more frequent disasters occur in the supply chain network caused by the cascading phenomenon, the model for the supply chain network should be built in terms of this characteristic. Based on this, an organization is expected to introduce some effective measurement methods of the invulnerability of the supply chain

network to investigate its invulnerability [5]. The investigation should be on the damage degree of the supply chain network which may be caused by adopting different attack strategies, as the problems could be with the security faced by the increasingly complex internal and external environment.

### RISK

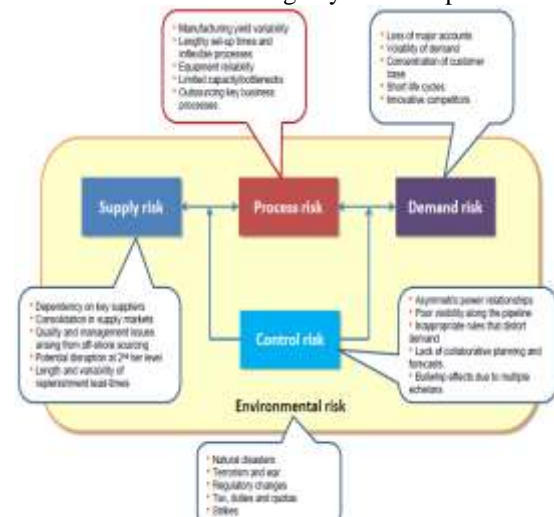
Most of the major risks to the supply chain networks and business continuity usually lie outside the company in the wider supply chain, such that the complexity of the inter-connectedness of modern supply chains also tends to increase their vulnerability to disruption. But with the macro environmental risks known to be from outside our control, but systemic risk which are of the micro environment in nature is created through our own decisions. Hence, an organisation could likely face a systems failure when venturing into the global market. The global village concept is highly supported by technology, which in some instance can face some breakdown. Although this might be rare happening within the network, a possible failure of the technological system has the ability upset or destabilize the entire connected supply chain [30].

### VALUE AT RISK (CVAR)

Conditional value at risk approach is also another method of dealing with insecurity as a result of stochastic challenges. This approach is equally useful, but it concentrates on reducing the amount of uncertainties at the known confidence parameters [68]. The conditional value at risk method works in the detection of the would be challenges and provides an opportunity of finding some strategy of reducing the uncertainties when designing the supply chain network. Therefore, the design of the supply network takes much time, hence the need to take all precaution to minimise the potential risks.

Demand risks may also affect the organisation if there a forecast miscalculation of product demand which may often be attributed to the product of lack of insight into year-over-year purchasing trends or unpredictable demand based on Volatility of demand, concentration of customer base, short life cycles, and innovative competitors; supply risks may also occur when the raw materials or suppliers depended upon is not delivered or does not deliver on time or not at all, thereby causing disruption to the flow of product, material, and/or parts; the environmental risk in the supply chain which is the direct result of social-economic, political, governmental, or environmental issues that affect the timing of any aspect of the supply chain; Control risk which may include the organization asymmetric power relationships, poor visibility

along the pipeline of the supply network, inappropriate rules that distort demand, lack of collaborative planning and forecasts and bullwhip effects due to multiple echelons; and Process risk where manufacturing yield variability based on lengthy set-up times and inflexible processes, equipment reliability, limited capacity or bottlenecks and outsourcing key business processes.



### BENEFITS OF MOVING THE SUPPLY CHAIN TO A GLOBAL MARKET

The supply chain management if not properly handled do have the ability to destabilise the company's competitive advantage. Nevertheless, it is equally true that the company's proper implementation of a global supply chain has the ability to bring about some desired benefits. The following is an assessment of the benefits:

#### REDUCED COSTS

Moving the supply chain to a global market helps firms to reduce on the cost of doing business [9]. When an organisation ventures into a global supply chain, the operating costs reduces in that the firm would be able to engage and network with other suppliers in other countries. Investing in the global supply gives organisations better contact with the target customer group and easy access to affordable resources [9]. The affordable resources accessed and closeness to the customer segments enhances the firm's competitive edge towards their rivals and improve the penetration of local markets with their local supply chains.

#### ENHANCED RELIABILITY AND EFFICIENCY

Investing in the global supply chain enhances the firm's reliability and responsiveness towards providing value to the customers. Taking

the supply chain close to the customers brings about reliability and efficiency in ensuring that services and products are delivered within the expected lead time [34]. An organisation can have a flexible response to the customers or end users if the global supply chain is done correctly [22].

#### **EFFECTS OF GLOBAL SUPPLY CHAIN NETWORK EXPANSION ON ORGANISATIONS TOTAL QUALITY MANAGEMENT**

Global supply chain network as a philosophy has proven to possess the potential to enhance the company's competitive edge or position. Therefore, big and first mover firms do adopt the principle of global supply chain management (GSCM) and combine it with the philosophy of total quality management (TQM) to ensure that their performance is strengthened [26]. Now the question is; does the global supply chain network have any effect on the total quality management of an organisation? First and foremost, it becomes of paramount importance to understand what TQM is and where it is related to global supply chain network.

Total Quality Management (TQM) is simply defined as that strategy that enhances the establishment and delivering of high-quality products or services as desired by the targeted customer segment and ensure that the consumers are satisfied [10]. The Total Quality Management (TQM) principle is based on that each and every member of staff in any organisation and should ensure that there is serious engagement with each other including other suppliers to produce high quality products and services [19]. The following is an explanation of how expanding the global supply network would affect the total quality management of an organisation;

#### **FLEXIBLE MANUFACTURING AND WORK PRACTICES**

Total quality management (TQM) calls for firms to continuously improve on the production of goods and services by ensuring that there is total removal of bottlenecks and improve the production process. This being the case, venturing into global supply chain network require that an organisation to pay attention to total quality management. Realising the attainment of TQM forces the firm to invest in the system of monitoring the whole supply chain network which would be costly [21]. Therefore, if quality is to be realised throughout the supply chain network, the company needs to have a good relationship with all supply chain network members. If the global supply chain network is not well

monitored and managed, the quality of products would be compromised, hence the company becoming uncompetitive [17]. Therefore, the global supply chain network helps the company produce quality products due to the fact that the firm will have access to quality raw materials thereby managing to produce the desired quality.

#### **PULL SYSTEM DELIVERY**

Just in Time (JIT) as a principle exists to realise on-time distribution and ensure that there is a reasonable minimization of notable avoidable inventory expenses [13]. In order to ensure achievement of consistent Just in Time (JIT) distribution, acceptable quality of the entire internal processes which should include that of the company's network partners should be guaranteed [12]. The global supply chain network might seem challenging to manage sometimes because a firm needs to ensure that there should be good understanding with channel partners. Therefore, should be able to engage committed supply chain network players who has the ability to provide the raw materials when needed in order to satisfy the targeted customer segment.

#### **TECHNOLOGICAL ACCESS**

In the recent past, it has become undoubtedly true that investing in the state-of-the-art technology improves the company's value chain with the quest to satisfying customer needs. Venturing into a global supply chain network helps companies to have access to technologies that would have product quality to satisfy the customers [31]. Having easy access to technologies as a result of having sound relationship with the supply chain network enhances the company's performance in total quality management basing on the speed, quality and service delivery. Failure to invest in technology jeopardizes the production of quality services or products hence an organisation failing to satisfy the customers [10]. This therefore confirms that the global supply network gives organisations leverage with regard to total quality management and enhance the satisfaction of customers.

#### **FOCUSING ON THE CUSTOMER**

Having a global supply chain network helps firms design products that exceeds the customer's expectations [3]. The global supply chain network requires that only reliable supply chain network members be trusted. Widening the number of global suppliers might or might not work, this has the potential to disturb the quality of the services and products. Customers have a clear understanding of the available quality around the

world due to the increase in the use of technology, hence this makes customers difficult to satisfy [4]. Therefore, having a committed global supply chain network enhances the company to be customer centric and satisfy the customers due to easy access to the quality raw materials.

#### **PRINCIPLES OF TQM AND IDENTIFY POTENTIAL COSTS OF QUALITY.**

Total quality management thrives on its principles. The following are some of the total quality management principles; continual improvement, factual approach to decision making, mutual beneficial supplier relationship, customer focus, leadership driven, people driven and process approach [31]. Therefore, any possible deviation or changes to the total quality management principles would make an organisation fail to produce quality products and service, which would in turn make the firm lose its clients. The loss of clients by the firm would eventually reduce the company's profits.

#### **FUEL PRICES EFFECTS ON GLOBALIZATION USE OF VARIOUS MODES OF TRANSPORTATION**

The global supply chain network requires to rely on trust worthy transportation. Therefore, this requires to clearly understand what term globalisation mean. Globalization simply refers to the process through which various economies that includes affected societies become more closely incorporated. [27] further stated that with the increase in worldwide globalization, many firms and researchers have invested much in trying to understand its consequences. Globalisation as a phenomenon helps firms manage to integrate production, distribution and consumption of products which further creates the global market as one. The investment by firms towards transportation and technology creates an easy way to managing globalisation [32]. The following is a discussion of how globalisation impacts the transport sector:

#### **TRANSPORT STRUCTURE**

Investing into a global supply chain network due to globalisation and formation of global networks which are complicated sometimes are the reasons why transport demand has become greater and the required quality has become stricter than before [28]. Therefore, it should be noted that globalisation causes changes to the transportation needs in terms of structure and required volume. In many economically developed countries, transport needs are highly affected by serious evolution or turn around structure of manufacturing [4]. The transportation of raw materials especially from the

less developed countries requires a serious coordination of various modes transport to ensure a complete global chain network is effective. According to [9], the transportation of frequent small quantities of goods due to many firms have brought the increase in the usage of sea, air and road transport facilities. This is done in line with the principle of Just in Time (JIT) which has enhanced the increase in the transport needs.

#### **CHANGE IN STRATEGIES OF TRANSPORTERS**

The more the firm expands the global supply chain network, the more sophisticated the transport needs become. The advent of the globalization of trade and industry process requires that the global transport structures have to be developed into a combined and well-coordinated one network of great options of goods or products mass movements [13]. Due to the rise in the use of the global village concept, it has seen an advent in what is known as global transport corridors which has enhanced the creation of the transport infrastructure with an international character with similar technical needs making it so easy to use the same transport type and technologies [20]. Globalisation therefore, has brought about an increase in the investment of similar transport type and technologies in many economies to reduce the lead time while products are moving along the chosen global supply chain network to ensure quality is enhanced and customer satisfaction is achieved.

#### **STRENGTHS AND WEAKNESSES OF EACH MODE OF TRANSPORTATION**

The global supply network requires a coordinated and reliable transportation facilities. In order to know the transport mode to select, the performance criteria to use is; cost, frequency, completeness, dependability, capability and speed [29]. It should therefore be understood that all the transport modes chosen do possess both strengths and weaknesses. The following is an explanation of the strengths and weaknesses of each stated transport mode:

##### **Sea transport**

Sea transport is one of the common modes of reliable transport that has been used over many decades to deliver goods across many different countries. [30] state that, though good it might be, sea transport has both advantages and disadvantages. This all depends on the type of products that are delivered along the chosen global chain network.

### STRENGTHS

The following are the strengths of the sea transport:

- i. The sea transport offers the biggest or largest capacity to carry the goods from one country to another
- ii. There is little or completely no cost to maintain the sea for it is natural
- iii. The sea poses no threat of traffic congestion during transporting the goods and rare accident happenings

### WEAKNESSES

The following are the weaknesses of the sea transport

- i. An organisation cannot transport perishable goods because the mode of transport is slow
- ii. The sea transport is highly affected by weather and climatic changes
- iii. Instability in political situation in some countries and doesn't give the transporters room for possible extension of the new route to unserved areas.

### AIR TRANSPORT

Air transport is another mode of transport which has been used and trusted over a period of time. [30] further suggested the following as the strengths and weaknesses of air transport:

#### STRENGTHS

- i. The air transport is the fastest mode of transport the firm can never regret to involve in the global supply network and it no barriers which are physical in nature
- ii. It is the best mode of transport to transport perishable goods due to its fast nature
- iii. It is one of the most effective mode of transport to enhance the company's Just in Time (JIT) delivery strategy.

#### WEAKNESSES

- i. The air transport freight costs could be high and the capacity to carry many goods is limited as compared to sea transport
- ii. The air transport is also highly affected by weather and it is difficult to connect all market places with air transport
- iii. This mode of transport requires a lot of formalities which can be frustrating sometimes.

Total Quality Management (TQM) is defined as a strategy that essentially aimed to establish and deliver high quality products and services that cover all customers' demands and achieve a high level of customer satisfaction. TQM is defined as a strategy that essentially aimed to

establish and deliver high quality products and services that cover all customers' demands and achieve a high level of customer satisfaction. TQM is defined as a strategy that essentially aimed to establish and deliver high quality products and services that cover all customers' demands and achieve a high level of customer satisfaction.

### FUEL PRICES INCREASE EFFECTS ON GLOBAL NETWORKS

Globalisation is highly supported by the available modes of transport if it is to succeed. During the 20<sup>th</sup> century, the trade system changed from local into a global system which has been influenced by the advent of the global supply chain system [33]. The main problem of global transportation today is mainly the fuel costs. The fluctuation of fuel prices does have an impact whether directly or indirectly on any industry, let alone a 10% increase [16]. Therefore, an increase in the fuel price may affect businesses in that the company will be required to increase the order volume to reduce the cost of ordering. This would also force the company to increase its products which if not handled well would reduce the company's customer base. The companies should engage different modes of transportation with a clear understanding of which mode would carry more goods and still manage to deliver within the required lead time.

### OPTIMAL DISTRIBUTION FOOTPRINT OF THE SUPPLY CHAIN NETWORK DESIGN

In the recent past, the supply chain management has proven to be very important and has become one of strategic importance if the company is to become competitive which very much includes the quality and time of service delivery. [14] further states that the supply chain network design is at the cross road of different functionalities or disciplines like logistics, management, operations and strategic planning. Taking it from the operations view, the most viable supply chain network management design is simply a concerted discipline which is meant to help determine the require location and facilities which includes how easy the flow will be through the facilities [2].

However, intentions for the intermodal transporting of raw materials and final products should be well analysed because the product transported may require delivery within the minimum period of time especially for the perishables. This requires to have a well-designed and efficient logistics networks that could be used to determining the opening of distribution canter,

allocation of retailers and suppliers, the inventory levels as well as the routing of shipments in each period. The locations of the distribution centres are selected from a set of candidate sites at the beginning of the planning horizon, as these decisions are strategic [1]. The following are the factors that would determine the optimal distribution footprint of the supply chain network design for an organisation:

A simple logistic channel can be viewed as follows:



Logistics channel

### THE CONCILIATION OF MARKET DEMAND

When determining the favourable distribution network, the company should consider having knowledge concerning the product demand and the ability by the transporters to handle the product [8]. The availability of knowledgeable transporters matching the demand of the product depicts a good supply network.

### THE AMOUNT OF CAPACITY

The capacity by the supply chain members to hold the raw material and finished goods is an important factor to consider when determining the favourable supply chain design [11]. The supply chain partners should pose enough amount of capacity at the facility, for this would help manage to supply its products to its customers within the catchment area of the company's supply chain. This also helps to reduce the cost of supplying the products and distribute within the required lead time [8].

### ENVIRONMENTAL FACTORS

The environmental factor is one of the important factors to consider when determining the optimal supply chain. As stated by [30], the air transport used has the ability to disrupt the supply chain network effectiveness. Therefore, if an organisation continues trusting mainly the air transport with regards to the type of products the

company may be offering, this has the ability to make the company lose customers when challenged with the bad weather. The company should consider other modes of transport in its supply chain network design to overcome the disadvantages a particular transport mode which may encounter challenges.

### STORAGE INFRASTRUCTURE FACILITIES

According to [8], the availability of infrastructure, fierce competition, preferences of consumers, important logistics and costs of facilities are also major considerations when designing the supply chain network. In order to satisfy the customers even in the proposed new markets, the company needs to analyse the costs of facilities those markets and understand the fiscal policy of the nation. Nevertheless, it is important to ensure that more than one reliable storage facility (warehousing) site is maintained to ensure easy distribution of products to customers and reduce the cost of long-distance transportation [55].

### BUSINESS PROCESS ENGINEERING OF SUPPLY CHAIN NETWORK.

Many firms have for a long-time established system within the organisation to enhance the operations and satisfy the customers. Nevertheless, this concept has also been adopted and used across firms through the creation of business supply chain systems to try integrate the supply chain management [50]. Therefore, good management of the supply chain network should involve the development or creation of broad process ownership sometimes referred to as broad process ownership. The business process ownership in supply chain management requires integration which to a larger extent should include collective process or work responsibilities between customers and suppliers [74]. Business process ownership can only be realised through combined management effort based on the cost, quality, service and speed in the production of products and having common systems in the quest to promote the sharing of information [64].

The success of any supply chain management is having some deviation from the close management of functional areas to ensuring that there is an integration of all key processes in supply chain management [80], of which this needs a sustainable system of information flow [56]. Therefore, it is very difficult to have a successful product flow unless the firm implements a process system or approach. The supply chain network integration should be able to bring about ownership of the business processes. This can only be realised

by taking a realignment of company's operating frameworks, and this can be seen to bring harmonization between the internal and external functionalities of the supply chain network management [43].

Therefore, the question is what is business process ownership in supply chain management? It should be understood that the concept is not new and has been used for some time now. [45] defined the concept of business process ownership as a well-coordinated and quantified set of responsibilities with the clear view of satisfying customers. [82] further argued that business process ownership and management is simply a well-coordinated approach to carry out an evaluation of the currently practiced activities in the quest to have a continuous improvement of production, marketing and other functionalities to improve the company's operations [82].

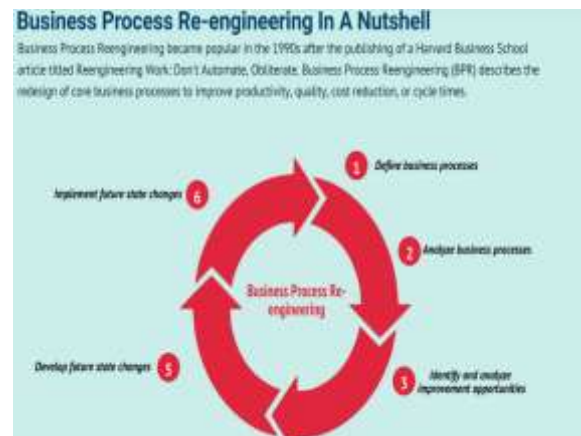
Owning a business process in supply chain management by an organisation should make the firm to become flexible and responsive in the supply to customers, hence achieving customer satisfaction [63]. The integration of the supply chain management through the re-engineering of the business process ownership should be for the real value creation if an organisation is to be competitive. Active management of the business processes through owning the activities at each stage of the supply chain requires the establishment or creation of sound relationships through supply chain network with other channel members, only this way has the potential to bring about efficiency and effectiveness in the supply chain [20] and the integration of the supply chain networks becomes the only hope for the success of business process [76].

#### **BUSINESS PROCESS ENGINEERING INNOVATION**

The activities within the supply chain network requires the channel members or the supply chain partners to embrace innovation if efficiency is to be realised based on cost control, quality management, service delivery and the speed at which customers are provided for with their requirement. The differentiation factor in having a superior supply chain network that has the potential to satisfy customers is one which is innovative [64].

Therefore, a firm should endeavour to get involved at every stage of the supply chain network through having access to information and control over activities. The important activities that are needed prior to the development of the business

process management of ownership in supply chain management is the development of a sound relationship between all supply chain members, an alignment of internal functions, encouraging a careful free flow of important and useful information which should include enhanced communication within supply chain [81].



Business process engineering in the supply chain network requires an investment in the technological infrastructure of an organisation and the development of the employee's skills [57]. Investing in technology will easily help the organisations within the supply chain network to easily manage the flow of materials from the suppliers up to the consumers and information from customers to the organisations.

Business process ownership requires that the firms have a clear management of the supply chain network to cover defining, analysing of activities and processes of the network, identification and redesigning, developing and testing, and the implementation and monitoring of the processes of the future state of changes for the network, which should include the transporters, reliable warehouses, retailers and targeted customer segments [55].

To fully understand whether the firm is in control of the supply chain, the work flow should be effective and efficiently managed. Business process ownership (BPO) can only be achieved or practiced when a firm is able to influence the channel members to participate positively in the satisfaction of customers. Therefore, the firm should develop a system that helps monitor the activities within the supply chain network especially if there is an engagement of a number of collaborating partners.

In an event an organisation has an assignment to handle, supply chain management should be evaluated and know how the consignment can be handled both the physical product and the



flow of information. When a firm wants to eliminate waste, it needs to own every little process by micro-managing the supply chain processes through what is known as a “lean supply chain” and an agile supply chain can be employed when the firm wants to have continuous improvements on the process by being flexible to changes [78].

### **EFFECTIVE STEPS FOR PROCESS SUPPLY CHAIN NETWORKS**

For an organisation to be competitive, it becomes important to choose the best supply chain network which has the ability to enhance the satisfaction of the customers. Therefore, the choice of the optimal supply chain network is dependent on several factors and its enhancement should follow the laid down processes to effectively and efficiently move the products while being fully in charge of the whole process [6]. Before selecting the best supply chain network, the following factors are to be considered:

### **THE ADOPTION OF STRATEGY MATCHING THE TYPE OF PRODUCT**

When selecting an effective chain network, it is imperative to fully understand the supply chain strategy the firm wishes or has been using. The strategy used will help select the supply chain members whose strength complements those of the company, that work in a synergy will bring about effectiveness in supply of goods and enhance customer satisfaction [73]. The type of the product and the stage it is on the product life cycle is also a major determinant when choosing the supply chain network. This is due to the fact that the characteristics of the products have an effect on the supply chain options used or available for an organisation [51].

### **CREATION OF CUSTOMER LOYALTY AND MARKET SECURITY**

Customers are believed to be the drivers of business especially the 21<sup>st</sup> century customer. [73] stated that a customer of today needs both a quality service or product and this should be available when needed. Therefore, the choice and design of an effective and efficient supply chain network also depends on the needs of the target customer group of the company [5]. The other important factor to consider is the market insecurity that could be brought by the environmental factors. It becomes important to understand the customer needs both current and prospective, and the changes in the market if the company is to satisfy the needs of its clients [58]. Therefore, the product lifecycle increases the market insecurity or uncertainty

because a product which is a current innovation and doesn't have a well-known way of distributing it will most likely bring about some challenges, hence this factor being important for consideration [70].

### **STEPS TO TAKE FOR FORWARD MOVEMENT TO THE SUPPLY CHAIN NETWORK**

In the supply chain network, the ultimate goal is to ensure that customers are satisfied. Therefore, what becomes of great importance is to ensure that the whole supply chain process is progressive by being effective and efficient [48]. For the process to move forward, there is a need to ensure that all the members that makes up an effective supply chain process are active and fully support the idea of satisfying the target customer groups through coordination. The following are supply chain touch points important to consider in the process:

### **SUPPLIERS**

The suppliers of products and services are required to manage timelines for the delivery to its customers and done efficiently and effectively [49]. In order to achieve this in the supply chain process for the value of customer satisfaction, it is important for the firm to select suppliers to be involved in the supply chain who fully understand the company objectives and are willing to remain committed to the support of the enhancement of customer satisfaction.

### **AVAILABILITY OF THE MANUFACTURING FACILITIES**

After selecting the suppliers who are able to support the company objectives, the firm should then see to it that there are manufacturing facilities near or within reach to have easy access to the needed products ready for delivery to the target customers [55]. The early access and engagement of responsible and efficient suppliers is one way of ensuring that the supply chain process is kept effective to the realisation of customer satisfaction. Failure to involve manufacturers who have a buy-in in the objectives of the firm, this may have an effect on the failure by the firm to enforce just-in-time delivery to customers. Therefore, the choice of effective manufacturers in the supply chain network has the potential to enhance the satisfaction of the customers hence improving the firm's profit margins [59].

### **STORAGE FACILITIES**

In order for the organisation to ensure that the supply chain process moves the supplies effectively, there is need to invest or outsource the best storage facilities so that products are safely stored ready for dispatch to the target customer [39]. The choice of the storage facilities should be to ensure that the network is effective and should be wholly dependent on the type of the products and customers. Therefore, the firm should invest in the storage facilities that seem to support the effective distribution of goods to the target customers. The storage facilities require constant reviews to ensure that it continues to be favourable and support the products in question [44].

### **CHOICE OF TRANSPORT**

After selecting the storage facilities, it becomes important to now consider the available transport facilities to complete the supply chain process. Depending on the type of products, the location of the manufacturing facilities, storage facilities and customers, the choice of the transport might be challenging. Therefore, an organisation should then choose and integrate the different types of transport facilities to ensure that there is constant and efficient movement of the products through the selected supply chain network [60].

### **DEVELOPMENT OF MULTI-STAGE STOCHASTIC OPTIMIZATION METHODS**

The development and design of an effective supply chain network should take full account of the needs of the target customer groups. The design of a good supply chain network should be taken as one with a strategic consequence especially during the time of variations and uncertainty in demand and supply [69]. The design of the supply chain network depends on the availability of capacity in terms of storage, transportation and skill. In trying to develop a good analytical multi-stage stochastic method in trying to improve the supply chain network, [44] discovered a very useful materials prerequisite directive for all relevant levels in the manufacturing or production scheme. The two authors therefore developed four (4) stochastic mini-models:

### **CONTROL OF MATERIALS**

The material control model is created to help recognise the required quantities of the materials to be ordered at a specific time period [6]. The quantities to be ordered is also affected by the acceptable intervals for reordering and the approximate time as expected for the supply chain network facilities to respond to the requirements as need come from the customers [46]. This model is

used during the development of the multi-stage stochastic optimization in that it enhances the provision of products within the required lead time and generating the bills of quantities given the fact that the firm should be able to be given a reasonable material response duration.

### **CONTROL OF PRODUCTION**

Control of production is a stochastic optimization model that [44] argued that for the supply chain network is to be effective and efficient, there should be an establishment of a system that should be able to correctly determine the sizes of production and acceptable lead time for all the product. This include the products the supply chain network deals with provided the response times for required materials is understood [65].

### **STOCKPILE OF FINISHED GOODS/ WAREHOUSE**

The stockpile of finished goods or simply the warehouse sub-model helps regulate the order size in a cost-effective way (economic). This model does the quantification for all the products individually with the use of cost information [52]. In order for the model to be of great use, it needs to have an input of the lead time of production and information concerning the customer demand. It should be noted that the customer demand varies from one customer segment to another, hence the need for a model which can reduce the uncertainties in customer demand.

### **DISTRIBUTION**

In an effective and efficient supply chain network, there is need to have enough distribution points if customers are to be satisfied through the practice of just-in-time. Therefore, this model through the establishment of useful ordering regulations or guidelines helps in the transportation of goods within the required time frame for each facility along the supply chain network [53]. Therefore, this sub-model is normally based on an input on the exact time the transportation or distribution facility is needed and information on the customer demand which includes the objectives of the company. Therefore, supply chain uncertainty may simply arise when decision concerning supply chain network does not address the logistics and distribution management adequately basing on resource capacity for effective measures to control [7].

## UNCERTAINTY AND SCENARIO MODELLING IN THE SUPPLY CHAIN NETWORK

When designing a working supply chain network, it is important to note that there are many uncertainties that if not handled properly, might make the firm fail to manage satisfy its customers. The proper approaches to designing an effective supply chain network should consider the availability of raw material suppliers and the adequacy of facilities to turn them into finished goods in readiness for delivery to customers within the required lead time [38].

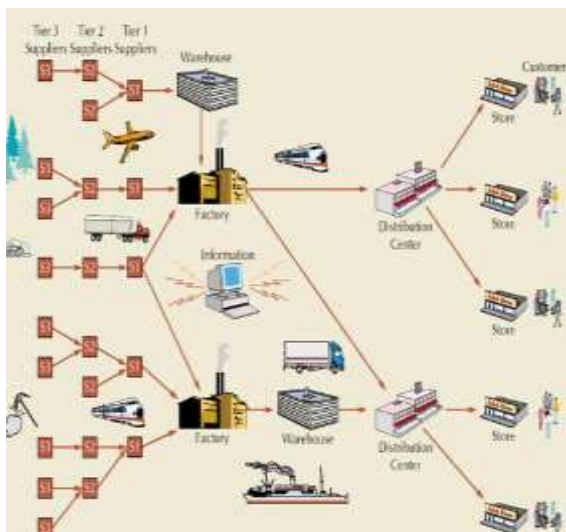


Figure: Supply chain networks

Supply chains may span thousands of miles across the globe, involving numerous suppliers, retailers, and consumers, and be underpinned by multimodal transportation and telecommunication networks.

The concept of enhanced supply chain network is important because of globalisation of the markets. In order to enhance competitiveness in the market place considering the company's intention to extend its supply chain network, there is need for the company to integrate the modes of transport to ensure efficiency of product transportation. Therefore, there are strategies that can be employed to study the uncertainties in the supply chain network and some are discussed below:

### SCENARIO APPROACH

The design of a supply chain network attracts a lot of uncertainty. Therefore, a firm can adopt the scenario approach which is of the view that situations or risks in the supply chain network should be taken differently and approached as they come, which further leads to controllable

optimization methods [75]. When using this strategy, it should be noted that a lot of stochastic dimensions do possess variations in the distribution with a lot of reliance on each other [36]. Uncertainties come in different ways at different in times, hence the firm can adopt the scenario approach to ensure that there is efficiency in the management of uncertainties. The management of uncertainties can be approached as a social science, which depends on the current happenings.

### MANAGEABLE STOCHASTIC PROGRAMMING METHOD

A well-planned stochastic approach is mostly commonly used in the confrontation of a possible eruption of a risk and cope with it in the supply chain network. Both the academicians and the professionals have come to terms with the newly developed approach under the stochastic approach known as "two-stage stochastic programming method" [37]. When using this approach during the design of a supply chain network, there is a speculation or determination of situations that might bring about uncertainty with the deliberate use of past information and the calculation of the incidence likelihood is correctly or accurately done [41]. [37] stated that during the use of this model, the first stage is normally costly as it takes a bit of some time for it sometimes involves the changing of many important things like facilities.

### SUPPLY CHAIN NETWORK THREAD FROM THE DEMAND SIDE TO THE SUPPLY SIDE.

The design of an effective supply chain network requires a consideration of important factors that do have an effect on every point or facility that of the network. The most important thing to factor in when designing the supply chain is the satisfaction of the customers [71]. The supply chain network on its own has nothing to do with evoking customer demand, for it only reacts or is activated through the establishment of supply chain strategies to actualise the just in time delivery to customers.

One very quintessential aspect of the supply chain management is that in the recent past, it has now become common and acceptable that competing on everything is no longer necessary, but businesses to operate in beneficial supply chains [7]. Therefore, in order the firm to be competitive and avoid falling into a strategic wear-out, it important to align the business with the customer needs and suppliers' capabilities, this can help realise the much-needed flexibility which further could enhance customer satisfaction [61]. Due to the available uncertainties in the supply chain network,

there is need to adopt flexibility measures to ensure that all supply channel stakeholders have the ability to respond within the required lead time to the demands of customers.

## INTEGRATION OF THE FRAMEWORK PROCESS

It should be recognised that the main driver to successful business management nowadays is a customer, hence satisfying the customer's needs becomes of primary importance. Therefore, firms should be able to develop frameworks that seem so sensitive to the needs of customers [79]. First and foremost, the important aspect of any business house is to have the ability to predict the demand from the clients or customers, this therefore has an implication on how the firm collects data about demand [47]. The collection of data from customers can be done through the use of technology and be able to make informed decisions by the suppliers within the supply chain network. If the demand side from the customers is understood by the supply side, collaboration becomes an important strategy [77].

In order for the supply side to respond favourably to the demand side, there is need for the integration of the process [72]. The integration of the supply chain process is only effective when there is collaboration by different players in the supply chain network. According to [47], when dealing with the demand side, there is need to fully evaluate the capabilities of the players found on the supply side if the supply chain network is to manage be flexible and deliver to the demand side within the required lead time. Therefore, there should be keen interest by the supply side to enhance the supply chain enablers such as the management of demand, management of supply chain and an effective management of information [47].

## FLEXIBILITY OF THE SUPPLY CHAIN NETWORK PROCESS

When demand from customers arise, the responsibility is on the shoulders of the firm to ensure that all the players in the supply chain network are made aware of the need to deliver the products. Therefore, it should be recognised that research has also been done on how best the supply chain network can be flexible enough to the satisfaction of customer demands [62]. The areas the supply side needs to fully concentrate on when trying to deal with the demand side with the view of satisfying customer needs are marketing management (helping in identifying the needs of customers through market research), procurement, production and transportation or logistical aspect

[77]. Failure to manage the demand side by the supply side would result in the loss of customers which eventually affects the profit margin of the firm.

## II. CONCLUSION

A proper design and re-engineering of the global supply chain network has become of great importance considering the need to ensure that the supply chain network has adequate storage facilities and locations to enhance the flow of materials to improve on customer satisfaction leading to the company's competitiveness. The design of the supply chain network should take recognisance of the demand side where customers belong. The important thing to do is simply encourage the supply chain players to create desired values that could bring about satisfaction to the customers. The satisfaction of customers can only be realised if they are given what they want at the right time. Therefore, supply chain flexibility becomes an important factor if value is to be created to customers. The choice of supply chain network members should include an analysis of their capabilities and capacities to handle the demand pressure.

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