UNIVERSAL SUPPLY CHAIN DISTRIBUTION NETWORK: A CATALYST TOWARDS GLOBAL CIRCULAR ECONOMY AND SUSTAINABLE BUSINESS PROCESS

Mohamed Haneefuddin

I. INTRODUCTION

Globalization has made changes in the business field across the worldwide. The exponential growth of the universal supply chains (consists of products, suppliers, distribution network and employees) which are international business and production networks, allows most efficient resource allocation of firms than the traditional supply chain. The expansion of information and communication technology (ICT), advancement in international logistics system and the trade fence reduction has contributed towards the implementation of economies via internet or universal supply chains. Resent adversities in the courtiers such as Japan and Thailand depicts that, advancement of universal supply chain not only helps in reducing the risk profile but also statistically enhances the economic vulnerability throughout the globe by superior direct and in-direct disaster risks.

The term "universal supply chain" has been exploited to narrate a sequence of the functional activities which are essential in the process of value creation that connects more than one country. The expansion of such chains results in the business activities at various stages of value creation such as research and development, design, production of parts, manufacturing process, marketing and branding, which are situated in different countries on the basis of where they are most efficiently produced/supplied. The characteristics of universal supply chains may depends on areas or location, they generally includes transportation of transitional inputs through successive countries within the universal distribution network system of transnational corporations. The target of the transnational corporations is to achieve the global trade from trade in ultimate consumer products (goods and services) to the trade in intermediate inputs through the universal production strategies.

Significant reduction in the trade costs has been achieved due to the rapid pace of development of universal supply chain in the last two decades. The international unbundling of production processes is depends on the precondition such as trade costs must be low enough to allow the firms to exploit country-specific compensation related to cost efficiency or market access.

A. Circular economy

Circular economy has attracted interest towards the vigorous economic model since the late 1970s. It has aimed at replacing the conventional linear production systems like take, make and dispose model. It focused on the efficient utilization of the resources as well as energy, the recycling of used goods and materials or waste and the sustainability of integrated product value chains, even across the countries. A circular economy can strategically cover a large range of global value chains and incorporates all of them into a non-linear, or circular, production system in order to optimize the efficiency of resources and production utilized in the system rather than looking for efficiency of individual components or functions separately within the value chain.

The main objects of the circular economy practice is efficient resource utilization in manufacturing and supplyprocess in terms of precise production, recycling of elements and products, management of wastes, biomedical

A'Sharqiyah University, Ibra, Sultanate of Oman
E-mail : m_haneef65@yahoo.com

feedstock, incorporated resource planning and eco-friendly industry development which focused on minimizing the utilization of natural resources as well as energy, minimizing the emissions of greenhouse gas and enhancement of recycling. From the circular economy practicesit has been estimated that more than a trillion dollars of global materials are saved per year.

The policies of government that encourages the enhancement of efficient resource measures in entire universal supply chain can bring changes for eco-friendly manufacturing, higher sustainability across the whole product life cycle and hence encourages move towards the circular economy. Since the 1990s, an adoption of circular economy concept was implemented in countries such as China, Japan, the Republic of Korea and Singapore as their national development strategies. Further, in the developing countries such as India, Indonesia, Malaysia, the Philippines, Thailand and Viet Nam have partially applying or planning for the circular policies (such as a legal structure for waste management). In the case of developing countries, circular economy development policies and associated legislative frameworks may take several years and there is a need of specific laws implementation in order to deal with the different issues like packaging, product design, materials and recycling.

B. Universal supply chain

The exponential increase of the competitions in the business field has created massive pressure for many companies in several industries. In such an ambiance, companies needs to search for the methods that involves designing and manufacturing of the new products, and also distributing such products in an efficient and effective way. In the last few years, companies has paid attention towards manufacturing process and associated operations cost reduction. Many companies are seeking distribution and reorganization of this issue as last boundary for cost reduction.

The supply chain management (SCM) is capable of dealing with the multiple relationships across the supply chain. SCM has its key significance in the logistic business enhancement, which expresses both the logistics functions and the interactions in along with the other functions of the firms such as marketing, operations, finance etc., and also represents the businesses outside the boundaries of the firm (Ballou, 2004).

During the last decades, organization dealing with production and distribution facing important issues related to the supply chain. If the company or organization is performing individual businesses then such organization no longer compete as independent entity. On contrary, forming a well definedsupply chains and networks of multiple businesses in conjunction with multifaceted inter-relationships can result in the smooth operation and flow of inputs and outputs.

Universal value added supply chains playsvital role in enabling the small and medium-sized enterprises (SMEs) to reaching the international markets and eventually facilitates them to improve their capabilities. Universal supply chain also helps to improve the sustainability of SMEs on the basis of level of sustainability of the lead firm. In the universal supply chains framework, SMEs are capable of entering into the supplier relationships together with the larger enterprises such as subcontracting arrangements which can specialize in limited set of activities and outputs within the universal supply chain framework, while accessing large regional and global markets. This would facilitate such firms to organize their products in the better way as well as enhances their technologies and skills. At the same time, universal supply chain also focuses on creating more demanding environment, in which the SMEs required to be perform in a more formal manner and also needs to improve their production methods as well as sustainable management practices.

C. Logistics system

In 1991, the Council of Logistics Management, an United States based trade organization has defined the logistics as the process of planning, implementing, and controlling the efficient, effective flow and

storage of goods, services, and related information from the production process to the distribution process for the purpose of affirming to customer requirements. This definition is invented in the military and is generally used. In United States, logistics costs comprise of about 30% of the cost of the products sold (Eskigun et al. 2005). In a logistics system, the highest expensive cost is distribution cost which is generally higher than the warehousing cost, inventory cost and order processing cost (Parthanadee&Logendran, 2006). The supply chain management has focused towards the distribution network due to the quick earnings and increased shipment rate, critical swing of transportation as well as regulation, the high shipping cost, and oil market uncertainties (Geoffrion et al. 1982).

Some of the important functions in the logistics are procurement, manufacturing, distribution, warehousing, inventory and information systems.Among these functions, distribution function is a significant in the whole logistics system, andsupply chain is the key link between the manufacturers and customers. However, distribution has its direct impact on both the logistics cost and the customer experience hence it is the major driver of profitability in a company (Chopra, 1993). Furthermore, to reduce the cost of the distribution, companies has considered a various methods and hence aimed at reaching the objective of reducing overall logistics and supply chain costs. The success of the company depends on the satisfaction of customers by means of key factors such as product features, quality and price (Robinson et al., 1993).

D. Distribution network

Distribution is referred as the processes involved in transmitting and storageof products from the supplier end to the customer end in the supply chain. The entire profitability of the company depends on the distribution network, since it directly impacts on both the supply chain cost and the customer experience. A well-designed distribution network is efficient for achieving large number of logistics and supply chain objectives, ranging from low operational cost to high customer service level. Accordingly, companies in the similar industry frequently choose extremely different distribution networks. Stewart, 1965 mentioned distribution is explained as "the Economy's Dark Continent" and it is probably final frontier for reduction of cost in the United States. This is even more appropriate in the present business atmosphere, since it has becomeexponentially complex to reduce costs of raw material and labor.

Distribution network is nothing but the flow of products as well as information from producers to customer. Distribution networks plays significant role in the retail outlet. The product and information should be managed by the manufacturer to flow from the manufactures to customer as well as customers to manufacturer. It depicts that distribution network is operates like buses which controls the distributors in terms of products and information

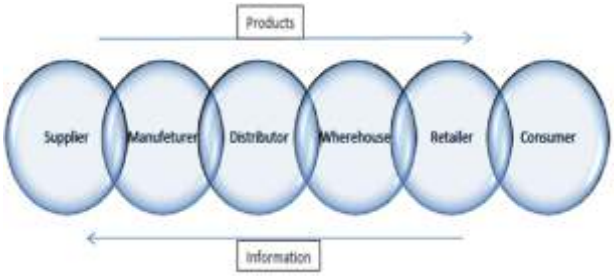

Figure 1: Distribution network

A wide range of activities are performed by the distribution network by means of procurement, logistics, warehouse, and inventory and customers order.

· ***Cycle view***

A distribution network mechanism can be split into various cycles each of them creates relationship with one another in the cycle view. The cycles of distribution network are:

- Renewal cycle (retailer distributor)
- Developed cycle (distributor manufacturer)
- Procurement cycle (manufacturer supplier)

Cycle view clearly explains the role and responsibilities of the network and they can easily find the outcome of the network.

A. Supply Chain Distribution Network design

Supply Chain Distribution Network (SCDN)

design includes strategic decisions based on the number, location, capacity and mission of the manufacturing and transmitting services of a firm, or of a set of collaborating firms, to provide goods to a predetermined, but possibly evolving, based on consumer. The decisions on the selection of suppliers, subcontractors, third party logistic providers (3PLs) and based on proposal to build product-markets, may also be included.These strategic decisions must be made temporarily, however after implementation period; the SCDN will be utilized on a daily basis for a long planning horizon needs. The flow of products in the network along with related costs, revenues and service levels is created due to the everyday's procurement, production, warehousing, transportation and also from demand management decisions. In addition, under uncertainty conditions, strategic design decisions are made in order to prolong the SCDN design for the several years. A performance measure is another important issues, which is used to estimate the quality of the designed network. In this context, return on investment measures, such as the Economic Value Added (EVA), are frequently exploited by strategic decision makers, however, design robustness is also taken into account as an significant dimension. In spite of considering a survey on the SCDN design problems, most of the currently available models consider only a subset of these issues.

This paper analyses the design issues of SCDN under uncertainty, and the availability of the models that supports design mechanism. It notices the some limitations and missing links in the literature, and inspires to develop auniversal SCDN design methodology. In addition, from the analysis of supply chains (SC) uncertainty sources and risk exposures, it evaluates the crucial environmental factors and discuses features of major disruptive events threatening SCDN. Furthermore, evaluation criteria of the appropriate strategic SCDN design are also discussed in this paper. It reveals that in order to assure the sustainable value creation estimation of the robustness of SCDN is essential.

B. Factors Influencing Distribution Network Design

The distribution network design has its great impacts on cost and service level of the supply chain. From the Chopra's suggestion in his article "Design the distribution network in a supply chain" (Chopra, 2001), the distribution network practices can be analyzed by considering two dimensions:

- The consumers requirements that are met or the customer service level (it influences on the revenue of the company)
- The cost of meeting the customers expectation (it resolves the profitability of the company)

The key factors of the customer service that are influenced by the distribution network are (Chopra, 2001):

- Product variety (different range of products/configurations provided for the customer)
- Response time (time between the customer's order placement and receiving delivery)
- Product availability (The probability of having stock of products while receiving order)
- Customer experience (The facility with which customer order is fulfilled)
- Order visibility (Customer's tracking ability of the ordered products from the delivery place)
- Returnability(The ability of the network to handle returns of unsatisfied products by the customer's)

The factors that affects on the cost of supply chain are:

- Inventory
- Facilities and handling
- Transportation
- Information

These factors are taken into account while considering the distribution among the any other pairs of stages, such as supplier to Manufacturer. There are various design options for a distribution network. In order to have a more accurate and detailed classification scheme, Chopra suggests a classification on the basis of two key decisions:

1. Weather the merchandiseis delivered to the customer'splace or picked up from a preordained site?
2. Weather product flowsvia an intermediary (or transitional location)?

On the basis of above two decisions, there are six distinct distribution networks that are classified as follows:

1. Manufacturer storage with direct shipping (MSDS)
2. Manufacturer storage with direct shipping and in-transit merge(MSDS-IM)
3. Distributor storage with package carrier delivery (DSPCD)
4. Distributor storage with last mile delivery (DSLMD)
5. Manufacturer / distributor storage with costumer pickup(MSCP)
6. Retail storage with customer pickup (RSCP)

Manufacturer storage with direct shipping or drop shipping

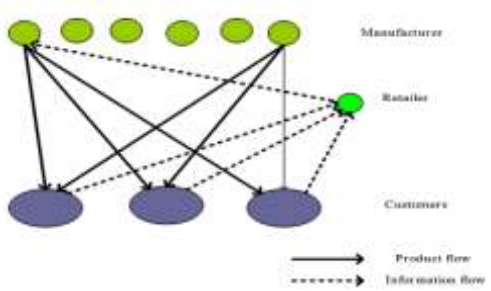

Figure 2: Manufacture storage with

direct shipping (based on (Chopra, 2001))

The characteristic of this distribution network are:

- The product is directly shipped from the manufacturers to the customers without mediators and information from customers flows via the retailers and then to the manufacturer as depicted in Figure 2.
- The product availability is enhanced by the manufacturer through centralized inventory and thus permits the retailers to keep low inventory cost. The centralization offers the major benefit with high value products with low quantity and unpredictable demand.
- Transportation costs are high, due to the package transporters utilization which involves higher shipping cost.
- More deliveries are needed with the drop shipping in order to fulfill the customer's order.
- Handling costs are lower as it facilitates direct delivery
- The information infrastructure is required to provide the product availability information to the customers by the retailers even though inventories are centralized at the manufacturer.
- A well organized information infrastructure enables the customers to track the ordered products from processing at the manufacturer.
- Response time is longer, since the order has to be transmitted from the retailers to the manufacturer and the distance from the centralized inventory is longer.
- Wide range of product variety is assured by the direct shipping.
- Returnability is complicated in direct shipping distribution, since each order might involveshipments from several manufacturers.
- Direct shipping would be well suited for the high value items, which consists of low demands and broad varieties. It also provides benefit when the order is coming from few sourcing location.

1) Manufacturer storage with direct shipping and in-transit merge (MSDS-IM)

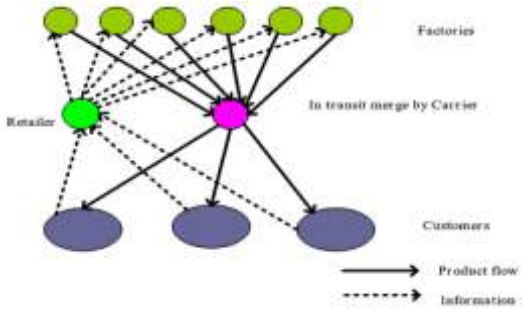

Figure 3: Manufacturer storage with merge in transit (based on (Chopra, 2001))

The characteristic of this distribution network are:

- In this network, single delivery is received by the customers. Since, each product in the order is not shipped directly to the customer, instead there is a combination of the pieces of the order coming from different suppliers. The flow of goods and orders is illustrated in Figure 3.
- This network is good for the high value product, whose demand is not predictable.
- Due to the single deliveries of product, the transportation costs are low.
- This network requires the complicated information system, huge coordination and order visibility is fundamental.
- Compared to the direct shipping, there is a enhancement of performances regarding response times, product availability and product variety while returnability is similar.
- The major benefits of this method are lower transportation cost and higher

customer service level. Hence it is utilized for low to medium order size, high value products coming from a limited number of suppliers.

1) Distributor storage with package carrier delivery (DSPCD)

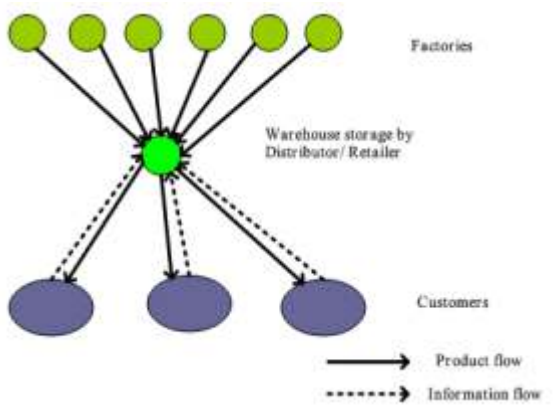

Figure 4: Distributor storage with carrier delivery (based on (Chopra, 2001))

The characteristic of this distribution network are:

- Inventory is performed in intermediate warehouse through distributors or retailers and merchandise are delivered from the intermediate location to the customers by the package carriers which undergoes transportation of goods from one point to another as depicted in Figure 4.
- This network requires the higher level of inventory, because the demand uncertainty is aggregated by the distributor/retailer warehouse to a lower level rather than the manufacturer.
- Distributor storage has low transportation costs, since it consists of economic mode of transportation such as truckload which is utilized for inbound shipments to the warehouse. Further transportation cost is reduced by combining outbound orders into a single shipment to go out for a single customer order.
- Distributor storage consists of large facility costs due to lower level of aggregation.
- Distributor storage requires less complicated information infrastructure and distributor warehouse exist between the manufacturer and the customer reduces the need of coordination.
- Distributor storage network guarantees the real time visibility between customer and warehouse at lower cost.
- Since the warehouse is situated closer to customers hence the response time will be lower and the order is aggregated.
- Product offering range is limited by the warehouse storage. Customer convenience and order visibility in the distributor storage is easier since it involves the single shipment of the customer's order from the warehouse.
- Distributor storage network mainly performing at the warehouse stage, hence returnability is much easier.
- Distributor storage with carrier delivery is well fitted for medium-fast moving items, in which customer expecting a faster delivery.

1) Distributor storage with last mile delivery (Home delivery) (DSLMD)

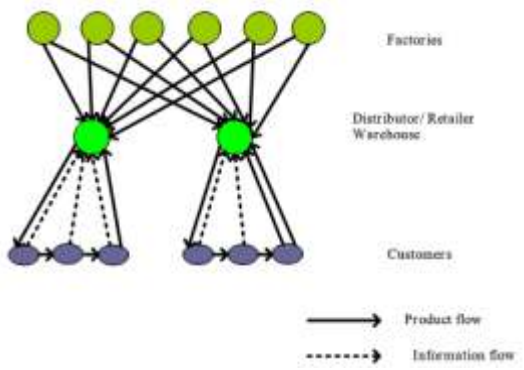

Figure 5: Distributor storage with last mile delivery (based on (Chopra, 2001))

The characteristic of this distribution

network are:

- In this network, product is directly delivered to the customer's home by the distributor/retailer without exploiting any package carrier and warehouse is situated much closer to the customer. However, it requires huge number of warehouses. The flow of products and orders is illustrated in Figure 5.
- The inventory level is high since it adopts lower level of aggregation. Hence this network is well suited for rapid moving items for which disaggregating demand doesn't imply increased inventory.
- Last mile delivery has high transportation cost due to the loss in economies of scale.
- The facility and processing costs are high are high since it needs huge facilities.
- Last mile delivery requires a additional capability of information infrastructure for scheduling delivery.
- This network has better response time and provides best returnability since truck which is used to delivery can also pick up the returns from the customer.
- This network has lower product variety and availability of product is very expensive.
- The customer experience is good particularly in case of bulky and hard products.
- Last mile delivery is well fitted for the large product orders and customers expecting convenient home delivery of the orders. The efficiency of the existing network is enhanced by coupling the last mile delivery along with it.

Manufacturer or distributor storage with customer pickup (MSCP)

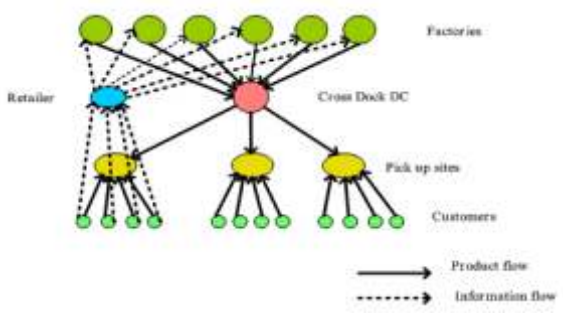

Figure 6: Manufacturer or distributor warehouse storage with consumer pickup (based on (Chopra, 2001))

The characteristic of this distribution network are:

- In this network, inventory is held by manufacturer or distributor warehouse,where the customers ordering the products via phone or online and comes to collects their orders from the specified pickup pointsas illustrated in Figure 6.
- In the customer pick network, depending on the situation, facility cost varies. If new pickup site is established then cost is higher while the cost is lower if they already exist.
- Processing costs at pick site are higher due to the fact that when the order arrives, it must be matched with the proper customer.
- This network requires the complex information infrastructure and a very good coordination between retailer, storage location and pickup site to ensure the order visibility.
- Manufacturer or distributor warehouse storage with consumer pickup network has comparable product variety and product availability.
- Customer experience is moderate since the customer has to pick up their orders.
- Order visibility is the key issue in this network, since customers cannot see the orders as they are informed to

pick up once their order is arrived. It involves a strong integration within the supply chain.

- Returnability of the order to the pickup site is easier to customers using the delivery trucks which are used for transportation.
- Wide range of products could be sold as the delivery cost is lower and larger number of customers could be served through this network.

Retail storage with customer pickup

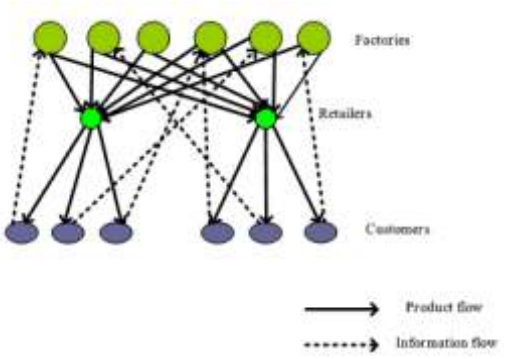

Figure 7: Retail storage with customer pickup (based on (Chopra, 2001))

The characteristic of this distribution network are:

- In this network, products are ordered by the customers through the telephone or online or also by visiting the retailer store and collects their order at the retailer store. The flow of goods and orders is illustrated in Figure 7.
- Due to the local storage, this network is lacking in aggregation, hence inventory cost is high. Thus this network is utilized for fast moving items
- Retail storage with customer pickup has low transportation cost and returnability is easier because it can be handled at pickup site with the low-cost transportation.
- Facility cost in this network is high due to requirement of huge amount of facilities.
- Orders are placed by visiting the retail store; henceinformation infrastructure is simple while it is complicated for online orders which need visibility.
- Since this network contains local storage, it has very good response time, however product variety is reduced and a large range of product availability is expensive.
- In addition, order visibility is complicated particularly for the telephonic or online orders.

Comparison of Performance characteristic of networks is given in the below Table1.

TABLE 1: COMPARISON OF PERFORMANCE

Cost Factor	*Performance*					
	MSDS	MSDS-IM	DSPCD	DSLMD	MSCP	RSCP
Inventory	Low costs	Low costs	Higher than drop shipping	Higher than DSPCD	Medium	Higher
Transportation	High	Lower	Low	Very high	Low	Lower
Facilities and Handling	Low	High	High	Medium	High-for New Low-for existing High-handling cost	Higher
Information	High	High	Low	Low	High	High
Service Factor	*Performance*					
Response time	Long	Long	Faster than drop shipping	Fast	Fast	Fast
Product variety	Very high	Very high	High	Medium	Medium	Lower
Product availability	Easy to provide	Easy to provide	Difficult	Difficult	Easy to provide	More difficult
Customer experience	Good	Better than MSDS	Better than drop shipping	Very good	Not good	Good or bad, depends on cases
Order visibility	More difficult	More difficult	Easy to provide	Easy to implement	Difficult	Difficult for online and phone orders easy for in store orders
Returnability	Difficult	Difficult	Not expensive	Easy to implement	Easy	Easy

CHARACTERISTIC OF NETWORKS

G. Current dynamics in distribution networks

Based on the demand for sustainability, modern industrial networks are undergoing basic reorganization in various ways (e.g. Narus and Anderson, 1996; Walters, 2008). In this paper, it is focused on how the distribution arrangements in these networks fulfill the demand of sustainability. The fundamental mechanism of the distribution has been expressed as "bringing together the heterogeneous supply on the one hand and heterogeneous demand on the other" (Alderson, 1965:200). This task is almost similar however; the concept of 'bringing together' can be changes. A new distribution strategy is accomplished through the technological enhancement in the logistics, manufacturing, and in the information exchange. These alternatives are exploited by the both customers as well as suppliers to enhance the efficiency and effectiveness of these arrangements.

One of the major modifications of distribution is a shift away from mass-distribution towards individualized solutions regarding particular customers (Wilson and Daniel, 2007). This is basically resulted from the valuation of the resources in which the significance of large-scale operations has been reduced. Based on the efficient logistics has made in distribution network, production lead-times of the flexible manufacturing systems is shortened. Eventually, it has become possible to design customer-tailored distribution solutions at reasonable costs and delivery times. Thus, these modifications lead to an enhancing customization of distribution network which signifies the dynamics in the resources.

Increased customization and lower reliability of the mass-distribution will directly impacts on the distribution network. One of the enhanced customization is the "Just-in-time delivery". Such arrangement is created by tight synchronization and increases the interdependency among activities. Another impact of reduced lead-times and enhancement in information exchange is an increasing attention to build-to order production (Gunasekaran and Ngai, 2005). These arrangements are also requires the extensive coordination because of buffers through which inventories will be reduced. As a result, the distribution network concern with major dynamics such as increasing the independency.

Customization as well as activity interdependence influence on the distribution network. Customization requires a number of distribution solutions and suppliers design, where 'multi-channels' has become a significant strategic issue (Weinberg et al., 2007). In order to cover the distribution gap, participants in these arrangements should be specialized in different ways. Development in the technology has facilitated opportunities for the different specialists, for example 'information brokers' in the flow of information and logistics service providers in the flow of goods. Thus increasing the specialization in the network is another dynamics in distribution network.

From the offer mentioned modifications, the distribution has become an increasingly complex issue. In a channel of intermediaries, bringing together of heterogeneous supply and demand is not only a matter of managing 'finished' products. There is no 'finished' products ready to be channeled out because of customization and built to order. Instead of considering the total supply chain requirements, frequently returns to component level. Hence, 'distribution' nowadays is often hard to distinguish from 'production'. For example, final meeting is often performed at 'distributors' close to customers. Modern distribution networks, therefore involves the types of activities, for example production, not traditionally considered distribution activities.

The current dynamics of the distribution network s are thus assumed to affect, and be affected by, efforts aiming at enhanced sustainability. In this paper, three sustainability dimensions are differentiated between Material consumption, Transportation work and Facility exploitation. Material consumption concerns about the issues relating to the utilization of natural resources such as use of raw material,

handling of scrap and waste, and energy use. In addition, issues related to opportunities for recycling, reuse, disassembly and remanufacturing are considered. Transportation work refers to ways of transporting the products and specifically this involves issues related to utilization of fuel and rates of emissions of CO2. Facility exploitation is concerned with features relating to economies of scale, such as fuel-rates in transportation facilities and the degree of exploitation of distribution resources in terms of for example distribution centers.

I. LITERATURE SURVEY

A. The principles of circular economy

The main objectives of the circular economy are to maintaining the maximum utilization and value of the products, components, and materials at all times. (Ellen MacArthur Foundation 2013b) It works based on the 3R principle namely Reduce, Reuse, and Recycle. The first R corresponds to reducing raw materials consumptions in order to optimize the utilization of by-products, waste, or recycling of discarded goods as the key source of resource materials. This in terms reduces the pollution produced at each step. The second R signifies the reuse, which represents the extension of product usage time, or delaying its end-of-use. This specifies that the product is utilized again for the same purpose with slight modification or enhancement in its original form. In this stage, the manufacturing of long lasting products that can be renovated, repaired or easily recycled is therefore necessary. The last R represents recycle which signifies the recovery mechanism through which waste is reprocessed into new products, materials, or substances. Both the reuse and recycling is the alternative for the consumption of raw virgin materials (European Parliament 2008, 10; Loiseau et al. 2016, 365; Sauvé et al. 2016, 53).

In the circular economy, recovering the material is essential; Ellen MacArthur Foundation (2013b) has deployed additional three principles. The first one specifies appropriate design which focuses on the significance of the design stage where products are designed for a cycle of disassembly and reuse. Second principle represents the materials reclassification as the biological nutrients and technical ones. Biological nutrients can be returned to biosphere or in a cascade of consecutive uses without any adverse impact to the environment. Materials such as metals or plastics represented as technical materials are designed to be re-used at the end of the life cycle. The Third principle represents the stresses on the renewable energy usage as the major energy resource to run the circular economy. This may causes minimized resource dependence and larger system resilience towards negative effects such as increased input costs and price volatility, and lack of supply. (Ghisellini, Cialani&Ulgiati, 2016, 16; Ellen MacArthur 2013b, 7)

B. Linear versus circular economy

In last few years, awareness about the circular economy has increased, and in present days it is taken into account as the solution for environmentally damaging production and utilization pattern (Baojuan&Zu, 2007, 760). It represents the economic development model by considering the shortage of raw materials and energy (Dahlbo et al. 2016, 37). The issues related to the resource reduction and wastage of products through combating against throwaway –mindset and 'take-make-consume-dispose' behavior of linear economy (Lieder & Rashid 2016, 37). This system can be restorative and regenerative through the intention and design process (Ellen MacArthur Foundation, 2013b, 7).

Usually, an economic activity performed in a loop, where the natural resources are originated from the earth and absorbs wastes and pollution. Figure 8 distinguishes the predominant linear economy model and circular economy model. Linear economy consists of simple process; extract, produce, consume, and trash as shown on the left side of the Figure 8. At each step the ecological concern is neglected which results in huge extraction of virgin resource, waste, and pollution. Linear economy is an open-ended system from extraction to disposal. In this

approach, the wastes obtained from the extraction, production process, and the post-consumption are cleared by burying or dispersed in ways that causes the environment pollution. In fig 8, circular economy is presented on the right side; it creates coordination between the resource utilization and waste management under consideration. In circular economy system, terrestrial limitations are taken into account via resource preservation and through maximizing exploitation of existing resources within the economy (EEA 2016, 5). Circular economy comprises of alternative closed loops within the production system and utilization planning to optimize the usage of virgin resources and hence reduces the waste and pollution at each step. (Andersen 2007, 134; Habibi, Battaia, Cung&Dolgui 2016; Sauvé, Bernard & Sloan, 2016, 50).

Figure 8:Linear economy versus circular economy (Sauvé, Bernard & Sloan 2016, 50).

A. Three levels towards circular economy

Circular economy practices can be implemented in three levels such as macro, meso and micro levels. Micro level is applicable for the countries, regions, and municipalities stimulating sustainable production and consumption and targeted at creating a recycling oriented society (Geng, Fu, Sarkis&Xue, 2012, 217). For example, since 2002, in China circular economy has integrated into national policy for sustainable development (Singh and Ordoñez 2016, 343).In contrast, circular economy is utilized as a bottom-up environmental designing tool and waste management policies (Ghisellini et al. 2016, 11). Therefore, government's regulatory framework provides clear indication to economic operators and society for the effective implementation circular economy (European Commission 2015, 2). European Union (EU) consists of an action plan for the evolution of circular economy. On the basis of this action plan (European Commission 2015, 2), competitiveness of the EU will be enhanced through circular economy by protecting businesses against the scarcity of resources and volatility of the prices. It will initiate promotion of innovativeness in order to determine the high efficient approach of production and consumption, thus helping companies to establish new business opportunities. In addition, it will generate new job opportunities and supports for integration and cohesion in the society without neglecting the ecological factors such as energy savings and resource conservation. (European Commission 2015, 2) In order to encourage development of sustainable business, most of the developing countries have deployed different environmental regulations called Extended Producer Responsibility (EPR). EPR is an environmental policy scheme that targets on the post-consumer stage of a product's life cycle. EPR policies place the financial accountability on to the consumer products manufacturer which requires companies to manage the end-of-use actions of their products efficiently and effectively. In order to consider the environmental impactswhich includes actions such as reduction in material consumption, use of more secondary material, and promotion of product eco-design in their product design, EPR provides incentives to producers. The fundamental objectives are to enhance the range of product recovery activities and reducing the environmental impacts of waste materials (Johnson & McCarthy 2014, 10; Pires et al. 2015, 343).

Circular economy practice at meso level is the various networks. Example of this level is international Circular Economy 100 (CE100) programme of Ellen MacArthur Foundation, in which many companies has considered concept of circular economy as an approach for collective problem solving. Thus this concept is exploited as a framework for the business to employ sustainability activities within (and

beyond) their entire supply network (Genovese et al. 2017, 345). In order to speed up the transition to a circular economy, leading companies innovators and regions are bring together by the CE100 (The Foundation for Circular Economy 2015).

Micro level represents the organizations. At the firm level, eco-design and eco-production strategies, and events such as green supply chain management are taken into account (Geng et al. 2012, 217). While the responsibility of the sustainability of economic development is shared by the governments, businesses, and consumers, especially the role of the corporate is most relevant (Rauter, Jonker& Baumgartner 2015). The offer mentioned circular economy principles reveal the aim of achieving the sustainable supply chain management practices which are certainly involves the reduction of adverse environmental effects due to the flows of materials and resources between different entities (Genovese et al. 2017, 345 - 346). In addition, companies such as influential global actors having the financial and technological resources and institutional capability in order to find solutions for the issues.

B. Sustainable business – triple bottom line

In recent years, sustainability has become one of the key factors in a successful business (Yang, Evans, Vladimirova& Rana 2017). It mainly aims at addressing issues related to environmental and socio-economic and future generations (Witjes& Lozano 2016, 37). The majority of current conceptualizations contains three dimensions of sustainability, that is, balancing between social equity, economic growth, and respect to the environment (Figure 9).

Figure 9: Three pillars of sustainability (Molamohamadi et al. 2013, 278).

Circular economy handles environmental sustainability as well as socio-economic issues by permitting economic growth within natural resource limits (Witjes& Lozano 2016, 37). Thus, companies are required to be adopt a long-term horizon in order to practice sustainable development and allow the economic growth sustain the social progress and the environment (Caniato et al. 2012, 660). Innovative way of business practices are essential to shift towards the circular economy (Ellen MacArthur Foundation 2016b). It requires modification in the industries profit acquiring approach. One of the major challenges in the manufacturing companies is to adopt business models which intend to get profit from the existing resources. (De los Rios &Charnley 2016, 4) Business model represents the capability of the firm to get the profit by serving products and goods (Boons &Lüdeke-Freund 2013, 9). It defines the ability of the company to creates, captures, and delivers value. Business model involves new innovations in creating the value for customers and captures how to create value. Hence it is completely new business method implementation (Yang, Evans, Vladimirova& Rana 2017).

A. Supply chain management

In Today's social life, supply chain activities are plays vital role, and hence it is a fundamental to conquer the sustainability issues (Abbasi& Nilsson 2012, 517). Determining the solutions to implement sustainable supply chain strategies to circular economy and considering full environmental and economic effects for this are thus become significant (Genovese et al. 2017, 345; Nasir, Genovese, Acquaye, Koh&Yamoah 2016). Sustainable supply chain management consists of managing material, information, and flows of resources together with cooperation among participators along the supply chain, at the same time it considers the goals from all three dimensions of sustainable development which are obtained through requirements of customer and stakeholder (Seuring and Müller 2008, 1700).

Relationships of supply chain play a vital role in achieving the firm's goals. The supplier's coordination and incorporation of activities and giving importance for needs of the customer's enhances the profit of the companies. According to Fraza (2000), supply chain management is directly linked with the relationship management, which contains suppliers and customers. The major components in the supply chain management practices are strategic partnerships of suppliers and customer relationships (Li et al., 2005), which is most important for the information sharing and it is one among the five pillars in achieving a solid supply chain relationship (Lalonde, 1998).

· *Closed-loop supply chain*

The general form of the conventional supply chain is also called as forward supply chain which is commonly used in linear economy that ends with final delivery to the end customer. Thus, it does not consider the state of the materials and goods after the use, whether they are no longer required or necessary, they are out of date or not working. (Blumberg 2005, 6) Through the implementation of concepts such as reverse supply chain management and reverse logistics can adapt circular economy principles to conventional supply chain management. Reverse supply chain management is the activities needed for the retrieval of used product from the market to recover, recycle, or dispose it, where as recovery refers to reuse process of the collected used goods or materials from the market with the intention of reducing the waste flows to the landfills. (Pedram, Yusoff, Udoncy, Mahat, Pedram&Babalola 2016)

Reverse supply chains consists of two types; open-loop and closed-loop. In open-loop supply chains the recovering of materials are performed by the third party who can reuse the materials or products. On the other hand, in closed-loop supply chain, it collects the end-of-life products from customers and returns it to the original manufacturer for suitable recovery processes (Govindan&Soleimani 2016). Closed-loop supply chain management is defined by Guide and Van Wassenhove (2009) as "the design, control, and operation of a system to increase the value creation over the complete life cycle of a product with dynamic recovery of value from different types and volumes over time" (Guide & Van Wassenhove, 2009, 10). The actors of reverse channels in the closed-loop supply chain network may also include the members of the forward supply chain like conventional manufacturers or from the specialized organizations such as secondary material dealers and material recovery facilities. Such distribution is significant, because it finding out whether the reverse distribution channels can be incorporated into forward distribution channels. (Yi et al. 2016, 191)

B. Distribution and its network

Distribution contains a wide range of activities over a complex network. A large number of definitions of distribution are available in the literatures. According to Bowersox, 1969, distribution is a business activity which is related to transportation of products or raw materials in a system that they appear at the designated place, when required and in usable condition, however the location of the origin or destination points are not taken into account. According to Brandeau et al. 1989, distribution is the steps involved in storing and transporting products from the supplier stage to the customer stage in the supply chain, where two stages are explicitly considered such as supplier and customer. There might be more than two stages in the distribution network, such as a consolidation, break-bulk, or cross-dock distribution centers (DCs).

The functions of the distribution are to provide a company with the possibility to achieve product delivery at a right time, to the right place, and with the right quantity at a minimum cost (Bucklin, 1966). They major actors of the distribution network generally consists of manufacturers, intermediaries (wholesaler, retailer, specialized) and final customers (Coughlan et al., 2006).

Distribution in a broadest sense, when it refers to the whole economic system is explained as the allocation of income and assets

within one society. In business economics, distribution is referred as the allocation of goods to the beneficiaries. Generally, distribution contains each activity that is related to transportation of material and/or economic power over tangible and/or intangible goods from one economic subject to another (Wirtschaftsleyikon24.net, 2011).

Thus, Domschke and Schield emphasized that distribution includes a system of all activities that are corresponds to the transfer of economic goods among the manufacturers and consumers. These synchronized preparation of manufactured goods are included in it based on their type and volume, space and time, as a result the supply deadlines can be fulfilled or estimated demand can be efficiently satisfied (when producing for an anonymous market)" (Domschke&Schield, 1994).

Distribution systems are generally divided into:

(a) Acquisition distribution system

(b) Logistic, i.e. physical distribution system.

G. Specht has noticed that the division of distribution system is entirely not accurate, because both of these subsystems show certain common starting points. According to this author, the distribution routes management i.e. distribution network is involved in the acquisition distribution system management, where as logistic distribution network system is emphasized on connecting the space and time through transportation and storage, order processing and shipment,and supply logistics, i.e. the movement of materials (compare Specht, 1988, 34-35).

Since 1970s, the term "distribution channels" has replaced by the term "marketing channel". It has been used in USA as a more complex term, because the intermediaries include both the participator in the physical flow of a product from the producer to the final customers and the participators who involved in the function of transfer of product ownership, and other intermediary organizations that involved in the distribution from production stage to consumption stage.

Hence, it is assumed that there exist three types of marketing channels such as communication channels, distribution channels and service channels (Kotler & Keller, 2008, 26). Distribution or marketing channels are mutually dependent organizations incorporated in the manufacturing process of goods or services that will be available for use or consumption. Furthermore, a marketing channel is the external contractual organization which operates to achieve its distribution objectives (Rosenbloom, 2004, 8).

A supply chain can be visualized as significant network, which comprises of interconnected entities of several types (Kotzab, Bjerre, 2005). The function of distribution network in the supply chain management is to deliver goods or products to customers. From the certain point of view, material or goods transportation from suppliers to a factory and from a factory to customers are almost same or very approximate approach. Since, in both the cases, the intention is to move the product or goods among the various locations under certain constraints. In such network, through the orders each transaction is initiated. Each order primarily includes order lines, quantities, addresses and time information. The benefits of the logistics system is that it provides information regarding the delivery possibility, status of processing, due dates, tracking and tracing articles and shipments, and facilitates extra services like inventory management, scheduling of supplies, invoicing, reminding and others (Gudehus, Kotzab, 2009).

C. Distribution Network design

A large number of researches have been made in distribution network design. (Francis et al., 1983; Aikens, 1985; Brandeau and Chiu, 1989; and Avella et al., 1998; Jayaraman, 1998) have studied issues related to the capacitated warehouse location that consists of locating a given number of warehouses in order to satisfy customer demands for various products. The same issue is extended by Pirkul and Jayaraman, 1998 by taking into account of localization of a given number of plants. They

constructed this issue as mixed integer model and developed an heuristic solution procedure based on a Lagrangean. The procedure was tested by considering the problem instances with up to 100 customers, 20 potential warehouses and 10 potential plants. A two-echelon facility location issue is taken into account by Tragantalerngsak et al, where the first echelon facilities are neglected and the facilities in the second echelon are capacitated. The objective is to satisfy customer demand of the product by find out the number and locations of facilities in both echelons. To solve this problem, they established a Lagrangean relaxation based branch and bound algorithm.Gourdin et al. 2000, studied a specific type of the incapacitated facility location issue, in which the same facilities requested by the two customers are matched. After deriving valid inequalities, as well as optimality cuts for the issues they have developed various methods to solve this issue. One of the major disadvantage in the past research studies (Gourdin et al., Jayaraman, Pirkul and Jayaraman and Tragantalerngsak et al.) is that they restricts the number of capacity levels available to each facility to just one. However, in practice generally various capacity levels are presented to select from for each facility. The problem become more realistic through the utilization of different capacity levels and simultaneously it is more complex to solve. Another drawback of previous work (Jayaraman, Pirkul and Jayaraman) is that they limit the number of facilities to open to a pre-specified value. Furthermore, these studies fail to explain how this value can be determined in advance.

Logistics distribution network design specifies locations, the amount and capacities of facilities, and the transportation requirement between them. A well-designed logistics distribution network in the supply chain provides cost saving through the recovery process of products and materials and also carry out the benefits related to environmentally friendly activities. (Yi, Huang, Guo& Shi 2016, 191) Implementation of reverse logistics network has a great impact on the forward logistics network performance and vice-versa, since they shares a number of resources such as transportation and warehouse (Dutta, Das, Schultmann&Fröhling 2016, 605).

III. METHODOLOGY

This section primarily discusses the research methodology and associated key discussions.

A. Research Questions:

The prime research question in this research of study is whether supply chain distribution network do impact on the global circular economy and sustainable business process. In addition, this study intends to explore answers for some other key questions, such as:

- Will the Manufacturer storage with direct shipping or drop shipping performs towards the circular economy and sustainable business process?
- Will the Manufacturer storage with direct shipping and in-transit merge performs towards the circular economy and sustainable business process?
- Will the Distributor storage with package carrier delivery performs towards the circular economy and sustainable business process?
- Will the Distributor storage with last mile delivery performs towards the circular economy and sustainable business process?
- Will the Manufacturer / distributor storage with costumer pickupperforms towards the circular economy and sustainable business process?
- Will the Retail storage with customer pickup performs towards the circular economy and sustainable business process?
- Doessupplier's productivity influence retail company's supply chain management and sustainable business process?
- Does Multichannel distribution benefit for the inventory control through inter-adjustment on the stock and sustainable business process?

B. Research Objective

Some of the key research objectives are given as follows:

1. To examine the various factors such as economic and demographic constructs, consumer preferences, technologies assisted mechanisms do influences on the distribution network.

2. To analyze the distribution network optimization in terms of providing best customer service and reducing the supply chain cost to achieve global circular economy.

3. To identify important challenges, examine the relevance of research findings, and develop an agenda for future distribution network system across globe.

C. Research Hypothesis

Hypothesis H_{01}:*To achieve the circular economy and sustainable business process the supply chain distribution network should contain fast response time, low transportation cost, easy returnability, easy order visibility.*

D. Research Design

This research presents a mixed research paradigm encompassing both the qualitative as well as quantitative research methods. In first approach, different distribution networks operational globally are discussed and characterized, while in later (i.e., quantitative), a primary data based analysis research has been performed. Here, in quantitative research phase, representatives from different manufacturing units or marketing heads, regional managers (belonging to different nationality or locations) are interviewed to examine the efficiency or suitability of different supply chain distribution networks (SCDNs) for their present business operations, and respective efficacy. In the proposed analytical research to identify optimal distribution network, primary data based study has been done, in which respondents, mainly manufacturers, wholesalers and retails are interviewed. Thus, based on the presented mixed research approach, a novel conceptual model for optimal and universally suitable SCDN model has been derived. To further examine the universal supply chain distribution network various statistical tools and techniques are used such as mean, medium, standard deviation.

A well known statistical tool named Statistical Package for Social Study (SPSS) has been applied to perform statistical assessment for each variable.

E. Sample Selection

The presented study intends to analyze the supply chain distribution network in order to achieve global circular economy and sustainable business process. Hence for the study, a total of 150 respondents such as manufacturers, wholesalers and retails are interviewed through the structured and semi-structured interviews. The proposed research has been optimistically designed in such a manner that it targets to retrieve optimal and sufficient information for the optimized distribution network in the supply chain management and its impact on customers satisfaction.

F. Data Collection

In the presented study, the data is primarily collected from the respondents belonging to varied socio-demographic hierarchy as well as different manufacturing units or marketing heads, regional managers are interviewed. To retrieve the responses, the individual respondents were asked respective or associated questions designed to examine various distribution networks constraints such as inventory cost , transportation cost, facility and handling cost and service factors such as response time, product availability and verity, order visibility and returnability etc. The responses have been collected by means of personal interviews, which were conducted on the basis of individual meetings and a friendly communication regarding intended study of analyzing the universal supply chain management to achieve circular economy and sustainable business process.

A questionnaire was designed by reviewing relevant theoretical and empirical studies. Pilot study was conducted by testing and pre-testing the questionnaire with

randomly selected 150 respondents. Feedbacks were incorporated and questions were then revised. The final version of the questionnaire consists of 36 closed questions. Specific questions were designed to measure the preference towards the different distribution network and its performance effectiveness. In order to examine retrieved data for better analysis and hypothesis justification, the responses were collected on the basis of 5 point Likert's scale ('Extremely Satisfied', 'Satisfied', 'Neutral', 'Not Satisfied' and 'Extremely Not satisfied') for certain selected questions.

III. DATA ANALYSIS

As stated, the present research is to analyze the distribution network in supply chain towards circular economy and sustainable business. The study has considered primary data collected from the 150 respondents including manufacturers, wholesalers and retails. On the other hand, to assess the performance of the different distribution network variables such as inventory cost, transportation cost, facility and handling cost, information cost and product availability as well as variety, customers experience, order visibility and returnability etc. were considered.

In the supply chain management, the distribution channel plays vital role in connecting the customers, retailers and manufactures. Table 4.1 describes the descriptive statistics of distribution channel.

TABLE 4.1 DISTRIBUTION CHANNEL

Distribution Channel	*Mean*	*Std. Deviation*
Company location is good for the target market.	4.210	0.945
Sales performance is related to good amount of degree to the distribution channel.	4.330	0.682
The inventory control can be improved through customer service and sales strategy, such as promotion, membership, credit and clearance sales.	4.430	0.497
Multichannel distribution benefits for the inventory control through inter-adjustment on the stock.	4.520	0.502

The responses collected from the respondents revealed that in order to connect to the more customers and serving them, the company should be located in good places (M=4.210, S.D=0.945). Respondents affirmed that the performance of the sales is mainly depends on the distribution channel, as it operates as bridge between the manufacturer and customers (M= 4.330, S.D=0.682).The channel management affects sales performance by helping to protect brand value, allowing vendors to sell their products at a premium, while enabling the channel to up-sell the proper services and support offerings that meet the customer's needs. Distribution channel management is significant in the supplying activities including assortment decisions and activities for reducing stock-outs and it controls the variations in the goods flows and controls the inventory by serving the customers (M=4.430, S.D=0.497). Respondents revealed that nowadays distribution channels are increasingly complex hence to serve the end-users multichannel distribution systems where diverse channel types (e.g. Telemarketing, sales force and e-commerce operations) benefits for the inventory control through inter-adjustment on the stock (M=4.520, S.D=0.502).

The following table (table 4.2) describes the statistical outcomes for the preference towards different distribution network.

TABLE 4.2 PREFERENCE TOWARDS DISTRIBUTION NETWORK

Preference towards distribution network	*Mean*	*Std. Deviation*
Manufacturer Storage With Direct Shipping	3.980	1.145
Manufacturer Storage With Direct Shipping & In-Transit Merge	4.090	1.137
Manufacturer Storage With Package Carrier Delivery	4.560	0.498
Distributor storage with last mile delivery	4.610	0.490
Manufacturer/distributor storage with customer pickup	4.420	0.606
Retail storage with customer pickup	4.790	0.409

The responses collected from the respondents revealed that retail storage with customer pickup is more effective since it has more advantages as compared to other distribution network (M=4.790, S.D=0.409). Since in the rural area, where the internet facility is not established properly, in such case customers prefer to buy the product which is available in the retail shop. If the products are not available in one retail shop then they will visit another retail shop. For the fast moving items retail storage with customer pickup is more effective. In addition, easy returnability through this network focuses towards the reduction of wasting as well as recycling of the product. Similarly the respondents strongly agreed that Distributor storage with last mile delivery or home delivery is more effective in the online shopping products or goods (M=4.610, S.D=0.490). Respondents also affirmed that to increase the effectiveness of this distribution network establishing more number of warehouses near to the customer's places is essential. In the case of higher demand products stocks held by the distributors or retailers performs better in delivering the goods to the customers through carriage delivery (M=4.560, S.D=0.498). The product pick up from the manufacturing place or distributor place is performs well in the urban places or developed cities where products are shipped directly from the storage places to the customers once they arrived to pick up place (M= 4.420, S.D=0.606). Respondents revealed that performance of the Manufacturer Storage With Direct Shipping is not up to the mark, since shipping takes place directly from the manufacture to customers a lot of delay in the delivery of the products/goods (M=3.980, S.D=1.145) hence preference for this network is very low.

Thus from the above table it is clear that in the developing places or rural areas the Retail storage with customer pickup performs better in satisfying the customer's requirements, where as in the developed areas or urban cities the Distributor storage with last mile delivery or home delivery are preferred more.

The responses collected for analyzing the performance of different distribution network is given in table 4.3.

TABLE 4.3 PERFORMANCE OF DIFFERENT DISTRIBUTION NETWORK AT SUPPLY POINT

Variables	*Manufacturer Storage with Direct Shipping*		*Manufacturer Storage with Direct Shipping and In-Transit Merge*		*Distributor Storage with Package Carrier Delivery*		*Distributor storage with last mile delivery*		*Manufacturer storage with customer pickup*		*Retail Storage with Customer Pickup*	
	Mean	*Std.dev*	*Mean*	*Std.dev*	*Mean*	*Std.dev*	*Mean*	*Std.dev*	*Mean*	*Std.dev*	*Mean*	*Std.dev*
Response Time	2.110	0.874	2.020	0.751	3.390	1.043	4.540	0.500	2.550	0.957	4.840	0.368
Product Variety	4.820	0.384	4.890	0.314	4.410	0.494	3.290	1.437	4.870	0.338	2.360	0.990
Product Availability	4.730	0.446	4.690	0.464	4.520	0.502	2.720	0.899	4.920	0.272	2.110	1.053
Customer Experience	2.390	1.053	3.543	1.119	4.560	0.498	4.850	0.358	1.770	0.827	1.560	0.729
Order Visibility	1.980	0.931	2.000	0.738	3.200	0.921	4.440	0.498	1.510	0.627	4.740	0.440
Returnability	1.780	0.882	1.520	0.784	2.160	0.598	3.970	1.048	4.310	0.580	4.830	0.377
Inventory	4.610	0.490	4.770	0.422	4.100	1.010	3.440	0.868	4.680	0.468	2.200	1.442
Transportation	2.060	0.838	3.840	1.160	4.390	0.601	1.900	0.979	4.860	0.348	4.850	0.358
Facility & Handling	4.540	0.558	4.160	1.022	3.270	1.062	2.960	0.920	1.580	0.741	1.270	0.547
Information	2.060	0.896	2.120	0.640	3.200	0.921	4.500	0.611	1.620	0.775	4.880	0.326

In the distribution network selection, companies have traditionally used criteria such as cost, quality, on-time delivery, and control of rejection rate as measuring factors. Nowadays supplier selection focuses more on sustainability factors which play a vital role for the success of universal supply chain distribution network. In order to target the circular economy through distribution network, returnability, transportation and information exchange factors plays significant role. To analyze the most important features of the distribution network, responses were collected about the different performance factors. The major factor towards achieving the circular economy is reusability, recycling of the product their by avoiding the wastage of the product or goods. Considering this factors in the distribution network, returnability factor is very significant towards the avoiding the wastage of product, respondents revealed that returnability of the products/goods through retail storage with customer pickup is very easy than any other distribution network (M=4.830, S.D=0.377) hence customers values this distribution network most.Similarly returnability in the manufacturer or distributor storage with customer pickup also fairly good in returnability since the returns are handled from the pick-up site (M=4.310, S.D=0.580). Considering the urban areas the respondents revealed that the returnability in Distributor storage with last mile delivery or home delivery gives the best returnability because trucks making deliveries can also pick up returns from customers (M=3.970, S.D=1.048). The companies are considering cost factor as the major things in the implementation of distribution network. As the cost of inventory, transportation, facility providing and information sharing costs are lower more will be the profit. The lowest price without compromising the quality is essential in the supply chain management. As the number of facilities in a supply chain increases, the inventory and resulting inventory costs also increases. The respondents revealed that inventory cost is high in the retail storage with customer pickup, since the local storage increases inventory costs because of lack of aggregation (M=2.200, S.D=1.442). On the contrary, the inventory cost is very low in the Manufacturer Storage with Direct Shipping since the inventory benefits of aggregation are small for items with predictable demand and low value (M=4.610, S.D=0.490). Similarly in the Manufacturer Storage with Direct Shipping and in-transient merge also has the low inventory cost due to the ability to aggregate inventories and postpone product customization (M=4.770, S.D=0.422).

In order to deliver the products from manufactures to retailers or to the customers, transportation process is needed between globally dispersed supply chains. Because the production sites are located in different countries a lot of transportation is needed which increases CO2 emissions. However, relative closeness of the main manufacturing countries enables transporting final products to destination mainly by sea and road, and air freight is only used in the rare cases of urgency. There is also an aim to reduce deliveries by combining orders, which further reduces transport emissions. Thus, there should be goals in terms of reduction of CO2 emissions from manufacturing processes and transports. The responses collected from the respondents reveal that transportation cost is less in the Retail Storage with Customer Pickup (M=4.850, S.D= 0.358) since the products are transported from nearby retail store to the customers place. On the other hand the transportation cost is very high in distributor storage with last mile delivery since in involves transportation from warehouse to the distributors or retailers and then to the customers home (M=1.900, S.D=0.979).

Considering the facility and handing cost factor in the distribution network, facility utilization is concerned with the aspects relating to economies of scale such as fill-rates in transportation facilities and the extent to which the distribution resources are utilized in terms of distribution centers. The facility and handling are reduced when there is no third party interface in the transportation of the

material from manufactures to the customers, hence the Manufacturer Storage with Direct Shipping performs well in reducing the facility and handling cost (M=4.540, S.D=0.558). However in the case of Retail Storage with Customer Pickup, there is a need of large number of retail outlets in local places hence facility and handling costs are high (M=1.270, S.D=0.547). In the case of Distributor storage with last mile delivery, there is also lot of facilities have to be incorporated hence facility cost is high (M=2.960, S.D=0.920).

Sales and marketing is about deepening customers' understanding of the products by providing information not only about the material content but also for the use phase. In order to incorporate customers to the manufactures information structure is needed. The responses collected from the respondents reveal that the less information structure is required in the retailer storage with customers pick-up (M= 4.880, S.D=0.326). Similarly in the case of distributor storage with last mile delivery, simple infrastructure is needed to share the information hence, information sharing costs is less (M=4.500, S.D= 0.611).

Considering service factor such as response time, the respondents affirmed that the very less time has been taken to respond to the customers enquire for the products or goods in the case of retailer storage with customers pick. Since the retail stores are close to the customers place, delivery of the products takes place within the several hours (M=4.840, S.D= 0.368). Similarly, distribution storage with last mile delivery also performs in the same way as retailer storage with customers pick-up like it delivers the orders of customers in the same day to the customers place (M=4.540, S.D=0.500). Respondents affirmed that the performance of the Manufacturer Storage with Direct Shipping is very poor in the case of responses time, since manufacture is takes place at different countries and customers were from different places (M=2.110, S.D=0.874).

Considering the product variety and product availability, the respondents revealed that in order to serve the different variety of the products or goods manufacture storage with direct shipping (M=4.820, S.D=0.384) and manufacture storage with direct shipping and in-transit merge (M=4.890, S.D=0.314) performs well, since the customers are directly contacting the manufactures hence they can get the desired products. There is huge varieties of the products are available for the customers in these distribution networks (M=4.730, S.D=0.446). Since in the manufacture storage with direct shipping and in-transit merge the ordered products from different suppliers are merged to provide good services hence product availability is high (M=4.690, S.D=0.464). In the case of retail storage with customer's pick-up, customers are getting the products which is in retailers stock or from warehouses, hence there is lack of product variety (M=2.360, S.D=0.990) and product availability is critical (M=2.110, S.D=1.053).

In order to optimize the distribution network, the experience of the customers towards delivering the products through the network is essential. The responses collected from the respondents revealed that customers experience is very good for the distributor storage with last mile delivery (M=4.850, S.D=0.358) since they are getting the ordered products to the home. Similarly they also revealed that the customers are satisfied with the service provided through the distributor storage with package carrier delivery (M=4.560, S.D=0.498).

Considering the order visibility of distribution network, order visibility is easier in the retailer storage with customer's pickup since customers can visit the retail store and able to observe the quality of the product (M=4.740, S.D=0.440). Similarly, the distributor storage with last mile delivery is also performs well in the order visibility (M=4.440, S.D=0.498) since product or goods are getting to the customers in the same day of order has been made.

In order to incorporate the optimized distribution network in the supply chain management, suppliers must have knowledge of their retailer's goods, strategies, and methods of business operation in order to sell and service

accounts affectively. The effective supply chain stress the need to extend the implementation of logistics integration upstream to suppliers and downstream to distributors and customers. Table below gives the suppliers performance.

TABLE 4.4 SUPPLIER PERFORMANCE

Supplier Performance	*Mean*	*Std. Deviation*
The lead times for manufacturing forced the company to keep more inventories.	4.170	0.865
Lead time influence the trend of the production and time to market.	4.080	1.021
Lead time effect on the correctness of forecasting in supply chain management.	4.290	0.714
The supplier's productivity influence retail company's supply chain management	4.560	0.498
There are some uncertainty involved for the late supply in the ordering system such as late delivery, late loading, machine brake down and custom stop-check etc.	4.380	0.735

Responses collected from the respondents revealed that the lead time for manufacturing forces the companies to keep more inventories (M=4.170, S.D=0.865). By monitoring inventories at different stores within a retail chain, the management could make intelligent decisions about how to meet customer demand and reduce discounting by shipping items between stores. In order to fulfill the customer's needs fallow-up the trend based marketing essential, respondents revealed that lead time of supply chain management influences on such trends and time to marketing (M=4.080, S.D= 1.021). While improving the order visibility demand by the customers, there is a need of interfacing the suppliers and retailers as retailers rarely shares the routine data with the suppliers, hence suppliers are forced to use forecasting and carry inventories, respondents revealed that the lead time tries to correcting the forecasting in supply chain management (M=4.290, S.D=0.714). Since the suppliers are the main players in the supply chain management their productivity of the suppliers also increases the productivity of supply chain management (M=4.560, S.D=0.498). Respondents also affirmed that there are some uncertainty involved for the late supply in the ordering system such as late delivery, late loading, machine brake down and custom stop-check etc (M=4.380, S.D=0.735).

TABLE 4.5 PERFORMANCE OF DISTRIBUTION NETWORKS FOR DIFFERENT PRODUCT/CUSTOMER CHARACTERISTICS

Variables	*Manufacturer Storage with Direct Shipping*		*Manufacturer Storage with In-Transit Merge*		*Distributor Storage with Package Carrier Delivery*		*Distributor storage with last mile delivery*		*Manufacturer storage with customer pickup*		*Retail Storage with Customer Pickup*	
	Mean	Std dev	Mean	Std.dev	Mean	Std.dev	Mean	Std.dev	Mean	Std.dev	Mean	Std.dev
High demand product	1.710	0.807	2.190	0.950	2.300	1.020	4.160	0.800	3.340	0.768	4.850	0.358
Medium demand product	2.280	0.954	3.100	0.958	3.200	0.828	3.340	0.901	4.270	0.468	4.404	0.537
Low demand product	4.310	0.464	3.450	3.980	4.340	0.496	2.530	1.048	4.470	0.521	2.260	0.970
Very low demand product	4.870	0.338	4.230	0.489	4.500	0.522	1.730	0.874	3.220	0.773	1.640	0.847
Many product sources	2.190	0.950	2.420	1.074	3.160	0.800	4.450	0.519	4.770	0.422	4.380	0.487
High product value	4.810	0.394	4.300	0.482	4.390	0.510	3.280	0.853	4.500	0.522	2.390	1.023
Quick desired response	1.770	0.919	1.790	0.913	1.680	0.886	4.560	0.518	2.190	0.981	4.810	0.394
High product variety	4.810	0.394	3.020	0.920	4.440	0.518	3.110	1.062	4.550	0.519	2.150	0.998
Low customer effort	4.290	0.456	4.840	0.368	2.260	0.991	4.730	0.446	4.820	0.386	1.580	0.830

Responses collected for the performance of the distribution networks for different products/customers characteristics revealed that for the high demand products retail storage with customer pickup (M=4.850, S.D=0.358) and distributor storage with last mile delivery (M=4.160, S.D=0.800) provides the better services to the customers. Respondents affirmed that for medium demand products manufacturer storage with customer pickup (M=4.270, S.D=0.468) and distributor storage with last mile delivery (M=4.404, S.D=0.537) performs well in delivering the products to the customers. In the case of low demand products delivery, manufacturer storage with direct shipping (M=4.310, S.D=0.464), distributor storage with package carrier delivery (M=4.340, S.D=0.496) and manufacturer storage with customer pickup (M=4.470, S.D=0.521) provides good services. For very low demand product, manufacturer storage with direct shipping (M=4.870, S.D=0.338), manufacturer storage with direct shipping and in-transit merge (M=4.230, S.D=0.489) and distributor storage with package carrier delivery (M=4.500, S.D=0.522) provides good services to the customers. In the case of many product sources distributor storage with last mile delivery (M=4.450, S.D=0.519), manufacturer storage with customer pickup (M=4.770, S.D=0.422) and retail storage with customer pickup (M=4.380, S.D=0.487) provides good service.

For high product value, manufacturer storage with direct shipping (M=4.810, S.D=0.394), manufacturer storage with direct shipping and in-transit merge (M=4.300, S.D=0.482), distributor storage with package carrier delivery (M=4.390, S.D=0.510) and manufacture storage with customer pickup (M=4.500, S.D=0.522) provides good service. Respondents revealed that, for the quick desired responses retail storage with customer pickup (M=4.810, S.D=0.394) and distributor storage with last mile delivery (M=4.560, S.D=0.518) distribution networks performs well. In the case of High product variety, manufacturer storage with direct shipping (M=4.810, S.D=0.394), distributor storage with package carrier delivery (M=4.440, S.D=0.518) and manufacturer storage with customer pickup (M=4.550, S.D=0.519). Respondents affirmed that for low customer effort manufacturer storage with direct shipping (M=4.290, S.D=0.456), manufacturer storage with direct shipping and in-transit merge (M=4.840, S.D=0.368), distributor storage with last mile delivery (M=4.730, S.D=0.446) and manufacture storage with customer pickup (M=4.820, S.D=0.386) provides good services.

IV. CONCLUSION

In the present day global competitive scenario, meeting global demands and retaining market share are some of the dominant goals of manufacturers. The fast moving pattern or design variations, rising competitions, localized as well as global open market have forced manufacturers to apply dynamic strategies as well as competitive strategic approaches to gain market. Supply chain management and associated distribution network are the key tools to enable smooth business processes.In this study a mixed research paradigm encompassing both qualitative as well as quantitative research methods have been applied to examine suitability of the different supply chain management and distribution system for efficient circular economy. In quantitative research phase, representatives from different manufacturing units, marketing heads, regional managers (belonging to different nationality or locations) are interviewed to examine the efficiency or suitability of different supply chain distribution networks (SCDNs) through structured and semi structured interviews.In this study six distribution networks (manufacturer storage with direct shipping, manufacturer storage with in-transit merge, distributor storage with package carrier delivery, distributor storage with last mile delivery, manufacturerstorage with customer pickup and retail storage with customer pickup) are taken in to consider. Further to assess the performance of the different distribution network, variables such as inventory cost, transportation cost, facility and handling cost, information cost and product availability as well as variety, customers

experience, order visibility and returnability etc. were considered.From the empirical study, it has been found that, retail storage with customer pickup is more effective since it has more advantages as compared to other distribution network. Since the returnability of the network is easier through this network, hence it reduces the wastage of the product and encourages recycling of the product.In additiontransportation cost is less in the Retail Storage with customer Pickup as the products are transported from nearby retail store to the customer's place, which further reduces transport emissions. Further information structure that builds the bound between manufacturer and customers is more effective in retailer storage with customer's pick-up. Hence it is assumed that retailer storage with customer's pick-up is more efficient and focuses toward circular economy and sustainable business process.

REFERENCE

Abbasi, M. & Nilsson, F. 2012 Themes and challenges in making supply chain environmentally sustainable. Supply Chain Management: An International Journal, vol. 17, no. 5, pp. 517-530.

Alderson, W. (1965) Dynamic Marketing Behaviour. A Functionalist Theory of Marketing. Richard D. Irwin, Homewood, Ill.

Alderson, W. (1965) *Dynamic Marketing Behaviour. A Functionalist Theory of Marketing*. Richard D. Irwin, Homewood, Ill.

Andersen, M.S. 2007. An introductory note on the environmental economics of the circular economy. Sustainability Science, vol. 2, no. 1, pp. 133-140.

Ballou, R. H., 2004. Bussiness logistics: Supply chain management. 5th edition, Pearson Prentice Hall, New Jersey.

Baojuan, S. &Zu, Z. 2007. Reverse logistics of enterprises based on circular economy. HeBei Polytechnic University. PRChina.

Blumberg, D.F. 2005. Introduction to Management of Reverse Logistics and Closed Loop Supply Chain Processes. Boca Raton: CRC Press.

Boons, F. &Lüdeke-Freund, F. 2013. Business models for sustainable innovation: state-of-the-art and steps towards a research agenda. Journal of Cleaner Production, vol. 45, pp. 9-19.

Bowersox, D.J., "*Physical distribution development, current status, and potential*", Journal of Marketing, 33(1), 63-70, 1969.

C.H. Aikens, Facility location models for distribution planning, European Journal of Operational Research 22 (1985) 263–279.

Caniato, F., Caridi, M., Crippa, L. &Moretto, A. 2012. Environmental sustainability in fashion supply chain: An exploratory case based research. International Journal of Production Economics, vol. 135, pp. 659-670.

Chopra S. (2001) *Designing the distribution Network in a supply chain*. Transportation Research Part E: Logistics and Transportation Review Vol. 39, No. 2 Wirtschaftsleyikon24.net,dostupnona: http://www.wirtschaftslexikon24.net/d/distribution/distribution.htm (accessed 02.05.2011.)

Chopra, S., "*Designing the distribution network in a supply chain*", Transportation Research Part E, 39(2), 123-140, 2003.

Dahlbo. 2016. Tekstiilijätteenkierrätyksenmahdollisuudet ja esteet (TEXJÄTE). [online document]. [Accessed 19 October 2016]. Available at http://www.syke.fi/hankkeet/texjate

De los Rios, I.C. &Charnley, F.J.S. 2016. Skills and capabilities for a sustainable and circular economy: The changing role of design. Journal of Cleaner Production, article in press.

Domschke, W.; Schild, Brigitt (1994): *Standortentscheidungen in Distributionssystemen*, in Issermann, H. (Hrsg.): Logistik, VerlagModerneIndustrie, Landsberg am Lech

Dutta, P., Das, D., Schultmann, F. &Fröhling, M. 2016. Design and planning of a closed-loop supply chain with three way recovery and buy-back offer. Journal of Cleaner Production, vol. 135, pp. 604-619.

E. Gourdin, M. Labbe, G. Laporte,

Theuncapacitated facility location problem with client matching, Operations Research 48 (2000) 671–685.

EEA. 2016. Circular economy in Europe, Developing the knowledge base. European Environment Agency. Luxembourg: Publications Office of the European Union. EEA Report No 2/2016.

EllenMacArthur Foundation. 2013b. Towards a circular economy: Business rationale for an accelerated transition. Cowes: Ellen MacArthur Foundation.

Eskigun, E., Uzsoy, R., Preckel, P.V., Beaujon, G., Krishnan, S., &Tew, J.D., "*Outbound supply chain network design with mode selection, lead times and capacitated vehicle distribution centers*", European Journal of Operational Research, 165(1), 182- 206, 2005.

European Commission. 2015. Closing the loop – An EU action plan for the Circular Economy. Brussels: EUR-Lex.

European Parliament. 2008. Directive 2008/98/EC of the European Parliament and of the Council of 19 November 2008 on waste and repealing certain Directives. Brussels: EUR-Lex.

Fraza V. SCM for small distributors. Industrial Distribution (2000) 89:81.

Geng, Y., Fu, J., Sarkis, J. &Xue, B. 2012. Towards a national circular economy indicator system in China: an evolution and critical analysis. Journal of Cleaner Production, vol. 23, pp. 216-224.

Genovese, A., Acquaye, A.A., Figueroa, A. &Koh, S.C.L. 2017. Sustainable supply chain management and the transition towards a circular economy: Evidence and some applications. Omega, vol. 66, pp. 344-357.

Geoffrion, A.M., Graves, G.W., & Lee, S.J., "*A management support system for distribution planning*", INFOR, 20(4), 287- 314, 1982.

Ghisellini, P., Cialani, C. &Ulgiati, S. 2016. A review on circular economy: the expected transition to a balanced interplay of environmental and economic systems. Journal of Cleaner Production, vol. 114, pp. 11-32.

Ghisellini, P., Cialani, C. &Ulgiati, S. 2016. A review on circular economy: the expected transition to a balanced interplay of environmental and economic systems. Journal of Cleaner Production, vol. 114, pp. 11-32.

Govindan, K. &Soleimani, H. 2016. A review of reverse logistics and closed-loop supply chains: a Journal of Cleaner Production focus. Journal of Cleaner Production, article in press.

GUDEHUS, T., KOTZAB, H., 2009: Comprehensive logistics. Springer. ISBN 978-3-540-30722-8.

Guide V.D.R., Van Wassenhove L.N., 2009. The evolution of Closed-loop Supply Chain Research. Operations Research, vol. 57, pp. 10-18.

Gunasekaran, A. and Ngai, E. (2005) 'Build-to-order supply chain management: a literature review and framework for development'. Journal of Operations Management, 23(5):423-451.

Gunasekaran, A. and Ngai, E. (2005) 'Build-to-order supply chain management: a literature review and framework for development'. *Journal of Operations Management,* 23(5):423-451.

H. Pirkul, V. Jayaraman, A multi-commodity, multi-plant, capacitated facility location problem: Formulation and efficient heuristic solution, Computers and Operations Research 25 (1998) 869–878.

Habibi M.K.K., Battaia, O., Cung, V-D. &Dolgui, A. 2016. Collection-disassembly problem in reverse supply chain. International Journal of Production Economics, article in press.

Jayaraman, An efficient heuristic procedure for practical-sized capacitated warehouse design and management, Decision Sciences 29 (1998) 729–745.

Johnson, M.R. & McCarthy, I.P. 2014. Product recovery decisions within the context of Extended Producer Responsibility. Journal of Engineering and Technology Management, vol 34, pp. 9-28.

Kotler, Ph.; Keller, K. L.(2008): *Marketing Management*, 12th Ed., Prentice-Hall, 2006., Prijevod, MATE, Zagreb

Kotzab, H., &Bjerre, M. (2005). Retailing in a SCM-perspective. In Kotzab, H. (Ed.), *Retailing the thecontect of IT and distribution* (p 14-29). Copenhagen: Copenhagen Business School Press

Lalonde BJ. Building a supply chain relationship. Supply Chain Management Review (1998) 2:7-8.

Li S, Rao SS, Ragu-Nathan TS, Ragu-Nathan B. Development and validation of a measurement instrument for studying supply chain management practices. Journal of Operations Management (2005) 23:618

Lieder, M. & Rashid, A. 2016. Towards circular economy implementation: a comprehensive review in context of manufacturing industry. Journal of Cleaner Production, vol. 115, pp. 36-51.

Loiseau, E., Saikku, L., Antikainen, R., Droste, N., Hansjürgens, B., Pitkänen, K., Leskinen, P., Kuikman, P. & Thomsen, M. 2016. Green economy and related concepts: An overview. Journal of Cleaner Production, vol. 139, pp. 361-371.

M.L. Brandeau, S.S. Chiu, An overview of representative problems in location research, Management Science 35 (1989) 645–674.

Molamohamadi, Z., Ismail, N., Leman, Z. &Zulkifli, N. 2013. Supplier Selection in s Sustainable Supply Chain. Journal of Advanced Management Science, vol. 1, pp. 278-281.

Narus, J. & Anderson, J. (1996) 'Rethinking Distribution - Adaptive Channels'. Harvard Business Review, July-August:112-120.

P. Avella, et al., Some personal views on the current state and the future of locational analysis, European Journal of Operational Research 104 (1998) 269–287.

Parthanadee, P. &Logendran, R., "*Periodic product distribution from multi-depots under limited supplies*", IIE Transactions, 38(11), 1009-1026, 2006.

Pedram, A., Yusoff, N.B., Udoncy, O.E., Mahat, A.B., Pedram, P. &Babalola, A. 2016. Integrated forward and reverse supply chain: A tire case study. Waste Management, article in press.

R.L. Francis, L.F. McGinnis, J.A. White, Locational analysis, European Journal of Operations Research 12 (1983) 220–252.

Rauter, R., Jonker, J. & Baumgartner, R.J. 2015. Going one's own way: drivers in developing business models for sustainability. Journal of Cleaner Production, article in press.

Robinson, E.P., Gao, L., &Muggenborg, S.D., "*Designing an integrated distribution system at DowBrands, Inc*". Interfaces, 23(3), 107-117, 1993.

Rosenbloom, B. (2004): *Marketing Channels: A Management View*, Seventh Edition, South-Western, Cengage Learning

S. Tragantalerngsak, J. Holt, M. Ronnqvist, An exact method for the two-echelon, single-source, capacitated facility location problem, European Journal of Operational Research 123 (2000) 473–489.

Sauvé, S., Bernard, S. & Sloan, P. 2016. Environmental sciences, sustainable development and circular economy: Alternative concepts for trans-disciplinary research. Environmental Development, vol. 17, pp. 48-56

Seuring, S. & Müller, M. 2008. From a Literature review to a conceptual framework for sustainable supply chain management. Journal of Cleaner Production, vol 16, pp. 1699-1710.

Singh, J. &Ordoñez, I. 2016. Resource recovery from post-consumer waste: important lessons for the upcoming circular economy. Journal of Cleaner Production, vol. 134, pp. 342-353.

Specht, G. (1988): *Distributions-Management*, Verlag W. Kohlhammer GmbH, Stuttgart u.a.

Stewart, W.M., "*Physical distribution: key to improved volume and profits*", Journal of Marketing, 29(1), 65-70, 1965.

The Foundation for Circular Economy. 2015. CE100 – A Global Circular Economy Innovation Platform. [online document]. [Accessed 2 November 2016]. Available at http://circularfoundation.org/en/ce100-

global-circular-economy-innovation-platform

Walters, P. (2008) 'Adding value in global B2B supply chains: Strategic directions and the role of the Internet as a driver of competitive advantage'. Industrial Marketing, 37, 59-68.

Weinberg, B., Parise, S. and Guinan, P. (2007) Multichannel marketing: Minds8/et and program development. Business Horizons, 50, 385-394

Wilson, H. and Daniel, E. (2007), 'The multi-channel challenge: A dynamic capability approach', Industrial Marketing Management, Vol. 36, pp. 10-20.

Wilson, H. and Daniel, E. (2007), 'The multi-channel challenge: A dynamic capability approach', *Industrial Marketing Management*, Vol. 36, pp. 10-20.

Witjes, S. & Lozano, R. 2016. Towards a more Circular Economy: Proposing a framework linking sustainable public procurement and sustainable business models. Resources, Conservation and Recycling, vol. 112, pp. 37-44.

Yang, M., Evans, S, Vladimirova, D. & Rana, P. 2017. Value uncaptured perspective for sustainable business model innovation. Journal of Cleaner Production, vol. 140, pp. 1794-1804.

Yi, P., Huang, M., Guo, L. & Shi, T. 2016. A retailer oriented closed-loop supply chain network design for end of life construction machinery remanufacturing. Journal of Cleaner Production, vol. 124, pp. 191-203.