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Investigation on Physical Distribution of Supply Chain Network in Retail Industries

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ABSTRACT: The purpose of this study is to describe the physical distribution & supply chain challenges are existed in retail industry particularly on consumer products. In addition to, addressed that what innovation is required in physical distribution and enhance new supply chain collaboration model for retail sectors that will bring new efficiency and cost reduction. This research paper is based on the conceptual work. The study is addressing that different challenges are involved in physical distribution of supply chain of consumer products which are in-store logistics, collaborative physical logistics, reverse logistics, transportation, demand fluctuation and packaging labeling. Further, this study is suggested that a new model of supply chain collaboration to enhance their operation efficiency, cost reduction and serving the customer in sustainable way. In addition, the author has implemented lean distribution in this integrated model of supply chain collaboration. This paper will provide clear benefits for the industry, for the individual companies and for consumers & shoppers.

KEYWORDS: Logistics, Physical Supply chain, Distribution, Retail

1. INTRODUCTION

The term logistics had been come from the military. The logistics function is not only limited to the military, it is applied to every business activity in the economy whether agricultural or industrial sectors. The logistics function is applied to industrial sectors i.e. to movement and storage of raw material and finished goods. Physical distribution is set of functions that well organized movements of goods from production center to customers (K.K Khanna, 2010, p.14). It is well connected between the production and marketing. Physical movement of finished products to the end users at the right time and right place is crucial function called as physical distribution. Companies going global have been facing the challenges with respect to distribute the goods, high transportation cost, inventory cost and high cycle time. In order to overcome these challenges, companies designing their physical supply chain in an efficient manner. Of late, From Small business to large business people has been paying strong attention to distribute their final products to their customer in sustainable way. Because, the physical distribution determines the customer services level to a large extent. However, ineffective physical distribution leads to business failure and loss of customers (Encyclopedia 2nd, Physical Distribution). This conceptual paper, the authors have concentrated on the physical distribution and supply chain challenges existing in the retail industries. The paper addressed the various supply challenges in FMCG sectors and developing an integrated supply chain collaboration model. This new integrated model of supply chain collaboration is to enhance their operation efficiency, cost reduction and serving the customer in sustainable way.

II. RESEARCH QUESTION

The primary purpose of this study is to understand physical supply chain challenges are involved in Retail Industry. Thus the research question can be formulated as follows:
To understand what are the main physical supply chain challenges for consumer products/retail industry over 10 years?

Research objectives:

In order to answer research question the researcher formulates a set of objectives, aimed to increase the understanding of case and put the limelight on different perspectives of the issue. These objectives are:

1. To profound the challenges & what innovation requires on Physical supply chain
2. To understand and enhance new model of collaboration.

The past decade, retail industry has been growing at a rapid pace in developed and developing economy. Retail companies enhance new methods for offering services to consumers. They utilize their supply chain activities in successfully. Every retail company wants to physically distribute the products/goods in a unique way. Supply chain is a key competence for retailer's in order to achieve high performance. Retail industry requires innovation in the physical distribution of products and makes a new model of collaborations with suppliers, customers etc. in order to servicing the customers in sustainable way. The answers on the research question will prompt retail industry to make innovative ways of physical distribution of goods/products to customers smoothly. In addition, Retail companies will gain sounds financial figures, improving supply chain functions, cost reduction and CO₂ emissions reduction, reduced energy consumption, better traceability and reduced traffic congestion.

2.1. Research Purpose & Methodology:

The purpose of this paper deals with understanding the challenges of physical distribution of supply chain in retail industry i.e. the consumer products over 10 years. In addition retail companies improve the existing physical supply chain performance. Further, this paper also concentrates on development of new model of collaboration. Using a review of existent literature, this work examines and expounds upon the physical distribution of supply chain challenges for retail industry. The academic papers are analyzed in terms of research purpose/question, methodology, findings, and challenges addressed.

III. CRITICAL LITERATURE REVIEW

A company is difficult to manage its products flow from raw material stage to end-users. It is vital challenges for company and an emerging opportunity for them. They make new things in Supply Chain activities. Typically, the maximal managerial control that can be expected is over the immediate supply and physical distribution channels. "*The Physical Supply chain refers to time and space gap between a firm's material stages and its processing points. Physical distribution means time and space gap between the firm's processing points and its end user*". Companies need to create innovation in existing physical supply chain. Retail industry needs to be made changes in Physical supply chain in order to build the future competitive supply chain. There are certain areas of physical supply chain challenges are involved, companies need to pay attention on these following areas i.e. (i). In- store logistics, (ii). Collaborative physical logistics, (iii). Reverse Logistics, (iv). Demand Fluctuation Management, (v). Identification and labeling (Future supply Chain, p 6-8, 2008).

3.1. In- store logistics: Retail companies should be paid strong attention to their in- store logistics. Assigning the logistics tasks is one of the biggest challenges for retail companies. Many of the logistics specialist addressed that one of the weakest link in physical supply chain flow inventory from the store's loading dock to stock room/ warehouse (shelf/rack). The poor execution of in-store logistics procedures is one of the reasons for store failure in meeting its targets. It can be due to lack of specific training of in- store logistics staff about utilizing know-how and logistics best practices (Definition & Role of In-store Logistics, 2011). The function of the in-store logistics is the set of operations to control the inventory at the point of sale and transfer goods from the store's loading dock to stock room/ warehouse (shelf/rack). There are some areas to be improved under the in-store logistics i.e. in-store visibility, shelf-ready products, and warehouse management system (WMS). These improvements cover product entering the store at the back and products selected by consumer.

In store Visibility: RFID technology can be applied to allow real time close approach into inventory with monitoring through computer when supplies are running low or when theft is detected.

Shelf- ready products which receive as a commodities that is easy to find, open and keep on the shelf. Further, it improves visibility and shelf replenishment.

Warehouse Management System (WMS): WMS helps warehouse manager to control and monitor the warehouse operations. Shopper Interaction requires availability of consumer data for both manufacturer and retailer. Electronic equipments can be used for optimizing shopper interaction such as electronic labelling, mobile payments and mobile device marketing, and in-store kiosks, narrowcasting the dissemination of information designed to stimulate purchases

(Future supply Chain,2008, p.24). The benefits of WMS are improved warehouse productivity, efficiency, and accuracy. The WMS improves labor's productivity, reduces the man power, and improves the orders picking accuracy. In addition, WMS technology provides managerial control and effectiveness through point of work confirmation, accountability, performance measurement and what- If scenario planning (Coyle et.al, 2009, p.338). In addition, In-store logistics staff concentrates to coordinating with sales department by undertaking charge and responsibility to a broad range of retail activities such as in-store replenishment management, store inventory, reporting, inter-store transfers, multichannel web/store logistics operations, and more. DHL has been following in- store logistics services. Their styles of in store logistics are to support in store operations by forming efficiencies including inventory optimization, and promoting stock availability, stockroom and shelf replenishment management, improvement in supply chain visibility, increased stock availability, while reducing quantities of needless stock, and improving customer service while targeting cost reductions (Supply Chain Solution, DHL).

3.2. Collaborative physical logistics: When two or more companies are jointly together for the purpose of optimization of operations related to transportation by sharing of equipments, vehicles, information, warehouses in order to reduce the cost, simplify the overall physical footprint, and to combine flows to improve service and asset utilization. Some areas need to be improved such as shared transport, shared warehouse, shared infrastructure.

Shared Transport: It is a sharing of transportation i.e. sharing load planning and truck capacity. Sharing of transportation between manufacturers, between retailers, between manufacturers and retailers and third party logistics providers.

Shared infrastructure: Manufacturers, retailers, third party logistics providers are working together to share warehouses and distribution centers. Some warehouses are fully automated without involvement of human-being. The pallets and inventory are moved with a system of automated conveyors and automated storage, retrieval machines organized by efficient programmable logic controllers and computers (Bowersox J et.al, 1996).

Sharing the information: among manufacturers, retailers and third party logistics providers in order to delivers goods from more than one point of sources to multiple points through warehouse and distribution centers (Future supply Chain, 2008, p.24).

ECR France's organization made collaboration among three independent manufacturers (Bénédicta, Nutrimaine and Lustucru) and one third party logistics providers (FM Logistics) and one major retailer (Carrefour) and six regional transporters. This collaborative physical logistics approach is designed to allow more frequent delivery and full trucks. They are gaining some significant benefits, the results shows that Average delivery frequency increased by 34%, average load per delivery increased by 115%, and service level maintained to 99.6% (Appendix- GCI, 2008, p.4) Connie Robbins addressed the Lee bandlow statement 'Working with a third-party warehouse adds resiliency to our supply chain and allows us to position products, such as mowers and grills, closer to our stores for rapid replenishment' (Connie Robbins Gentry,2004, p. 59).

3.3. Reverse Logistics: Reverse logistics comprise the issue of source reduction, conservation, recycling, substitution, and disposal that associate with the production, marketing, and logistics activities such as procurement, manufacturing, maintenance, spare parts inventory, material handling, warehousing, storage and packaging. European reverse logistics defines reverse logistics: "It stands for all operations related to reuse of products and materials. Product Recovery Management (PRM) is concerned with care of products/material after have been used. Reverse logistics refers to all activities to collect, disassemble, and process used products in order to ensure sustainable recovery i.e. to create environmental friendly" (Edward J. Marien, 1998) Rogers and Tibben-Lembke (1998) addressed that one of the difficulties in managing returns as the manufactures & retailers. They may disagree one of the following reasons: 1. Condition of the item 2.Value of the item 3.Timeliness of the response. Reverse Logistics some areas are required solutions such as the reuse of assets in the supply chain that are not directly product related, such as pallets and crates. Solutions include traditional backhauling, product recycling, packaging, reuse and packaging recycling. "Reverse Logistics is transforming a high cost import model into a cost- competitive local fulfillment model".

3.4. Demand fluctuation Management: Retail companies need to maintain the smooth demand signal from customers. In order to maintain the smooth demand signal, the companies make better collaboration & integration with their suppliers. Further, Vertical solutions include introduction and promotion calendars and supply/ demand capacities to align introduction and promotions. In addition, collaboration on execution, & collaboration on monitoring will also maintain the demand fluctuation (Future supply Chain, 2008, p.27).

3.5. Identification & Labeling is done by barcodes and RFID tags. Identification is providing information about all partners in the value chain with the ability to uniquely identify parties/locations, items and events, with clear rules about where, how, when and by whom these will be created, used and maintained. Labels currently are the most widely used means to communicate about relevant sustainability and security aspects of a certain product toward consumers and trading partners. Schuitema who is one of the leading Dutch retailers has implemented RFID technology to returnable plastic containers for ready-to-cook vegetables. The output of RFID has increased Schuitema's sales by 10% to 12% (Future Supply Chain, 2008).

3.6. Supply Chain Collaboration: The model of supply chain collaboration concepts into an integrated model will provide the future supply chain architecture necessary to bring new efficiency and cost reduction to the industry. The following four collaboration concepts are at the core of the overall future supply chain architecture which are (1) Information sharing – driving the collaborative supply chain (2) Collaborative warehousing (3) Collaborative city distribution, including home delivery and pick-up (4) Collaborative non-urban distribution, including home delivery and pick-up (Future supply chain 2008, p34).

Information Sharing: Sharing information is driving the supply chain collaboration in an efficient manner. Information about the actual status of items in the supply chain, at any moment, is essential to correctly co-ordinate all the combined logistics streams. To prevent out-of-stocks, demand-signal data, like Point of Sales data, Internet shopping sales data and other mobile-sourced shopping data, must be shared in a standard and timely manner. This principle also applies to information about item location, quantity and status (Future supply Chain, 2008, p.36-37). The free flow of data and associated information is essential if the industry is to properly manage these events and achieve high levels of product availability when and where consumers want it.

Collaborative Warehouse: Collaborative Warehouse concept is that go far beyond the existing warehouse collaboration concept. It is a core competence of supply chain collaboration architecture. Retailers & manufactures play a crucial in collaborative warehouse concept. They not only warehouse sharing but select the location, collect the shipments from various manufacturers, combined the shipments & distribute the shipments to one or more retailers in different modes of transportation. It is called a store picking. This will be important in order to shorten the chain and increase flexibility in allocating inventory to demand. Collaborative warehousing should improve the: - Capacity utilization of the total warehouse, Transport optimization through shared delivery from the warehouse, CO₂ and energy reduction through the use of the latest technologies (Future supply chain, 2008 p.38).

Collaborative City Distribution: The new model of supply chain collaboration looks forward the collaborative city distribution that need to be applied in urban areas. The major challenges are addressing that in urban areas for distributing the commodities like traffic congestion & CO₂ emission. Merging the different streams into the city onto one infrastructure is called as "city- Hub" with a collaborative cross- dock operation. For example, the growth of the home delivery system i.e. the parcel coming into the city & deliver into home. The alternative model of the home delivery system is the neighborhood distribution should merge with the urban replenishment model. This means consolidation of different delivery streams via city hubs. The new neighborhood distribution models will have pick-up points and or drop-off boxes to make easy the parcel stream in a consolidate way. Consumers will be given the choice to either have their online-ordered goods delivered at home, or to collect them at specific pick-up points or drop-off boxes. In both cases consumers will cause considerably lower CO₂ emissions, compared with using their cars to go shopping.

Collaborative Non urban distribution: The transport optimization is one of the major objectives for the longer distance i.e. final store/home Full truckloads from collaborative warehouses can be moved in the most efficient way to the remote area, possibly using alternative modes of transport like trains. The functions of the regional consolidation center are consolidating the goods from various collaborative warehouses into a store replenishment routes. At the same time, these consolidation centres are needed to merge the long-distance streams with the local product streams to create efficient replenishment into the stores (Future supply chain, 2008, p.38-39).

3.7. Benefits of an Integrating model:

This paper is compared a current situation of supply chain model with future situation, which addressed those four collaborative concepts. The current situation of Supply chain model, let considers eight production centers are delivering equal amounts of commodities per day to four different retailers. The eight manufacturers are having their own warehouses and the retailers are having their own regional distribution centre (RDC). They targeted to four urban & non urban stores by using Regional distribution center in different routes. The current scenario characteristics are (a)

stakeholders are manufacturers & retailers (b) consumes and stores are placed in both urban & non urban areas (c) each manufacturers are having own warehouses (d) each retailer has its own distribution centre (e) manufacturer ships its products to each of the four distribution centre (f) retailers will ship the products from its distribution centre to each of its stores (g) no physical supply chain collaboration takes place among manufacturers, retailers & between manufacturers & retailers. The new model collaboration of supply chain model, eight manufacturers are arranged into two groups each group consist of four manufacturers are sharing a common collaborative warehouse. From these collaborative warehouses, commodities are shipped in full truck loads to either city hub or regional distribution centre, where the different streams are efficiently merged into store replenishment routes. Collaborative model characteristics are (a) manufacturers and retailers are stakeholders (b) manufacturers have a collaborative warehouse(c) Retailers do not have their individual distribution center but products will be cross docked by either city hub for urban areas or by regional consolidation center for non urban areas (d) Transport from the city hub/regional consolidation centre will be shared and goes to the stores of the different retailers.

The existing model compares with the future situation which combines the collaborative concepts of warehouse collaboration, sharing the information, reduce the lead time, shared transport to urban areas and non urban areas. This new supply chain collaboration model addressed five key performance indicators (KPI) which are “*transportation cost, handling cost, total truck kilometers, reduction of CO₂ emission & reduce the lead time*”. All the five KPI could be improved significantly in these new collaboration models. The study was conducted in different areas which are cereals, white goods, beverages, coffee and vegetables. The result shows the percentage of improvement of new model of supply chain collaboration that 40% reduction in transportation cost/pallet, 20% reduction in material handling cost/pallet, 25% cost cutting in total truck kilometers travelled, CO₂ emission reduced by 25% and lead time reduced by 40%. The ‘*integrated new collaboration model*’ clearly addressed that it can generate positively improvements, with profitable for the industry, for individual companies, for consumers& shoppers (Future supply chain, 2008).

Scenario	KPI	Transport Cost per pallet	Handling cost per pallet	Total truck per kilometer	CO ₂ Emission	Lead Time
Current Situation		79.69	20.50	4800	250	5
Collaboration Approach		48.30	16.50	3576	184	3
% of Improvement		39%	20%	26%	26%	40%

Table 1: Impact on KPI with Existing & collaboration model
Source: Appendix-Global Commerce Initiative, Capgemini

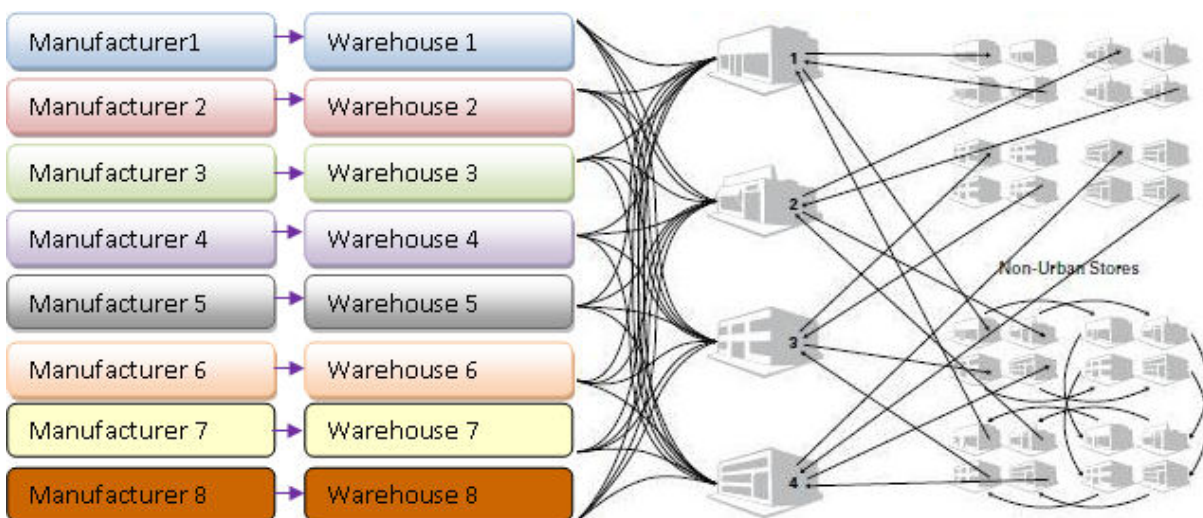


Fig 1: Current Situation of Supply Chain Model
Source: Future supply Chain 2016

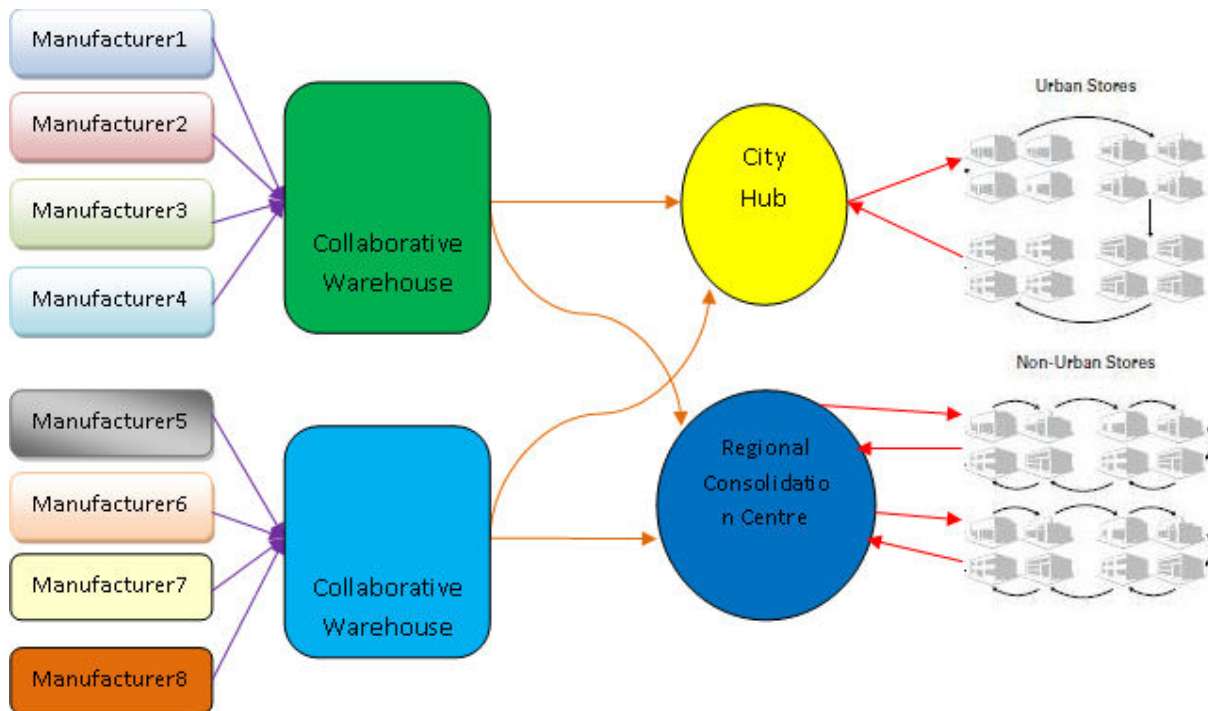


Fig 2: New Collaboration model of Supply Chain
Source: Future supply Chain 2016

3.8. The Conceptual model of Integrated Supply chain collaboration with Lean Concept:

Distribution is processes of making the product and or services available for consuming by consumer or end-user. Global trends, the physical distribution operation is one of the major challenges for the companies because it directly connected to customer service, minimum value added services and high cost associated with the distribution. Distribution plan directly impact on the customer services and/or cost. Lean distribution process increase the flexibility in operation, simplicity to reduce the inaccurate forecast, reducing lead time, reducing lot sizes, increasing reliability and achieving the consistent results. Lean approach is looking for creating flexible distribution operations that reply to fluctuation of market needs. This conceptual paper is focused on implementation of lean concept during the distribution processes. The author addressed that “lean distribution breaks the forecast accuracy barrier to improving the customer service and profit with flawless execution of simplified operating process” (Krik D Zylstra, 2005, p1.). The paper has already noticed five KPI for new model of collaboration supply chain besides, mentioning reducing cycle time, customer services, and flexibility in distribution operations in order to servicing the customer in sustainable way. Lean distribution is a direct to evaluating the current distribution practices and paradigm to make possible increase the flexibility and lower cost. The main drivers of lean distributions are cycle time, variation and flexibility. These factors become drivers of inventory levels, cost profiles and other aspects of distribution chain. So lean works to systematically to improve theses parameters that driving force of the entire supply chain rather than to take independent actions seeking to improve the service levels & inventory and cost.

IV. CONCLUSION

In the first section of this paper, authors have argued that concept of physical distribution of supply chain in retail industry. The paper has addressed five major retail industry sectors which are vegetables, coffee, white goods, cereals and beverages. Mentioning the existing challenges involved in theses industries are in-store logistics, Collaborative physical logistics, reverse logistics, demand fluctuation management & identification & labeling. The second section of this paper the authors noticed that new integrated supply chain collaboration model and making comparison with the existing & future scenario of supply chain. Further, the paper has addressed five key performance indicators (KPI) which are transport cost per pallet, material handling cost, reduction of CO₂ emission, reduction of travelling time of truck per kilometer and reduction of lead time. This new integrated model of supply chain collaboration is to enhance their operation efficiency, cost reduction and serving the customer in sustainable way. In addition, the authors have developed a conceptual model of the new integrated supply chain collaboration model with lean approach. Lean approach is looking for creating flexible distribution operations that respond to fluctuation of market needs. The main

divers of Lean distribution are cycle time, variation and flexibility. Lean distribution process increase the flexibility in operation, simplicity to reduce the inaccurate forecast, reducing lead time, reducing lot sizes, increasing reliability and achieving the consistent results.

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