REDESIGNING THE DISTRIBUTION NETWORK TO ACHIEVE EXCELLENCE IN SUPPLY CHAIN FOR AUTOMOBILE BATTERY INDUSTRY IN INDIA

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Abstract - Supply Chain (SC) integrates the entire business processes starting from Vendor's Vendor to Customer's Customer into a single platform. It assimilates suppliers, manufacturers, warehouses and customers so that the end users can get the Finished Goods at the right time, at the right place, at the right price and at the right condition. In a Supply Chain Management (SCM), Distribution Network (DN) is a significant contributor towards supply chain surplus. Organizations should re-visit the existing Supply Chain Network (SCN) based on the factors like Goods and Services Tax(GST), statutory regulations, dealer population, market conditions, IT infrastructure, political environment, strategic location etc. This paper will provide a conceptual analysis on supply chain strategies for Automobile BatteryIndustry in India to achieve excellence in areas (a) Customer Service (b) SC Network (c) Demand Planning (d) Supply Chain Cost (e) Tax etc.

Keywords - Supply Chain Management (SCM), Distribution Network (DN), Supply Chain Network (SCN), Automobile Battery.

I. INTRODUCTION

Distribution Network or Supply Chain Network has a vital role in SCM. It has a direct impact on organizational profitability and Customer Experience(CX). Distribution Network is a ladder in SCM by which raw materials or finished goods moves and gets stored from source to destination. To improve SC efficiency and cost optimization in the Automobile Battery Industry in India, the following measures can be taken [1],[3], [5],[6] :

(1) Improve Customer Service Levels considering (a) Right set of stock availability (b) Responsiveness (c) Planning improvement. SC manager have to ensure the availability of the right set of Finished Goods inventory at warehouses / sales offices to cater the demand fulfilment of Dealers or end customers without increasing working capital costs. With the help IT tools, Organization can improve the forecasting accuracy and introduce stock replenishment. To reduce the Loss of Sales, manufacturing firms can optimize the stock level with the help of ERP (Enterprise Resource Planning) software [7],[13].
(2) Scientific Inventory Norms like (a) system driven replenishment (b) optimized stock levels (c) inventory norms for across SKU (Stock Keeping Unit) (d) pro-active measures to minimize Slow Moving and Obsolete Stocks etc. will help organizations to release the working capital [14].
(3) Network Optimization by (a) rationalization of stock holding points (e.g. Spokes, Hubs, Zone , Warehouse etc.) and (b) optimize transportation by introducing dynamic route planning (c) dispatch planning for optimized load and consolidation (d) optimize warranty claim process and reverse logistics etc. will help to reduce the 'Total Delivered Cost (TDC) [14], [15] .
(4) Sales and Operations Planning [17].
(5) Reduce multiple transfers across SC[18]
(6) Tax Optimization: Identify opportunities for tax credit under GST regime and GST scenario evaluation to optimize tax out go and GST linked strategic decisions [19], [10].
(7) Design SC Organization with Centralized or shared service concepts and clear role clarity
(8) Define Key Performance Indicators (KPI) and monitoring [20],[8],[11].

II. CHALLENGES BY THE ORGANIZATIONS:

In India, Battery Industry, is a duopoly with two leading Battery manufacturing companies. They are controlling the organized market. Each Organization designs, manufactures, markets and sells the lead acid batteries in India as well as other countries. They manufacture a wide range of products, have more than 200 stock keeping units, factories across India and huge dealers' and distributors' network across the country. The firms have two to four tiers supply network. The Battery manufacturing firms have two Strategic Business Units (SBU) i.e. (1) B2B – Business To Business (2) B2C – Business To Consumer. B2B caters mainly industrial customers like Railways, Telecom and Original Equipment Manufacturers etc. B2C serves the dealer's or distributors' business and after sales market. As a result, a large and complex distribution system is built up and incurres 2-3% of total revenue towards SC cost. In the replacement market, unorganized

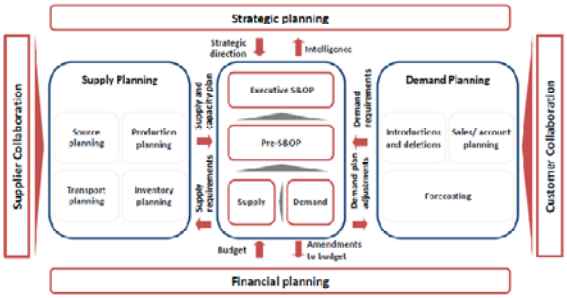
players account for 30-40% market share due to low cost offered by them [10], [13].

III. CONCEPTUAL FRAMEWORKS FOROPTIMIZATIONS

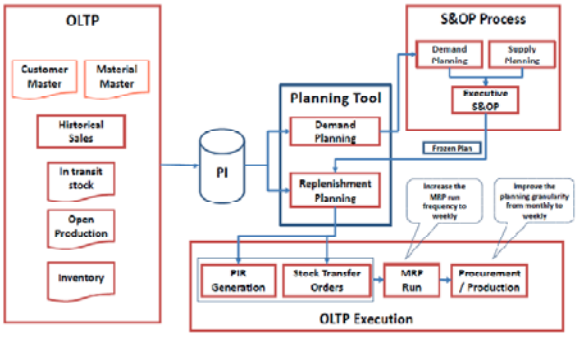
3.1. Network Optimization Framework

The Goal is to "Identify the Optimal Network by minimizing the Total Supply Chain Cost" considering (a) Inventory holding cost (b) Warehouse Operation Cost (c) Transportation cost (d) Tax. Decision variables would be (a) Warehouse selection (Opening or closing) (b) Warehouse to factory mapping with multi-echelon options (c) Percentage of Depot demand fulfilled by warehouses. Organization can consider the constraints like (a) Plant production capacity (b) Maintaining supply demand flow balance at each node (c) Inter node Service Level Agreement(SLA). Due to large and complex distribution network, a two-stage optimization has been adopted to identify the optimal network.Design approach for network optimization categorizes into three major steps: (1) Develop Model (2) Scenario analysis and output analysis (3) Validate and finalize the output. In this framework, cost heads are (a) Dealer Delivery Cost (Stock Keeping Points to Dealer's premise) (b) Primary Transportation Cost (Factory to Firm's Stock Keeping Points like Spokes, Hubs, Zones & Warehouses etc.) (c) Secondary Transportation Cost (Inter branch stock transfer) (d) Warehouse Rents (e) Manpower Expenses (f) Inventory Cost. [10] –[12].

3.2. S&OP (Sales and Operation planning) Framework



3.3. Demand Planning Framework



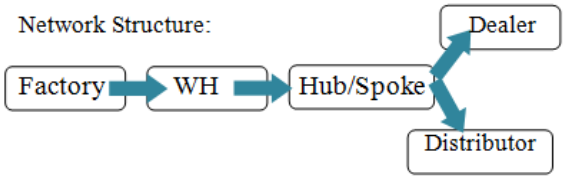
OLTP – Online Transaction Processing Systems, PI – Process Integration, PIR – Planned Independent Requirement, MRP – Material Requirement Planning.

3.4. Data Template for Network Design

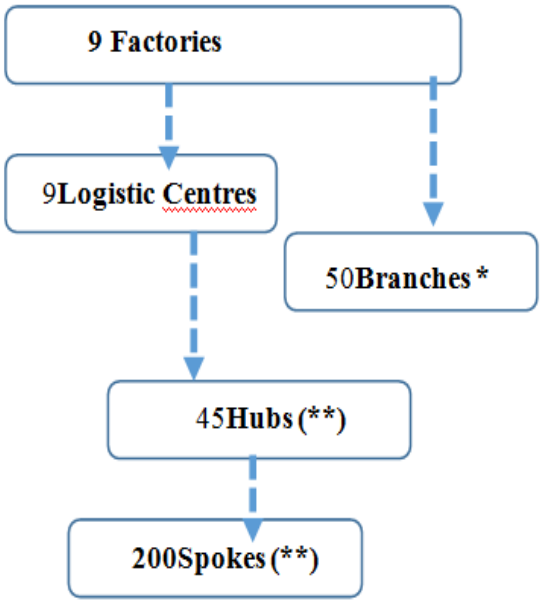
To work towards optimization of Distribution Network, master data like Material, Dealer, Location, Plant Capacity, Sales Data, Transportation Cost, Tax Structure, Warehouse Capacity and associated costs are required [16], [2].

3.5. Network Re-Design: Approach, Methodology and Steps

The leading BatteryManufacturer has 9 manufacturing units, 9 Logistics Centers/Warehouse (WH) , about 200+ Hubs / Spokes / Zones / Regions across India.



As-Is Network Structure:



- * For B2B Business
- ** For B2C Business

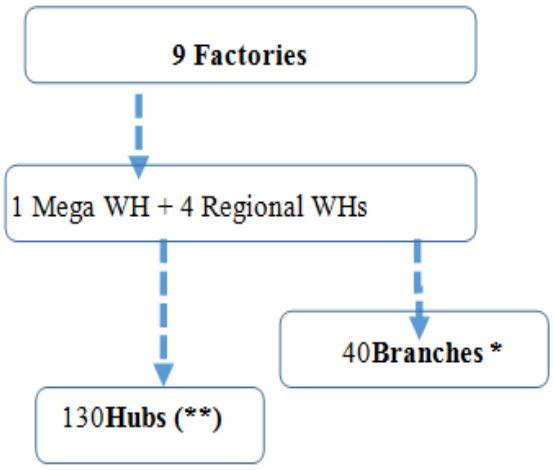
Design approach for Network Optimization was categorized into 3 major steps: (1) Develop Model like Excel Solver (2) Scenario Simulation and Output Analysis (3) Validate and Finalize the output.

Modelling -1:

Scenario	# of Spokes	Distance (Million Km)	Total Ton-Distance (Metric Ton Km)	Remark
As-Is	200	1.5	7.5	* 80 % of the total annual weight within 75 km * 70% of total dealer within 75km
Scenario 1	150	1.2	7.0	* 75 % of the total annual weight within 75 km * 66% of total dealer within 75km
Scenario 2	120	1.1	7.4	* 73 % of the total annual weight within 75 km * 63% of total dealer within 75km

Based on discussions/ workshops /Local conditions / inputs received from the regions, 130 spokes were finalized as To-Be Network. Key benefits of "To-Be" Network are (a) shift from 3 tier to 2 tier model (b) replenishment based inventory norm at warehouses using tool (c) common premises for B2B and B2C wherever applicable (d) Fixed Journey Cycle Plan (FJCP) based model to Dynamic Journey Cycle Plan (DJCP) based model to continue maintain service SLA.

To-Be Network Structure:



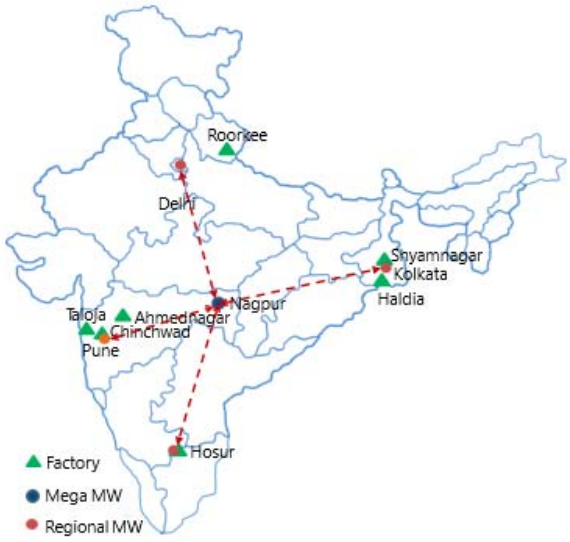
Cost	As-Is (%)	To-Be(%)	Savings(%)
Dealer delivery	27	28	-1
Primary Stock Transfer	33	35	2
Secondary Stock Transfer	14	11	3
Warehousing & Manpower expenses	26	24	2
Total	100	100	6

IV. RESULTS AND DISCUSSION

Considering 130 stock keeping points across locations, it was suggested to set-up the mega warehouse at Nagpur and other four regional warehouses will be located in Delhi, Kolkata, Pune and Bangalore. Materials are to be moved from factories to the nearest regional mega warehouse. Regional mega warehouses will reserve stocks for servicing the local demand and transfer the balance volumes for other regions to the central mega warehouse located at Nagpur. Central Mega Warehouse at Nagpur will ship materials to the four Regional Mega Warehouses and the trucks will carry back to Nagpur and return loads for other regions. There will be movement of dedicated vehicles between the Central Mega Warehouse to the Regional Mega Warehouses. Dedicated vehicle movement will be applicable for matched tonnages between forward and return movements. For the remaining (unbalanced) tonnage as well as movement between factories to theregional mega warehouse, market sourced vehicles have been considered. For the purpose of reasonable efficiency, B2B & B2C loads to be clubbed for to-& fro movement between the Central and Regional Mega Warehouses.

Based on discussion on various network scenarios, the following structure is recommended for implementation: (1) Forward logistics and Reverse logistics (warranty claims and scrap) to be executed through a network of 130 sales offices (2) No stock transfer into the remaining facilities / warranty claims related reverse logistics from these spokes to be done (to be closed after stabilization of new network) (3) Fixed Journey Cycle Plan based model for forward as well as reverse logistics to be utilized from these 130 spokes (4) There will be a focused attempt to establish on-demand deliveries (using dedicated vehicles) and this model will be adopted gradually, as availability of capable vendor base and other local

circumstances permit (5) With capabilities developed for onsite warranty inspection, a decision should be taken for further consolidation of Network structure (6) For B2B business, Network structure of 30 branch locations, of which 20 are co-located warehouses and 10 will be standalone warehouses.



Location of Central Mega Warehouse(MW): Nagpur
Location of Regional MW:(1) Delhi (2) Kolkata (3) Pune (4) Bangalore

Routes:

From Factory	To Regional MW
Haldia	Kolkata
Shamnagar	Kolkata
Hosur	Bangalore
Bawal	Delhi
Chinchwad	Pune
Ahmednagar	Pune
Roorkee / Haridwar	Delhi
Bawal	Delhi

V. CONCLUSIONS

The current research paper dealt with revising of the existing distribution network to achieve excellence in supply chain for Automobile Battery Industry in India. Research methodology adopted in this study involves the collection of market research data, face-to-face interviews with stakeholders of the Battery Manufacturers, literature review, balance sheets of the firms etc.. So, the research output may not be applicable for other industries in India and global market. Organization should revisit their Distribution Network time to time considering market conditions, customer's feedback, technology trends, current market reality, environment & sustainability etc. However, this conceptual research paper will help BatteryManufacturers to get an idea about the optimization of their SC network. This paper is presented as a foundation to develop a mathematical model towards network optimization technique, cost minimization and balance between responsive and efficient SC to achieve excellence in company's supply chain strategy. [16], [9].

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