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Devising the Optimal Distribution Network

Increasingly, manufacturers are turning attention to their distribution networks. They're asking themselves how to optimize current infrastructures. This is motivated by two key factors:

1) A need to shed operating costs, particularly in an environment of high fuel prices and strong Canadian dollar;

2) Knowledge that distribution networks can offer competitive advantage in a marketplace demanding ever higher levels of customer service.

No pre-established solutions exist for what constitutes a manufacturer's optimal distribution network. Each has a unique context influential on the outcome of any investigation into exactly what their optimal network should look like.

However, the methodology employed to arrive at the answer is universal: collect the necessary information; model current network performance under a series of growth projections; model potential alternatives under the same series of projections; compare the alternatives to the current infrastructure in terms of capital and operating costs, customer service, financial sensitivity, risk, and ease of implementation. Once complete, this method provides an effective platform for building the optimal distribution network.

The first step, collecting the necessary information, is the most important. Everyone wants to avoid the "garbage in, garbage out" maxim that leads to bad decision making. Instead, all information for use in this exercise must be properly reviewed, cleansed and validated making it mission- critical to thoroughly review information needs prior to undertaking a distribution network study.

Each point in the distribution network must be mapped and characterized in terms of its logistics function. This includes the supplier base from which the manufacturer draws raw materials and companion finished goods, the company's production sites, its distribution centers and stocking points, as well as, its customers.

1) The suppliers each need to be described in terms of volumes shipped into the network expressed in:

• cost of goods, pallets, pounds and cubic feet; the frequency and mode of shipment (truck load, LTL, rail cars, etc.); the lead times from supplier to distribution center or production site; the information exchange between your company and your suppliers.

2) Each facility within the distribution network starting with production should be described:

• production in terms of current capacity; expansion capability; site constraints; geographic position, economic size of production runs; annual volume in cost of goods, pallets, pounds and cubic feet; SKUs produced; on-site storage capacity; the frequency and mode of shipment; the destination of shipments (i.e., direct to customer, into distribution centers or stocking points)

• distribution centers and stocking points in terms of storage and throughput capacity (current and site maximum); number of SKUs; is it owned or leased (if leased, term of lease); geographic position; 3rd party or self-operated; service region and customer base; the frequency and mode of outbound shipments (to customer locations and inter-facility transfers).

3) The customers served should be described in terms of shipping volumes, geographic location, service level, particular requirements.

Compiling the above allows a manufacturer to create a static distribution network map. The next level of analysis converts the static map into a dynamic network model making use of transactions between suppliers, production facilities, distribution centers and customers. To do this:

• A sample period is chosen and all transactions occurring within that period are brought into a database to create a network model. Often, data management constraints lead companies to use an abbreviated sample period, for example 12 weeks.

• 12 months is the preferred sample period as it allows for a rigorous analysis that models seasonal distribution network peaks and valleys and eliminates errors arising from "annualizing" a model. That is, converting a short sample period and the related cost model based on annualized figures rather than actual P&L performance and operating budgets.

• All transactions for the sample period are incorporated at line level detail including:
  - Each purchase order line shipped into the network;
  - Each production run (with lot number association);
  - Each inter-facility transfer at the SKU-line level;
  - Each order line shipped to a customer.

• Using the physical properties of the items and freight history, the transaction can be expressed in terms of pallets, cubic feet, pounds and shipments. To conclude, the final aim is to project the dynamic distribution network model to a future state or design year. Too often, this step simply models using a volume growth rate assumption or set of assumptions and measures the effect on the network. However, while absolute volume growth is an important component of projecting future network requirements, other critical elements to consider include:

• New item variety – new products originate for a variety of reasons, from packaging changes to entirely new product lines. Changes in SKU variety affect both production and network capacity.

• Alternate suppliers or supply channels – optimal network design should incorporate future planned changes to key raw materials supply. This may impact geographic origin of the supply such that new infrastructure or increased capacities are required. For example, sourcing product from overseas affects not only the frequency and mode of inbound shipments, but related extended lead times and variances alter inventory positions a company takes on those products.

• New customers – the absolute volume growth must be characterized in terms of growth from both existing accounts and new accounts or customers. This latter growth may be regionally specific or dispersed along the lines of the current customer base and therefore plays a determinant role in the optimal network solution.

• New customer demands – as customers evolve and seek cost reductions and service level improvements from their own networks, demands on manufacturers change. It's important to ascertain forthcoming changes in customers' demands. For example, a manufacturer may deliver product directly to customer retail locations while down-the-road that customer requires product shipments to distribution centers instead, leaving the store deliveries to the customer's own network.

Having amassed, cleansed and validated the appropriate information, the manufacturer is ready to model the current distribution network and explore alternatives that yield a better cost-service outcome. In this way, when it comes time to recommend changes toward an optimal distribution network as a result of the study, management can be confident of a sure footing.

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