

Understanding the Distribution Center Network

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The history of supply chain development is a very interesting one to consider. There are many areas to think about, but we will focus on inventory and develop this idea further. In early times, companies worked solely between the manufacturer and the customer directly. The manufacturer produced the product and the customer bought it. When demand began to grow for a product, customers would buy more to make sure they had enough product on hand. This also resulted because many of the sales people for the manufacturer traveled frequently and you were not sure when they might return. In this case, the customer held the inventory.

As retail stores developed, customers were now given many more purchasing choices, and a non-moving location where they knew they could commonly find products. A new part of the supply chain was created. In this development, customers chose to purchase less because they could always come back when they needed something. Because of this transition, now the retail store would maintain inventory to ensure they had products on hand to sell.

As retail space was often limited however, and customer demand continued to grow, the warehouse concept was developed. An intermediate location for storing inventory allowed a company to fulfill demand to match customer orders. At the same time, the retail stores were not burdened with carrying too much product in inventory storage. Again, yet another addition was created in the supply chain, and now the manufacturer maintained the inventory.

So what do we notice about this evolution? For one thing, the inventory has consistently been moving downstream in the supply chain to the next contributor. In today's world this is happening yet again. As costs have become a larger factor in material flow processes and supply chains, warehousing strategies have been more closely analyzed. What we are now seeing is a change where many companies are developing distribution centers to handle and move product instead of store product. This change has signaled the new era of supply chain, where inventory is yet again moving farther downstream to the supplier.

In considering this phenomenon, we must first consider the fundamental differences between a warehouse and a distribution center. Although some use the terms interchangeably, there is an important difference in the function of both. A warehouse by its nature is designed to carry inventory. In a make-to-stock model, a company will store the inventory in a location, which reduces the costs of holding inventory at the retail level, but makes product available when replenishment is needed. Multiple products can be stored to assemble different orders based on customer needs. In the basic sense, a warehouse makes finished product inventory easy to control to ensure customer demands are fulfilled.

A distribution center on the other hand, acts as a material movement location instead of a material storage location. When product is delivered to the distribution center it immediately enters a system that either sends it directly to the customer or repackages the product with others for immediate shipment. Due to the nature of the distribution center, commonly you will see little or no inventory. In this case, demand is fulfilled by producing the order and assembling the final shipment in the distribution center.

As companies around the world are focusing more attention on the distribution center model, we will consider the functionality and operations of implementing this system. This article will take a closer look at not only how a distribution center is coordinated internally, but also the external factors that must be considered such as manufacturing processes,

ordering and 3PL development. With supply chains around the world becoming longer and more complex, distribution centers are rapidly becoming the next evolution in material movement. It is because of this, that a company must understand how to build a strong distribution network.

Distribution Center: Advantages and Disadvantages

In first considering a distribution center, we must look at the important advantages and disadvantages of this model. Although many companies are utilizing this strategy, is it necessarily right for every company? As each supply chain model and company is different, these factors can help decision-makers better analyze what areas of the supply chain they are looking to improve. After these considerations are better understood, then a company can make a more informed strategy for their supply chain development moving forward.

The key advantages for building a distribution center are first, the reduction in inventory. Once we understand the primary function for the distribution center, we might see this as quite obvious. The reality however, is reduced inventory is directly related to a reduction in procurement, manufacturing or transportation lead time. As distribution centers commonly increase the speed of material flow, lead times are inherently reduced in one of these three areas. With a reduction in lead time, lower inventory levels can be maintained as product can be produced and delivered more readily. This ensures that demand is fulfilled without carrying a large amount of stock. In this case, a company can reduce their inventory holding costs and importantly the cash that is invested in inventory. As a result, this is one of the primary reasons more companies are moving to distribution center model. But there are other reasons.

Increased material volume movement is another advantage. As inventory capacity is limited by physical space, warehouse capacity, transportation capacity, and retail holding capacity, the volume of product that can be moved is limited. With a distribution center, a company removes the capacity constraints of a warehouse and allows the productivity of material movement to increase. As demand grows, more product can move through the distribution center on to the customer instead of focusing on moving inventory to the customer and producing to maintain buffer inventory. Transportation management based on the distribution center operations also allow for increased volume movement.

As distribution centers are made for material movement, improvements in transportation logistics are a third advantage. When product arrives at a distribution center it is immediately prepared to be shipped. With these improvements to the system, overall transportation costs can be reduced based on increased capacity utilization, more frequent delivery schedules, better delivery routing and more structured policies for pick-up and delivery. As companies look to reduce these costs further, coordination is critical.

Another cost savings is in lower overhead costs. Warehouses come with many overhead costs primarily related to material handling. As product must be moved either within the warehouse or to the shipping area, these processes utilize valuable resources. Distribution centers in comparison use a lower amount of overhead because the system internally is created for material flow processes. In a simplified model, product enters one side, moves through the distribution center, and leaves out the other side. Based on the reduction of procedures in inventory documenting, inventory handling, shipment preparation, loading and unloading etc. the process costs of operation can be greatly reduced.

One last advantage we see with distribution centers is increased flexibility. This can be

related to flexibility in transportation routing, controlling material flows to stop orders that are cancelled, or using postponement at the distribution center to improve process flow. These are just some examples. Material handling processes are also much more flexible in a distribution system. If an expedited product is needed it can be routed into the distribution system more easily. If repairs are needed, some companies do after-sales service at their distribution center to fix or provide spare parts. The distribution center gives these companies the flexibility to manage inflows and outflows of not only finished products going to a customer, but also material processes that are integrated into the system.

After considering all the advantages, one must also look at the disadvantages of a distribution center model. The first and most prominent is that distribution centers require a different process management approach than warehousing, so people must adapt. As materials are relatively easy to manage when kept as on-hand inventory, a distribution center creates a whole new set of complexities because material is no longer controlled in the same way. Material is simply flowing through the distribution center, and as orders now go directly to the manufacturer, not the distribution center, at times this system will seem difficult to control. Based on the product type and demand levels, maintaining control of the system could be very important to a company.

One reason here is the risk of stock-out. When the cost of stock-out is high for a product or company, a distribution center may not be the optimal solution. With inventory on-hand a company can simply send the product to a customer to fulfill demand. In a distribution center model the order is received and production must begin, taking into account the lead time. In this case, if the lead time is longer, the company may not be able to fulfill the order when the customer needs it. No matter how efficient the distribution process is, the costs to the customer and the manufacturing company for not having the product will be high.

At the same time, stock accuracy can be difficult to manage with a distribution center because limited or no stock is kept on hand. With a distribution center, again lead times become critically important to maintain adequate inventory and more importantly manage material process flows throughout the downstream supply chain to ensure products can be made-to-order. This means coordinating lead times between contributors to ensure demand is satisfied or inventory is prepared at intermediate locations. When a company is used to managing inventory, this change in process can create potential stock inaccuracies throughout the supply chain as a make-to-order system requires different stocking levels than a make-to-stock model.

Managing transportation systems is another potential disadvantage for a distribution network. With strong 3PL providers who are in part dedicated to the distribution center, less risks can occur. By working closely together, routing and scheduling can be managed more effectively. In general however, the coordination needed to manage transportation in a new system is very different from the standard warehousing model. Transportation companies must have knowledge well in advance of pick-up times, which are dependant on customer orders and manufacturing and transportation lead time. On the other end, delivery times are important to ensure high service levels. In this distribution system, scheduling and planning are far more essential to create a smooth material flow process.

Lastly, we must consider the capital investment for a distribution center. First we must look at the structural investment, but also the internal operating systems managing material flows. Inside a distribution center there are commonly a number of material processes occurring such as sorting, picking, order assembly and shipment documentation processing.

Each of these systems comes with an added cost, and depending on how advanced the distribution center is, the costs can be very high. This factor should certainly be weighed against the added value of the advantages listed above. Importantly this will differ for each company and supply chain.

A Closer Look at the Distribution Center

As previously described, a distribution center's function is to act as a material movement location, a coordinating point where product can be either shipped directly to the customer, or repackaged with other products and shipped to complete an order. For a distribution center to operate efficiently, the layout and design of the distribution center must more appropriately fit the function it serves.

When considering the internal layout of a distribution center, one important factor is inbound and outbound coordination. Specifically, consider the unloading and loading bays available. With a distribution center, you commonly find many more truck bays, as product is more frequently being shipped. Therefore if a truck comes to pick up material, but all the docking bays are full, then this is time lost as the delivery truck must wait. In planning, the number of unloading and loading bays will be determined by coordinating the material movement needs and the transportation system that will delivery product or send product to the customer.

At the same time, adequate space must be created for unloading and shipment preparation. These two areas in a distribution center are considered by many to be the most critical space in the whole facility. Depending on a number of factors such as product type, average shipping size, repacking requirements etc. much can be done when product is initially delivered to save on time later in the process. With outbound delivery, the shipment preparation area can also reduce time costs and increase flexibility. For example shipment preassembly during high demand times or locating frequently ordered products close to the loading area for fast-order replenishment when required.

Another consideration of modern distribution centers is the complex systems that govern the operations. In some cases, this can be automated shipping separation lines that moves product from inbound delivery to outbound delivery. In these processes, product can either be unpacked and repacked, shipping documents can be scanned to bundle shipment orders, or in some cases a combination of both. What is critical to a distribution center are the information flows that provide people or equipment with the data to process the materials effectively.

In modern distribution centers, you will find the most important systems are those that create information transferring. This could be software that informs material handlers where product is located and the most efficient picking route. Another example is order preparation information to ensure transportation capacity is best utilized, and customers receive their orders on time. Shipment documentation is yet another system, where once an inbound delivery is made, the computers can print shipment documents that are ready to attach to the outbound delivery once it is assembled. In sophisticated models, invoices are also sent directly to the customer. With improved information flows and integrated software the materials can be monitored to improve inventory accuracy, and at the same time the operational process can be controlled to optimize the performance of this component in the supply chain.

Lastly, we can consider other potential uses for a distribution center, namely after-sales service. As transportation schedules are more frequent, many companies will use low volume

return transportation to carry defective products or products that can be repaired. By housing the remanufacture or repair center at the distribution center, products can be fixed and returned directly to the material movement process for return to the customer. This can improve customer service levels, reduce transportation costs, as well as other costs commonly incurred during after-sales service.

Coordinating Material Movement

Once the internal processes of a distribution center are determined, material movement throughout the supply chain must be organized. The distribution center acts as the coordinator. As the distribution center's location falls commonly between the manufacturer and the customer, this new system can dramatically improve customer service, lead times, and reduce costs in the entire material process. It also importantly changes downstream factors. What the company must first determine is what is the optimal model to use? In many cases a large central distribution is used, but in some cases a large distribution center may feed product to smaller regional distribution centers. In this case, a distribution network is created. After building a model to improve the entire supply chain operations, then the company must view how downstream and upstream processes will change.

When planning a supply chain model, important metrics should always be considered to improve the effectiveness of material flows. For example, how does the distribution center effect the lead time compared to current operations? With lead time, the company can look at the overall, transportation, and processing lead time, which will be different from the warehouse. What must also be looked at are downstream effects in lead times, since the material movement process has changes. How does increased frequency of delivery from the manufacturer impact replenishment from downstream suppliers? How will the lead times change for operations occurring before the manufacturer? As these factors all impact the manufacturing operations once a customer order is received, companies must look closely at how a new distribution center impacts the entire system flow.

Integrated software tools are being developed with the growth in supply chain technology to improve visibility and data transfer. Electronic Data Interchange (EDI) systems now can create information sharing electronically among all contributors in the supply chain, utilizing a central distribution center as the material movement monitor. This can inform all parts of the supply chain, where the product is, how long it will take to receive, when the order is placed, the shipping window, and payment processing as well. With the suppliers, manufacturer and customer interacting on the EDI platform, the distribution center can then watch order processing to anticipate material flows.

By better understanding the material flow throughout the operations, the entire supply chain can coordinate more effectively to meet changing customer requirements, increase the speed of material flow, and lower costs. In many cases, by improving the process of material delivery, companies can increase their sales channels through the distribution center, tying in new customers that see a value in an integrated system.

3PL Transportation

The last aspect we must consider is 3PL management. As a distribution center creates increasingly sophisticated transportation routing, it is important to work with 3PL providers that act as partners in the growth of a company's supply chain network. What becomes fundamental to having a distribution center operate effectively is scheduling, routing and

planning. This will build material movement processes delivering products to the distribution center during appropriate times, and moving product to the customer when they require delivery.

Some of the areas to consider are order frequency, delivery size, inbound pick-up and delivery location. In all of these cases, 3PL providers, the distribution network and the supply chain as a whole should coordinate to reduce redundant processes and increase the material movement strategies, which optimize resource utilization. By working together, costs can be greatly reduced in transportation, which is sometimes very high for companies, and also improve the profit margin on products per unit.

Flexibility is also a key to making a success 3PL partnership work. If a customer requires an expedited order, can the distribution network and the 3PL ensure the product is delivered? Coordinating material movement between retail outlets is another area of flexibility. If one location has a product that a customer orders, but closer location do not have inventory, can the transportation systems be managed to utilize efficient capacity and fulfill the order. Once a distribution center network is established, these are the areas of improved service a company can offer, increasing sales and better optimizing material flows to generate profit.

Distribution centers are becoming an important material flow control for growing supply chains around the world. Generally we see that these models start on a small scale and grow as the company expands their sales channels by creating increased value in servicing the customer. Some industries rely heavily on distribution centers, such as postal services. Other industries are only beginning to develop these systems. What seems to be consistent is distribution centers are now recognized as an important model in improving material process flows. This is increasing the profit making potential for industries around the world, hence why so many companies are integrating distribution center systems.

As supply chains continue to compete against other supply chains, the effective management and utilization of resources will be the key. Distribution networks create complexities in material flow that must be closely monitored and controlled. This will take new ways of thinking and strategy development to integrate the supply chain even further. The leaders are tomorrow are already building these models, but also looking at how they can continuously modify even further the resource requirements used in operations. As competitive challenges increase throughout all industries, the companies that will succeed are ones that reduce costly procedures, optimize resource utilization, integrate the entire supply chain network, and increase sales channel value for customers. Other companies will take notice and want to link in to these models. This creates better suppliers and more customers.