THE SQUARE ROOT LAW:

A MODERN ANSWER TO A MODERN INVENTORY WORLD

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INTRALOGISTICS

To be competitive in a modern sales environment, retailers must be agile in their ability to adapt to the needs of today's customer. This means faster and cheaper shipping, as well as an excellent in-stock selection. Retailers must be hyperfocused on the location of their customers and how their regionality is changing and growing. The simple truth is that most retailers will need to locate inventory within a 2-day shipping radius, or less, to reach customer expectations.

It will be inevitable for retailers who wish to remain relevant and competitive to ask the following question: "When adding additional regional fulfillment centers to my existing supply chain network, how much inventory will be required in each facility?". When first addressing this question, many may believe that one would simply split the existing inventory between additional facilities. This creates a problem, however. When using this approach, a retailer will find that items become out of stock more often since much of the safety stock will be located farther from the customer. As mentioned before, the goal is to place inventory closer to the customer, while keeping products in stock. To correct this issue, many would simply duplicate the inventory when transitioning from one facility to two. This is overcompensating, inflating inventory levels above required levels and increase a retailer's holding cost beyond what is reasonable. So, what is the sweet spot?

When tackling this challenge, I like to refer to a simple supply chain theorem called the 'Square Root Law'. This is a useful approximation first published by D.H. Maister in 1976. The law states that the future inventory requirement can be approximated by multiplying the total current inventory by the square root of the number of future distribution points (nodes) divided by the current number of distribution points (nodes):

$$I_{n2} = \sqrt{\frac{n2}{n1}} * I_{n1}$$

For example, if the current supply chain network has 1 fulfillment center and you would like to increase to 2, multiply the inventory level by the square root of 2. What this tells us in practice is that the level of inventory required does not increase linearly in relation to the number of facilities. When increasing the number of facilities from 1 to 2, the inventory does not increase by a factor of 2, but rather the square root of 2. This also means that as the number of facilities increases beyond 2, the total inventory requirement grows at a lesser rate.

The Square Root Law is a great tool for planning purposes, however there is a caveat. This calculation does not consider variations such as product regionality. If customers in certain regions require a higher or lower demand of certain items, the calculation will be sub-optimal. A deeper analysis may be required to determine product regionality, however the 'Square Root Law' is a great way to determine order of magnitude and help guide corporate leadership when planning an optimal supply chain network to meet the modern customer's expectations.

Contact us at info@hy-tek.com or call us at 678.842.9114, if you want to learn more about the Square Root Law and Supply Chain Network Optimization.