Lesson number 11. Algorithm for controlling logistics in supply chains

Purpose of the lesson:

to study the algorithm of logistics management in supply chains

Key words: Algorithm for controlling , controlling business processes, supply chains

Main questions:

1. Objectives
2. Models
3. Data
4. Integration
5. Delivery
6. Algorithms
7. Process
8. ROI

10 Rules for Supply Chain & Logistics Optimization.

While these innovations have reduced cost by reducing manual effort, their greatest impact is yet to come. They are the essential enablers for optimizing supply chain and logistics decisions. Supply chain and logistics optimization is neither easy nor cheap but it is the biggest opportunity for most companies to significantly reduce their cost and improve their performance. For most supply chain and logistics operations there is an opportunity to reduce cost by 10% to 40% by making better decisions. Over more than 30 years of developing and implementing supply chain and logistics technology, I have found the following 10 rules to be essential requirements for success.

1. Objectives - must be quantified and measurable Objectives are the way that we specify what we want to accomplish with logistics optimization. This in turn is how the computer determines whether one solution is better than another and management determines if the optimization process is providing acceptable ROI. For example a delivery operation might define the objective to be - minimize the sum of the daily fixed cost of assets, the per mile cost of fuel and maintenance, and the per hour cost of labor. These costs are both quantified and reasonably easy to measure.

2. Models - must faithfully represent required logistics processes Models are the way we translate operational requirements and constraints into something the computer can understand and use in algorithms. For example, we need models to represent how shipments can be combined into loads for a truck. A very simple model such as the total weight/volume of the shipments will faithfully represent some loading requirements (e.g., bulk liquids). However, if we use a total weight/volume model for loading new cars on a car hauling truck, many of the loads that the computer thinks will fit cannot actually be loaded while loads that the computer discards because it thinks that they will not fit may actually fit and be

better than the ones selected. Hence, in the latter case the model does not faithfully represent the loading process and the loads developed by an optimization algorithm are likely to be either infeasible or suboptimum.

3. Variability - must be explicitly considered Variability occurs in almost all supply chain and logistics processes (e.g., travel time varies from trip to trip, the number of items to be picked at a DC differs from day to day, the time to load a truck varies from truck to truck). Many of the models associated with supply chain and logistics optimization either assume that there is no variability or assume that using average values are adequate. This often leads to errors in model results and poor supply chain and logistics decisions. Ignoring variability is generally a receipt for failure. Variability must either be explicitly considered in the models or the supply chain and logistics practitioners must have the expertise to explicitly consider variability in interpreting model results.

4. Data - must be accurate, timely, and comprehensive Data is what drives supply chain and logistics optimization. If the data is not accurate and/or it is not received in time to include it in the optimization, the resulting solutions will obviously be suspect. For optimization that focuses on execution, the data must also be comprehensive. For example, having the weight of each shipment is not sufficient if some loads are limited by volume of the truck.

5. Integration - must support fully automated data transfer Integration is important because of the large amount of data that must be considered by logistics optimization. For example optimizing deliveries from a warehouse to stores each day requires data regarding the orders, customers, trucks, drivers, and roads. Manually entering anything other than very minor amounts of data is both too time consuming and too error prone to support optimization.

6. Delivery - must provide results in a form that facilitates execution, management and control Solutions provided by supply chain and logistics optimization models are not successful unless people in the field can execute the optimized plan and management can be assured that the expected ROI is being achieved. The field requirements are for simple, unambiguous directions that are easily understood and executed. Management requires more aggregate information regarding the plans and their performance against key performance benchmarks over time and across facilities and assets. Web based interfaces are becoming the medium of choice for both management and execution.

7. Algorithms - must intelligently exploit individual problem structure One of the biggest differentiators among supply chain and logistics optimization technologies is the algorithms. An irrefutable fact regarding supply chain and logistics problems is that each has some special characteristics than must be exploited by the optimization algorithms in order to provide optimum solutions in reasonable time. Therefore, it is critical that (1) this special structure be recognized and understood by the analyst setting up an optimization system; and (2) the optimization algorithms being used have the flexibility to allow them to be “tuned” to take advantage of this special structure. Since logistics optimization problems have a huge number of possible solutions (e.g., for 40 LTL shipments there are 1,000,000,000,000 possible load combinations), failure to take advantage of special

problem structure means either that the algorithm will pick a solution based on some rule-of-thumb or that the computational time will be extremely long.

8. People - must have the domain and technology expertise required to support the models, data, and optimization engines Optimization technology is “rocket science” and it is unreasonable to expect it to function well over time without at least a few “rocket scientist” to insure that the data and models are correct and that the technology is working as designed. You cannot expect a complex set of data, models and software to be operated and supported without considerable effort from people with the appropriate technical and domain knowledge and experience.

9. Process - must support optimization and have the ability to continuously improve Supply chain and logistics optimization requires a significant ongoing effort. There is invariably going to be change in logistics problems. This change requires systematic monitoring of data, models and algorithm performance not only to react to change but to initiate change when opportunities arise. Failure to put into place processes to support and continuously improve logistics optimization invariably results in optimization technology being either poorly utilized or becoming “shelf-ware.”

10. ROI - must be provable considering the total cost of technology, people and operations Supply chain and logistics optimization is not free. It requires significant expenditures for technology and people. Proving ROI requires two things: (1) an honest assessment of the total cost of optimization and (2) an apples-to-apples comparison of the solutions being produced by optimization versus benchmarked alternatives. There is a strong tendency to underestimate the ongoing cost of using logistics optimization technology. If the total cost of logistics technology decreases after the first year, it is likely that the solution quality is decreases proportionally. It is seldom the case that the ongoing annual cost of effectively utilizing logistics optimization technology is less than the initial cost of the technology.

Determining the impact of optimization technology requires

(1) benchmarking with regard to key performance indicators before implementing the technology,

(2) comparing the results from optimization to the benchmarks, and

(3) performing regular audits of optimization performance. Few companies today know how well their supply chain and logistics optimization is actually performing and how to determine their most significant opportunities for improvement. This is both the greatest challenge and the biggest opportunity for the next generation of supply chain and logistics optimization technology.

Questions

1. What are the 10 rules for optimizing your supply chain and logistics?
2. Describe the rule People
3. What does the integration include
4. What does volatility mean
5. How algorithms are applied

Main literature:

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