ADEXA
Whitepaper Series

From Predictive to Prescriptive Analytics and Beyond …

Predictive analytics looks at the patterns of the past and predicts the likelihood of an event in the future. In addition, pattern recognition can be used with the use of AI techniques and topology to find relationship between different variables and how one can cause the other. The latter has demonstrated much success in medical field as to the efficacy of certain treatments or in retail industry showing what works and what does not help to increase sales. Such patterns are hidden in the data. It takes a long time for humans to try and find these relationships by trying to make certain hypothesis and then examine the outcome to see if it is true or not. Systems can perform billions of searches in seconds and discover hidden causes that can be very helpful.

In supply chains, we deploy predictive analytics in a number of ways. For example, demand planning deploys techniques to forecast the future based on the events in the past. In addition, we use certain AI search techniques, such as Gradient Descent, in order to find optimal levels of inventory for every item at different points in the supply chain. We refer to this system Multi Echelon Inventory Optimization (**MEIO**). But note that, MEIO does more than just predicting the future, by highlighting a problem, it also tells the user what to do and how much future inventory is needed for the expected demand. In demand planning, however, we are only made aware of an event in the future, namely potential demand for a certain SKU at a given point in time. What to do about it is not part of the equation! On the other hand, MEIO says, given the demand that we see, here is the solution at every point in the supply chain. It can be seen that demand planning and MEIO together form a prescriptive analytic engine

Prescriptive SCP

As powerful as the above engines are, they rely on past data in order to predict the future. In order to truly be able to predict the future we need to have a full model of the supply chain. Just like a mathematical equation that you plug in the numbers and it tells you what to expect, a model of the supply chain tells you exactly what will happen and what we can do to resolve the

issues by plugging in the data. The supply planning engine has no notion of the past other than what the current status is. It is capable of mimicking all the details of the supply chain under any given set of parameters. Thus, it shows all the expected outcomes of changing demand, losing supplier, increasing production, breakdown of equipment or transportations lines and so on. But it goes further and finds solutions to expected problems and makes recommendation what preventive measures must be taken and what the outcome (financial and operational) would be. Examples are use of substitute materials or suppliers, changing the product mix or redirecting inventory to different regions. We conclude that the modeling of the supply chain is both predictive and prescriptive with the exception that it relies on an accurate model of the future rather than the past patterns. When to use predictive and when to use prescriptive supply chains models are determined by the amount of detail one has for input and the amount of detail that is desired in the model. As an example, companies need to predict how much revenue they will book using point of sale (POS) information to do this. POS data can be used as a causal factor in an expected shipment model. This is predictive. If the company takes the POS data and adds inventory and a model of the extended supply chain, the expected shipments can then be calculated in a prescriptive model.

Let's take this to an even higher level of intelligence, that is Self-Improving Supply Chain (SISC) systems. SISC has the ability to be aware of what is expected to go wrong and make recommendations to change before it happens without human intervention. For instance, every time the system runs, the system notices shortage of certain types of items in the supply inventory. If this happens frequently, it forces the system to recommend more expensive substitute material to meet customer orders. But after a few occurrences of such decisions, the system can recommend a higher inventory availability of the short item in order to avoid the use of higher value item. Note that this is all happening in the future and the system is actively examining different scenarios and making decisions on what is expected to happen rather than what may have happened in the past. The subtle difference is that Prescriptive SCP engine and SISC rely on modeling the future to prescribe what to do at the same time improving its performance by "learning." Conventional predictive and prescriptive analytics rely on past models of data to predict the future. Although we are excited about the former, we believe that both approaches are useful and needed to accurately manage supply chains. In fact, our solutions of sales and operation planning entail both methodologies in order to paint an accurate picture of supply chain and what decisions are to be made to enhance and improve operations and financial results of the companies.

For more information on self-improving supply chains, the reader is referred to **SISC** or via contact options below:

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