



## Not Your Father's Planning System

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In recent years we have been witnessing a tsunami of changes occurring in the information industry leading to the fastest rate of change in every aspect of social life and business practices. A few observations:

- Intelligent cell phones are widespread and social media is connecting people in real-time
- Information companies have been replacing not just brick and mortar companies but are now replacing the traditional taxi cabs and transportation companies
- Speech and visual recognition systems are commonly used in business, banking and security
- Ecommerce is now 5% of the \$4.3 Trillion in total US retail sales. For clothing and footwear, almost 20% goes to eCommerce
- Intelligent devices are in people's homes from Washing machines to vacuum cleaners and refrigerators with widespread use of IoT
- Robot store assistants are now greeting shoppers at stores and responding to their needs. People's avatar's help shoppers on line to pick the right make up and clothing items.
- A one-year old can play with tablets while expecting a magazine picture to change as if it is a touch screen!
- 3D printers can make anyone a *manufacturer* in their garage!

What has brought these facets to our lives is a combination of advanced technologies, discussed below, that have become mature enough to allow such unprecedented modes of

communication and information exchange. What has been going on is a revolution in the way we live, work, relate to each other, communicate, collaborate and even go to war with each other.

Machine intelligence is used to make all kinds of decisions from the right amount of water in our washer machine to the quantity of shipment of an item to a location for storage or sale. As data becomes so abundantly available in real-time, systems are needed to make sense of it all. Stock market is a good example of such trend. Every morning the same data is available to everyone everywhere. People who have the best decision making systems the fastest are the winners in the financial markets. They do this by highly optimized algorithms and Artificial Intelligence (AI) techniques.

It is estimated that 90% of the information and data that is available to us was created in the last two years. IDC estimates that by 2020 the total amount of data available to us is 40 Zeta Bytes (Each Zeta is 1 Billion Terra). As human beings the only way we can cope with this is to have intelligent systems to decipher the data and recommend what can be done or should be done. A simple example is having 500 TV channels. Unless there is an intelligent way to find, or to recommend to you, your favorite programs, a sequential search is not an option.

Areas that have been instrumental in supply chain planning technology are:

1. Computer Vision and Speech Recognition
2. AI Techniques, especially machine learning and inference techniques

3. Optimization algorithms including planning and scheduling
4. Pattern recognition in Big data and techniques to uncover hidden information that may not be obvious

Learning systems in AI are intended to make software more and more intelligent by learning from its environment. As an example, given a model of supply chain of a company, it must have the capability to constantly improve as the company changes. In some cases, the changes are subtle such as demand falling slowly or frequent shortages of certain materials increasing cost. Of course there are obvious changes too such as losing a customer or a supplier. How would the models of the supply chain understand these changes and relate to them? This is currently done with a lot of help from their users and programmers. However, we are at a point where systems can have the capability of changing themselves by understanding the aberrations in the environments in which they operate—Also known as *Self-Repairing or Self-Improving Supply Chains*®. As an example, assume a supplier is late by 3-5 days most of the time or a customer generally over-forecasts by 10%. An intelligent system is capable of picking up this kind of pattern, confirming it, and then account for it into the future models automatically. Thus the supply chain model is constantly *adapting* itself to its surrounding and changing as the business changes. By using techniques in big data analysis, models are constantly corrected by detecting new patterns and on-going changes. Thus representing an accurate view of what is actually going on. Once a correct model is available, optimization techniques can yield a much better solution of how the operation should be run for best results and highest profits.

Of course none of the above is possible unless we tap into techniques which make the systems more human, i.e. ease of use, safety, credibility and reassurance, and somewhat emotional connection. Much like video conferencing that

became popular by showing people's faces and emotions, social media can also play a role in business. For example, the purchasers and vendors can see each other while sending messages back and forth or at least can see a picture of the other, get to know them resulting in a personal connection leading to better business practices. There is currently available technology to detect even facial expressions and feelings, used for better service at retail stores and what should or should not be in stock.

Messaging, social media, collaboration and communication as well as speed and intelligence are becoming the ingredients and central to every business system. It will lead to making digital "personal assistants" available to everyone in every aspect of social life and business environment. They can predict your needs even before you need them, understand your emotions and follow your practices. We are on the verge of having "driver-less" planning engines too. Just tell them where to go or in this case "optimize profit at 98% delivery performance!"