Supply Chain Digitalization

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Introduction:

In conjunction with this year's Gartner Supply Chain Executive Conference, ZTE's Anders Karlborg along with ASU's Todd Taylor and USC's Christopher Gopal initiated a meeting with a group of supply chain thought leaders to debrief on the discussions of the event and extract key learnings. The group met to brainstorm ideas and trends specifically related to the "digitalization" of supply chains and discussed its impacts and applications in the future. It is intended that similar meetings will be held annually in conjunction to the Gartner Supply Chain Executive Conference to continue the evolution and growth of the digital supply chain. This article provides a brief summary of their meeting and includes the ideas and principles they discussed.

Main Areas of Discussion

The participants already had an understanding of "digitalization" in the supply chain, industry 4.0 and the evolution to flexible, integrated, automated, smart and resilient supply chain ecosystems. From that common ground, the discussion centered on the four areas below. The first three areas being technologies that are essential to supply chain digitalization and the fourth being an overarching principal that drives success.

1. Blockchain
2. Predictive Analytics
3. Artificial Intelligence
4. Performance Metrics for Supply Chain Digitalization

Blockchain

Description: The blockchain discussion was focused on private, enterprise blockchains and how this new technology is being used today and how it may be used to benefit supply chain ecosystems in the future. Professor Taylor led the discussion and explained, that at its core, private blockchains are distributed ledgers with the following components or characteristics:

- Persistent data stores that track the state of "assets". These assets could be purchase requests, requests for pricing, orders, notifications and many other kinds of information.
- Chaincode (smart contracts) that provide instructions to automate transactions and information exchange between network partners.

- Enhanced security due to the use of public and private keys, the sequenced and encrypted ledger as well as the fault tolerance of the ecosystem guarding against unwanted intrusion or rogue actions.
- An ability to conduct private transactions with single or groups of partners in the blockchain network. Here he also explained that these transactions could be operated through the use of private channels, keys, chain code and membership and permissions.
- He also explained that validation in private networks does not require the arduous proof of work that public blockchain networks require and that the protocols here were still evolving with the rest of the technology.

Benefits: Due to the immutability of the transaction history, these networks foster greater degrees of trust, automation, integration and collaboration along with a simplicity that has great potential to move supply chain networks toward the aforementioned goals of digitalization. Instead of exchanging documents or subscribing to proprietary marketplaces, blockchain holds the potential to allow for simple, efficient information flow and transactions across disparate partners.

Obstacles and Challenges: Professors from the supply chain department, engineering and across ASU created a Blockchain Research Lab which is investigating the benefits of blockchains, the various aspects of the technology itself and helping to identify best practices and address many questions that remain as this technology evolves. Some of those in discussion today include:

- Costs are unclear. Large initial capital investments may be required to bring supply networks onboard.
- How to estimate and plan for costs of implementation, replacement of old systems and changes in software?
- How to predict and estimate benefits?
- Is it possible for companies to "leap frog" to a block chain and skip unnecessary steps?
- How to decide on standards given the issue of interoperability whilst not stifling innovation?
- What are the legal ramifications of smart contract code (chaincode) and what will be the response of governments and law makers/enforcers?
- The technology is still in a very nascent state and will take a few years to mature to the point of viable production use. Some niche implementation will occur much sooner, however.

Suggestions: Even given the challenges, it is becoming clear that this technology is set to have a dramatic impact on supply chains. It was the resolve of the group to help advance the thinking and contribute to the technology development and direction.

Predictive Analytics

Description: The discussion regarding predictive analytics showed the growth of data science over recent years. Predictive analytics is a big jump from common historical data analytics and is far more accurate and useful. We are all familiar with the predictive power of historical data and analytical modeling. These capabilities provide us with supply chain crystal balls of a sort.

Benefits: The group discussed three developing ways to gather information for predictive analytics; using IoT, social media and sensor data. After discussing how to gather data for these advanced, predictive models, the group started to think of ways they can be used in the future. The main use cases discussed were the customization of products and services and enhanced risk management capabilities. Through predictive analytics, companies will be quicker to adapt to changes in the market and may even be able to predict the change and prepare for it before it happens.

Obstacles and Challenges: Through the conversation the group concluded that the largest challenge is, as always, the data challenge. Data is either unavailable, suspect, under-utilized or not used properly. Predictive analytics will only be effective if executives have confidence in the tools and can use them appropriately to make decisions. Another point that was discussed was the cost to collect data. Companies will need to ask if the cost to collect data is worth the time, money and resources.

Suggestions: Overall the group determined the benefits of predictive analytics (and the subsequent steps toward AI and Cognitive Analytics) as out-weighing the costs and as an essential component to the progress and success of supply chain digitalization. Create clean and constantly refreshed data models that can gradually become smart and predictive through automated data refresh and machine learning.

Artificial Intelligence

Description: The group of supply chain thought leaders all agreed upon the potential impact of artificial intelligence to create more flexible, integrated, automated, smart and resilient supply chains. Artificial intelligence involves machine learning, intelligence, and the automation of day-to-day processes and operations through smart/adaptive machines.

Capabilities from IBM's Watson and the solutions from Enterra and others were discussed. The first part of the conversation revolved around cognitive analytics. The group talked about a link to blockchain and the ability to automatically update and enrich data models which in turn would update blockchain chain code and transaction instructions, thus creating a "learning" supply chain system. But the vision of AI extends even deeper to systems that are able to understand and interpret real world phenomenon and then take action based upon what is observed.

Benefits: The conversation then dove deeper into the details of artificial intelligence. The ability for machines to continuously adapt and improve was identified as a key to the success of future supply chains. Also, the ability for machines to predict when maintenance is required will provide cost savings and help mitigate disruptions in the supply chain. The group identified several benefits of artificial intelligence such as lower labor costs, increased quality, better consistency, less errors, improved modeling and analytics, increased customer intelligence, better service/demand management and improved supply chain interruption predictions.

Obstacles and Challenges: The promise of artificial intelligence is only limited to one's imagination. However, to begin to enjoy the value that artificial intelligence provides there is a price to pay and challenges will arise. The group identified a few challenges and questions companies will face if artificial intelligence is being considered.

- The interpretation of real world events by learning systems to improve predictive models that then lead to action or recommendations for action. These interpretations assume an etymology of events and unpredictable human interactions.
- It is difficult to calculate the eventual ROI for the investment in artificial intelligence. It is possible that the investment will yield a positive return one day but the question is how much will it yield, how do you calculate the gain and what are the potential benefits.
- Change management is needed for the implementation of artificial intelligence and a new "ERP" systems. It is difficult and time consuming to train people how to use new ERP systems and artificial intelligence.
- Who develops and specifies the intelligence and priorities in the AI system?
- Cross-company design/procurement/manufacturing/fulfillment collaboration – internal and external; all have different objectives.

Suggestions: Suggestions from the group were to follow some of the leading companies in the space and see how the technology matures and evolves before making sizable investments. Watch Enterra and others. There are foundational elements that can be put in place such as continuously and automatically improved modeling that can provide improved insights and analytics. Simply looking for the best ways to digitize and automate processes in your value chain is where to start.

Performance Metrics for Supply Chain Digitalization

When talking about KPIs and metrics, the group had various ideas to measure the success of a digital supply chain. A few types of metrics that are useful for supply chain digitalization include output metrics, process metrics and value chain metrics.

- Output metrics are usually cost, revenue, unit and profit related. Units produced in a given timeframe, units sold, cost of goods sold, etc.
- Process metrics are metrics such as cycle times, perfect order, and other measures of process efficiency.
- Value chain metrics expand the scope to include not just the measures of your own entity but the performance of the network as a whole.

Another key area to measure is the implementation of a digital supply chain. MVP metrics can be used to measure implementation. Christopher Gopal shared his top 5 metrics for business; profitability, liquidity, growth, innovation, and customer experience.

Conclusion

The final summary of actions included the following:

1) Blockchain – follow the advancement of the technology and standards. Don't just read commentaries but implement the technology in a proof of concept or pilot so you have an accurate picture. This is important enough to learn about and know.
2) Predictive analytics – Create clean and constantly refreshed data models that can gradually become smart and predictive through automated data refresh and machine learning.
3) AI – Watch some of the leaders in the space. Look for the best ways to digitize and automate processes in your value chain.

These technologies are beginning to come together to help digitize, automate, integrate and improve global value chains. These heightened levels of visibility and transparency are meeting resistance from many who capitalize on inefficiencies and lack of integration and information. It's certainly an exciting time to be a supply chain executive!