Digital Supply Chains Compress Time...Both Cycle Time and Customer Time to Value

"I want your solution to be live and delivering operational value to my business in 60 days!" That's what our executive sponsor at a large global company said to me a few days ago. Sixty days from signing a contract with us, he expects to be watching the live movement and understanding the behavior of his orders inbound from foreign suppliers to manufacturing, as well as outbound finished goods from his DCs to customers. He wants this capability at a part or SKU level, across all global transportation modes, and he wants accurate predicted times of arrival factoring the impact of external events and risks. Finally, he expects dynamic lead-times and variability for each of his global lanes, routes and nodes based on the live behavior of his entire network.

Twelve years ago, I would have balked at the request and stared into space in disbelief. Thankfully we've been hitting these timelines for several years now.

With almost every customer, we're delivering what this leader asked for within the first 60 days. Granted, during the initial phase of an implementation, we focus on a subset of the customer's supplier base, inbound to a partial list of their plants, and outbound to a subset of customers, but that's across all global transportation modes for thousands of shipments a day. In fact, it's the customer's ability to mobilize its internal resources that's the gating factor to going faster and broader.

This ability to compress time to value is only achievable with a mature, powerful digital supply chain platform. A live system delivering operational value to an organization inside of 60 days? I've seen global ERP implementations take close to a decade. I've personally implemented ERP and supply chain planning and execution systems that have dragged on for years. What a difference from the 1990's and 2000's!

What is it about digital supply chain solutions that make it possible to deliver value in such a short timeframe, while traditional supply chain solutions take so long, are so painful and costly to implement?

CLOUD NATIVE

Let's start with the most obvious advantage digital supply chain solutions have over legacy supply chain solutions. They're cloud native. They were born in the cloud, not retrofitted to operate in the cloud as an afterthought in order to check a box for marketing purposes.

How many of today's ERP and advanced planning systems were built on a 1990's and early 2000's technical stack? How many companies have rolled up multiple smaller acquisitions, attempted to make all the point applications interoperate, and then pushed the complex mess into the cloud? How many customers are happy with how these systems integrate, interoperate, perform and scale after they were cloud enabled by legacy vendors? Most of us know this approach is designed to hype marketing and say all the right words in a sales cycle.

Legacy ERP and supply chain planning and execution solutions still require a great deal of technical set up and administration. In some cases, hardware still must be purchased and provisioned. Customers must acquire and manage database licenses, integration software, third-party embedded software and network infrastructure. Fortunately, today's digital supply chain solutions were born in the cloud and run in the cloud. They require very little hardware, soft-

ware or back-end set up to provision a new customer instance. The good ones scale up and down automatically while remaining cost effective for the customer.

Since TransVoyant started our journey after 2011, our solution is truly cloud native. Our cloud native traits have enabled us to quickly ingest our customers' internal data, fuse it with our global behavior data and produce valuable supply chain insights quickly...squeezing time to value.

SOURCE DATA

Every supply chain solution requires data inputs. Supplier management systems require purchase orders and supplier commits, transportation management systems require customer orders and carrier contracts, demand planning solutions require order history and point of sale data, to name a few.

In legacy supply chain solutions, one-to-one custom connections and transformations must be developed to extract a single data element so it can be consumed by the target system. If another system needs the same data, a different one-to-one connection is made. In many cases, the source data is incomplete or inaccurate, so it must be enhanced, cleansed and normalized. Legacy supply chain solutions force customers to spend large chunks of time and money on unique integrations while paying for the same integration multiple times.

A digital supply chain solution sits on top of a modern, temporal and spatial, one-to-many stream integration architecture with existing connections to legacy systems. The stream architecture has data cleansing, enhancement and normalization built-in, greatly reducing integration time and money. This approach provides a "connect-once-distribute-many" capability that enables all upstream and downstream digital supply chain insights and applications to interoperate seamlessly. Our customers see the result in time to value and minimal integration cost. Believe it or not, we have many customers who have never paid us a dime for an "integration"!

As important, digital supply chain solutions come complete with vast amounts of data on day one. These data streams include the real-time location and behavior of global transportation assets, the behavior of ports, airports and border crossings, and current and future weather and traffic. Other data streams include natural disasters, consumer sentiment, geo-political trends, crowd movements, road construction, wave heights, etc. Since available global sensor data continually expands, a digital supply chain solution must continually, and cost

effectively, add new data streams to help customers better understand changing global behavior.

Today's leading digital supply chain solutions have already done the hard work of identifying, collecting, cleansing, normalizing and ingesting massive amounts of global real-time big data. This is no easy task, to be sure. As an example, our live data streams are flowing into our digital supply chain platform constantly. There is no room for platform "down time" as global behavior is always "on". Therefore, this massive amount of live behavior data is available on day-one of an implementation, and is a key factor in our ability to deliver customer value inside of 60 days.

Why is this so important? On day one of a customer implementation, we already know the real-time location and behavior of the conveyances that their goods are traveling. We know the behavior of the routes and lanes. We know the airport and port behavior. We know how the behavior varies across time, day and season. We've been watching all this global behavior continuously for years. Therefore, all we need to begin tracking and predicting what will happen to specific goods in motion is a single piece of information from the customer. . . a bill of lading. Armed with that single piece of information, we automatically associate customer goods with the conveyances, routes, lanes, ports, airports, etc. This is another key reason we show our customers real-time behavior of their supply chain within the 60-day time to value window.

Tracking the real-time movement of an organization's global shipments—across all modes of transportation—is table stakes for a complete digital supply chain solution. Showing real-time and predicted dynamic inventory levels within warehouses and work-in-process in manufacturing; accurately predicting when shipments will arrive at their intermediate and final destinations; and understanding and predicting lead-times, capacity, and variability is of greater value.

How do digital supply chain solutions deliver these strategic insights, within a short period of time? In a word..."Platform".

UNDERLYING PLATFORM

Traditional supply chain solutions are constructed with an application-first mentality. By that I mean the design focus and code base is embedded within the processing logic and UI of the system. Because of technical limitations in the 1990's and 2000's, these applications are constrained to a single or limited

number of business functions (e.g. demand planning, transportation management, warehouse management, etc.). Coupled with the inflexible point-to-point integration approach previously discussed, a single database architecture (usually static relational), customers are made subservient to the application.

In the world of digital supply chain solutions, living data, information and insights are the drivers to unlock myriad interdependent and synchronized applications. Customers are no longer subservient to the application. An important value of a digital supply chain solution is its ability collect, analyze and unlock the intelligence that is buried in the data from a customer's extended physical and logical supply chain; data from its upstream and downstream partners; and data about the dynamic events surrounding its supply chain across the entire globe.

Therefore, digital supply chain solutions are constructed as platforms first. Applications are then added "on top" of the platform. The platform contains the massive real-time big data streams that are continuously collected from IoT devices; a scalable and intelligent one-to-many stream integration infrastructure; the APIs that connect to, normalize and ingest these data streams; the machine learning algorithms (a.k.a. processing logic) that continuously analyze the data to produce intelligent insights; and the data science and data engineering tool kits to allow non-stop production of new algorithms, insights and predictions.

Let's talk a little about a few of these platform components.

APIs

Yester-year's ERP and supply chain planning execution systems had very poor integration layers. In fact, they were practically non-existent. Integration touch points for ERP were almost always custom developed, later using toolkits, but still very difficult to build and maintain. They were also rigid. The inbound data had to be in a very specific format or else it would be kicked out by the target system. In other words, the systems expected well-structured and consistent data which is not how the real-world produces data.

In stark contrast, the APIs and integration layers of today's digital supply chain platforms are extremely flexible and powerful. The integration layer within our Continuous Decision Intelligence (CDI) platform, for example, includes the same API framework that enables us to pull in over 1 trillion big data events around the world every day, ingest streaming data from our customers' ERP and supply chain systems, and pass predictive insights and prescriptive recommendations back to those systems for execution.

Our CDI platform ingests data from customer systems, upstream and downstream partner systems, .pdf files, excel spreadsheets, documents, emails, text messages, EDI messages, databases of all types, and myriad other forms equally well. In other words, it is built for today's data. Data that is unstructured, semi-structured, structured, spatial or temporal. Data that streams at massive volumes consistently or trickles at us sporadically. The time and effort that this part of the CDI platform saves us when enabling a customer, versus a traditional supply chain solution, is immense.

Another area of differentiation between digital supply chain solutions and their traditional predecessors is the processing logic.

PROCESSING LOGIC

ERP and supply chain planning and execution systems have rigid logic. By logic, I mean the math (often static rules) behind counting things or optimizing things. When the operations research professionals at traditional supply chain software companies developed their processing logic, they had an answer in mind. They wanted to optimize a transportation plan, or produce an accurate demand forecast.

Therefore, they started with the desired answer, figured out what kind of processing logic would be required to produce that answer, and then figured out what kind of data inputs would be required to feed the processing logic to arrive at the desired answer.

Digital supply chain solutions work differently. They start with the data inputs. They employ self-learning and human-assisted algorithms that analyze the data inputs; identify patterns, behaviors and outcomes; and from that logic, they produce insights.

Why are deliveries of a single finished good always late to customer XYZ? In many cases, supply chain professionals have no idea when, where or why things go wrong in their extended supply chain. They can't sift through and identify live behavior patterns that occur prior to a problem or an opportunity. In the digital supply chain world, they don't need to know; they can let the machine figure it out for them.

A digital supply chain solution shines a light on the entire end-to-end supply chain. It watches and learns flows and behaviors associated with a company's end-to-end supply chain. It knows where parts originated at a foreign supplier. It knows how long a container sat at the port of origin, waiting to be loaded onto an ocean

vessel. It knows the precise route the ocean vessel took to reach its destination, and whether it made unscheduled port stops. It knows how long it took the vessel to berth and unload. It knows how long the container sat in the dockyard before the dray carrier picked it up. It knows the route that the truck took to reach the manufacturing facility. It knows how long the truck had to wait outside the plant for a dock door to become available. It knows which part within a complex bill of material caused a manufacturing line to be delayed because the part didn't arrive on time. It knows why that part didn't arrive on time. It knows what route the truck took to move the finished goods from manufacturing to a distribution center. It knows the route the truck took to transport the goods to the customer and it knows why it took longer than planned.

What does this understanding of learned behavior have to do with time to value? By seeing everything unfold in the extended supply chain in real-time, and by continually analyzing actual performance against expected performance (or optimal performance), over and over again, the machine solves issues and identified a priori patterns very quickly that would take individuals, operating within siloed organizations, a very long time to solve, if ever.

Let me offer an analogy, coming from a kid who worked on a farm as a teenager. Imagine a corn maze with several successful paths from one end to the other. A few of the successful paths take less time to traverse than others. Nonetheless, the corn maze is so large and complex that it takes a long time for even the most accomplished participants to solve. Now imagine the maze shifts every fifteen minutes, completely changing the pathways to completion. This is your supply chain, and your supply chain professionals are the people trying to navigate the maze.

How long would it take your teams to solve this hyper complex maze? A very long time, if ever!

Now imagine a machine learning-based computer being fed by real-time images from a video camera mounted on a drone. Imagine that drone flying up to 1,000 feet above the corn maze, with a complete, real-time view of the maze. Now put a couple thousand people into the maze, and allow the computer watch all these individuals independently trying to solve the maze.

The computer learns how long it takes a person to walk from one point to another point within the maze. In fact, it learns how long it takes for each individual to walk from one point to another, because all participants walk at different speeds. It also learns characteristics and attributes of both individual

and group performance such as stride length and running versus walking. It knows whether temperature or time of day is influencing performance. It learns at what intervals the maze shifts and the different configurations the maze takes when it does shift. After watching and learning the behavior of the maze, and the people within it, and the environment around it, and predicting when the shifts will take place, the machine learning computer produces an optimal solution in a fraction of the time that it would take people to solve.

That's rapid time to value.

Our solution has been watching the corn maze (a.k.a., the extended global supply chain) for years. The platform comes complete with pre-established learned behavior models for lanes, routes, carriers, nodes, etc., within the extended global supply chain, under varying conditions. That's why we provide our customers with insights, such as accurate predicted times of arrival and behavior-based actual times of arrival for their shipments from the day we ingest their first bills of lading.

Over time, as our platform watches the performance of our customers' specific supply chains, including in-node performance (e.g. suppliers, manufacturing plants, distribution centers, retail stores, etc.), it also begins to understand lead-time, capacity and throughput variability for the customer's unique supply chain at a nodal, lane or route level. This enables us to continuously feed planning and scheduling systems (e.g. inventory optimization, order promising, transportation management, etc.) with granular and dynamic insights that enable our customers to meet service level requirements while simultaneously reducing inventories.

That's significant value, all enabled within months, not years.

Digital supply chain solutions are redefining the market in so many ways, and time to value is one of the most significant. Experienced supply chain professionals, with painful memories of ERP and supply chain planning and execution deployments fresh in their minds, need to reset their expectations and demand more. More speed and more value.

Thankfully, this is one of the few cases where a resetting of expectations is a good thing!

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