

Turning “Big Data” Into “Big Visibility”

Leading companies are beginning to leverage their data to gain valuable intelligence and automate processes across their end-to-end supply chain

Advanced analytics can generate deep and expansive value by providing real time visibility across the supply chain and improving forecasting, demand planning, sourcing, replenishment, production, transportation and logistics, and distribution processes.

Most firms have already invested in business intelligence, supply chain management (SCM), and modeling tools that claim to make it possible to drill deeper into their supply chain data in search of savings. These tools are often marketed with vague promises that they will harness the organization's "big data" and/or provide "end-to-end" (e2e) visibility.

Yet despite the fact that they have undergone a number of complex and expensive technology implementations, most C-level and supply chain executives admit that they still have little idea of what is happening throughout their extended supply chain until long after events have taken place. It is nearly impossible for their organization to sense an issue and modify or optimize its response in a timely manner.

As a result, today's executives are frustrated—they know their companies are sitting on extremely valuable information assets and yet they are unable to leverage it for the benefit of their organization. While they work hard every day running operations or trying to figure out how to best allocate their limited capital, the thought is always in the back of their minds that there has to be a better way. The problem however is that it is very challenging to know what tools to invest in and how to time that investment.

This white paper explores how companies can successfully leverage their big data to gain unprecedented levels of visibility and control across their supply chain. It will demonstrate that with the right technology approach, companies are making significant shifts in their use of data to include advanced analytics that transform historical and real time data captured in their own SCM and ERP systems (and those of their trading partners) into predictive and prescriptive insights. These companies are using advanced analytics to provide real time visibility across their supply chain and improve forecasting, demand planning, replenishment, sourcing, replenishment, production, transportation and logistics, and distribution processes.

Note that while not all organizations are ready to harness their big data and implement advanced analytics, many advantages can still be gained from analytics without their application becoming overly sophisticated or complex. For some, simply gaining a more accurate window into what is happening across their end-to-end supply chain is a worthwhile investment. In the end, there can be little doubt that whether or not you already have data waiting to be used, investing in new analytical tools will likely be in your organization's future.

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Supply chain’s biggest buzzwords: “Big Data” and “end-to-end visibility”

Every white paper, webinar, and article about supply chains these days seems to include some mention of big data, end-to-end (“e2e”) visibility, or advanced analytics. As with most buzzwords, their definitions are vague and it is unclear how, if at all, they are related to each other.

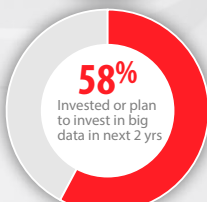
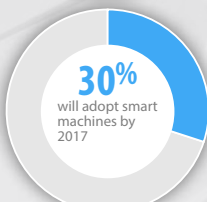
When talking about big data, most sources emphasize the sheer scale of the data sets that now exist, with anything over 1 petabyte usually getting the big data label.¹ A petabyte of

data is 1024 terabytes, and terabyte of data is 1024 gigabytes. To provide some sense of scale (and how far we’ve come), 20 petabytes is the total amount of hard disk drive space manufactured in 1995. Today it is the amount that Google processes on a daily basis. For 15 percent of manufacturers in a recent survey, 20 petabytes also represents the current size of their ERP databases.²

Finding a consensus for what supply chain visibility means is much harder, but by any definition it’s a very passive exercise. Essentially, companies are executing transactions, storing the

1. “Big data: are we making a big mistake?”, Financial Times, 2014.

2. “5 Steps Supply Chain Executives Can Take to Harness Big Data”, Supply Chain Insights, 2013.



Key Facts

- A recent survey of 400 executives (more than half in C-suite roles) found 51% of respondents believed predictive analytics will provide more precise risk assessment of suppliers, but only 31% are currently using predictive analytics in this manner (The Economist).
- 58% of companies in the supply chain industry have invested or plan to invest in big data technology during next two years (Gartner Research 2013).
- A recent survey of 127 companies in supply chain industries, a majority indicated that their biggest challenge with big data was to understand how to extract value (Gartner Research 2013).
- By 2017, 30% of companies will adopt smart machines for no-human decision-making in one or more supply chain processes (Gartner Predicts 2014).
- By 2017, the convergence of structured and unstructured data will fundamentally change the way CP supply chains deliver value (Gartner Predicts 2014).

Gartner Research recently revealed that virtually no companies are able to or will be able to provide end-to-end supply chain visibility in the near future.

results in a data warehouse, pushing the data to portals and/or business intelligence tools, running analytics on what has happened, and just trying to do better next time. And while the “end-to-end” label is often used, the truth is that most technology systems still offer a simplistic form of visibility into one part of the supply chain at the expense of the other. At best (and this is rare), this means visibility across the internal departments of the organization with national sales and purchasing visibility into its immediate trading partners.

Given these limitations, it is no wonder that Gartner Research recently revealed that virtually no companies are able to or will be able to provide end-to-end supply chain visibility in the near future; in fact, by 2016, they estimate less than 20% of companies will be able to provide end-to-end supply chain visibility.³ The truth is that most companies are essentially flying blind.

Why is end-to-end visibility so hard to obtain? The primary reason (and one that has been overlooked by most other commentators), is that supply chain visibility is primarily a big data problem.

The outsourced supply chain’s big data problem

Simply put, to obtain end-to-end visibility you need to solve a number of big data problems. The reason why there has been so little progress on the visibility front is that today’s supply chains are too sprawling, too outsourced, and too complex for traditionally architected systems to handle. Companies have abandoned vertical integration, instead outsourcing a large majority of the supply chain functions that they once managed in-house. The result is that supply chains have become incredibly complex global webs of trading partners scattered all over the world, each focusing on a narrow slice of the fulfillment or manufacturing process. They are filled with 1000s of suppliers, SKUs, and components.

Executives understand that their traditional enterprise management systems are not designed to manage activity beyond the four walls of their enterprise, and are certainly not equipped to deal with the big data problem. As supply chains become more tangled, with a greater number of far flung suppliers, customers, and logistics providers, managers are faced with risks that can crop up in dozens of countries.

No wonder a recent Deloitte survey of 600 executives at manufacturing and retail companies found that 63% were highly concerned about risks within the extended supply chain comprising vendors and customers, ranking it among their top-two concerns.⁴

3. Gartner “Predicts 2013: Collaboration, Cloud and Evolving Strategies will Drive Global Logistics”, available at (gated): <http://www.gartner.com>

4. Deloitte Consulting, “The Ripple Effect”, 2013, available at: http://www.deloitte.com/view/en_US/us/Services/consulting/Strategy-Operations/09e4439a0e17c310VgnVCM1000003256f70aRCRD.htm

Combining human insights with statistical/mathematical approaches yields better predictions than either is capable of producing on their own.

In response, companies that have long used complex data sets to plan manufacturing to meet customer demand are now looking to combine data from external sources to better predict future risks. The problem is, if a single manufacturer alone can house 20 petabytes of data (as we already learned), how much more data must the rest of the supply chain contain?

Introducing “big visibility” (supply chain’s advanced insights)

Forward-thinking companies understand that a reliance on analytics presents the only scalable approach to analyzing and gaining insights from deluge of big data. Much like a grandmaster in chess, they must become expert in looking at different patterns within their supply chain. A chess grandmaster employs a set of actionable strategies to win matches, which adjust real-time depending on the moves selected by their opponents. In similar fashion companies must establish a set of protocol strategies which can be effectively deployed on a real-time basis as the pieces on our board change on a daily and weekly basis as a result of supply conditions, consumer decisions, available tradeoffs, or some relevant combination of factors.

The grandmaster does not make ad hoc decisions in the moment. Rather he or she deploys a move within a much larger context. Similarly, as companies seek to understand how their outcomes are related to all the actions and decisions of their trading partners and consumers, they must consider protocol strategies that relate to the entire end-to-end continuum. One Network is calling this capability “big visibility”.

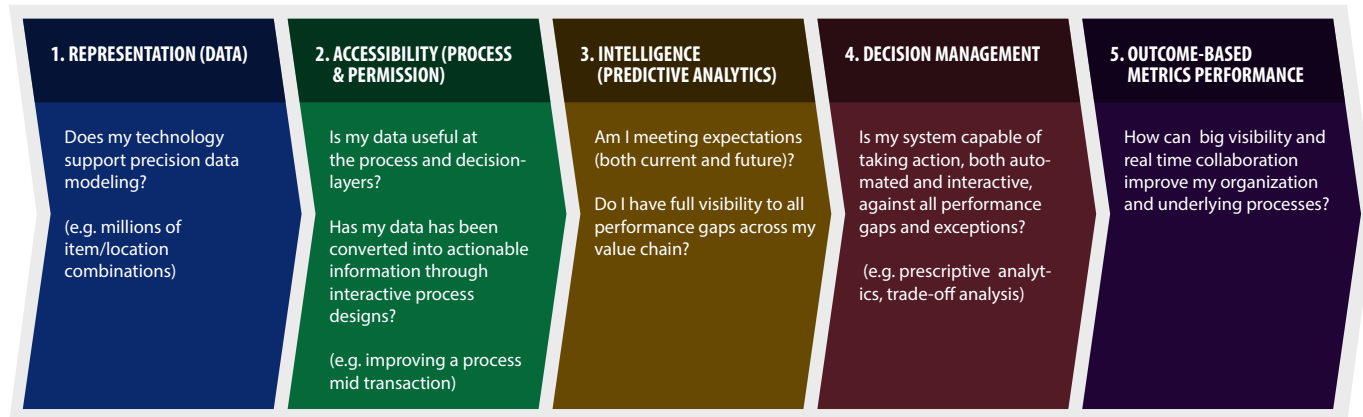
An important point to remember is that relying on human intuition or manual analysis cannot support the kind of fact-based, fast, profitable decision making that is required by big visibility. Advanced insights of this type are driven by a combination of both human and machine interaction. Combining human insights with statistical/mathematical approaches yields better predictions than either is capable of producing on their own. A good example of this is weather forecasting where the amount of data and computer power brought to bear on the problem is huge, yet the human element still adds value.⁵

With Big Visibility You Can...

- Model supply chain data with much more precision.
- Capture and interconnect data in multi-partner, multi-echelon environment to create intelligence.
- Alter decisions in real time (within a transactional process workflow).
- Utilize predictive and prescriptive analytics to solve problems before they occur and utilize optimization to improve outcomes in revenue, inventory, and transportation expenses.

⁵ This example taken from Nate Silver’s “The signal and the noise”, 2013.

BIG VISIBILITY ROADMAP


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Introducing the big visibility road map

Reaching the holy grail of big visibility will not be easy. It requires a wide range of data from across the internal supply chain, the trading partner network, and from macroeconomic conditions. Current supply chain analytics tools are nowhere close to delivering these kinds of advanced analytics.⁶ They struggle with capturing, housing, and analyzing data, much less recognizing demand and supply patterns.

Even more discouraging, Gartner predicted that many of the analytics-based supply chain decision support tools will likely become obsolete due to their inability to deal with big data, conduct analysis within the required time cycle for the decision, and automate decision making.⁷

So how can companies achieve big visibility? What follows is a **5 stage maturity model** that organizations can use as a roadmap. Each stage of maturity offers its own

unique challenges (and benefits if achieved). The five stages (illustrated above) are representation, accessibility, intelligence, decision management, and outcome-based performance. To further illustrate each stage, One Network has provided real examples from actual One Network customers.

1. Representation (Data)

The first step toward big visibility is merely representing the supply chain's data. With the advent of big data, representation has changed forever. It is no longer necessary to limit representative data in the supply chain based on traditional system or technology constraints. Advances such as Hadoop based architecture and horizontal grid computing enable organizations to represent data with an unprecedented amount of flexibility and scalability.

Case Study: Walmart, for example, makes point of sale (POS) data available every 15 minutes. This data is a valuable asset and should be used to improve revenue and margin per square foot at the store shelf. With current technology architectures it would have been impossible (or infeasible) to

6. Gartner Research recently reported that their scalability, data governance, and overall solution maturity are not as advanced as in more established technology tools. Gartner Research, "Market Guide for Supply Chain Analytics Technology", 2014

7. Gartner Research, "Predicts", 2014.

One Network has proven to be able to represent millions of item/shelf/store combinations, update that data every 15 minutes, run transactions against that data, and solve for exceptions on a continuous basis while providing visibility across multiple trading partners and supply chain echelons.



properly model, plan and execute at this level of detail. One Network has proven to be able to represent millions of item/shelf/store combinations, update that data every 15 minutes, run transactions against that data, and solve for exceptions on a continuous basis while providing visibility across multiple trading partners and supply chain echelons.

Lack of representation will typically result in the following commentary...

- **DC Manager** – “We can’t see inbound deliveries across most of our mid size or smaller suppliers.”
- **Buyer** – “My PO’s don’t show as ‘in-transit’ until a week after they ship.”
- **Accountant** – “Each quarter close is a nightmare because we don’t know about goods delivered FOB at month end.”
- **Stores** – “Shipments have an estimated ETA, but show up 2 to 3 days late.”

2. Accessibility (Process and Permission)

The second stage of big visibility is accessibility, and here real time process automation and management have changed the game. In traditional architectures, accessibility is somewhat synonymous with integration, universal object definitions, and longevity. However new architectures provide a real time business process management layer which in turn provides full control and interaction while executing a transaction – through state change and tracking event linkages. And not only is the data accessible, but through advanced process capabilities including policy and permission control, accessibility to big data now generates huge value at the process and decision-making layers.

Case Study: A tier 1 automotive manufacturer (and current One Network customer) had made good improvement in inventory over the past year, but had reached a point of

Lack of accessibility will typically result in the following commentary...

- **DC Manager** - “It takes a super user to figure out how to track and trace.”
- **Buyer** – “I can track WIP by PO#, but post factory I have to use container #'s, BOL #'s, case #'s etc.”
- **Accountant** – “Shipments from 2012 have actual freight costs, but 2013 only show assumed PO freight factor – can’t compare.”



diminishing returns. The constraint was that in order to continue driving down inventory, they needed to manage new supplier policies within a transaction, rather than their prior method of trying to improve the policy post transaction (when it was usually too late). In this case, suppliers were shipping early, based on an advanced shipping notice (ASN), and inflating the manufacturer's inventory positions. Similar to the Walmart example, the only way to solve this problem was to increase representation to include every part number at every location within the process that was executing between the manufacturer and its suppliers, including 3rd party transportation providers and distribution partners.

Yet going beyond representation, accessibility needed to be provided through a new transactional process that allowed the manufacturer to govern the new inventory policy while also controlling transactional state related to the ASN's.

Finally, the new process needed to integrate to the ERP systems in order to complete the transaction and "approve to pay". Early results show a significant decrease in inventory using the new accessibility/process/policy/transaction.

3. Intelligence (Predictive Analytics)

Because achieving big visibility's representation and accessibility stages have spawned a new and more responsive set of processes and policies, companies now have the opportunity to generate a higher level of intelligence by comparing the incoming process data to their expectations of both the process' performance itself as well as the process'

outcomes. Intelligence is all about knowing where a company is versus where it wants to be. Predictive analytics play a key role at this stage.

Case Study: One Network partnered with a Top 3 global toy manufacturer that was losing sales during major holiday seasons because it did not have the representation or accessibility in order to create the right intelligence related to retailers' revenue targets, in store/in stock levels, or days of supply. With One Network's advanced representation it was able to model its most important retailer's POS data and run a forecast in continuous mode to understand whether they were meeting expectations both current and future.

Lack of intelligence will typically result in following commentary...

- **DC Manager** – "Inbound volume forecasts are only sent once per month. The system should generate new forecast information whenever there is a significant change or event."
- **Buyer** – "I think landed cost is rising, but I have to push large data sets to excel to calculate rolling window metrics."
- **Accountant** – "Landed cost is shown on a weekly executive dashboard, but the calculation ignores DC bypass shipments."
- **Stores** – "I have to run four separate reports to calculate when out of stock items will be available again."



4. Decision Management (Prescriptive Analytics)

Ultimately, big visibility intelligence is useless unless a company can interrupt a business decision point in a process and create a measurably different outcome. It's amazing how many implementations stop at the intelligence stage and just push that data into a data warehouse or business intelligence portal. The reason of course is that the architecture isn't designed for the big visibility accessibility or process automation that was described earlier. With this decision management capability, companies can take their newly discovered intelligence and interrupt transactions and/or processes at either state transitions or by tagging tracking events. Once their intelligence shows an exception to their expected performance exists, they can then invoke a number of methods to manage this exception, both with automated routines and human intervention and/or collaboration. These methods include prescriptive analytics, optimization, and trade-off analysis.

Case Study: Another One Network customer (a major CPG manufacturer) had improved greatly on its forecast error using big visibility intelligence, but of course (given that no forecast will ever be 100% accurate) it still experienced some error in last minute sales at the shelf prior to replenishment shipments from the DC. One Network gave it the ability to run a last minute allocation optimization that redistributed the mix based on a real time view of store/in stock for every item on every shelf, which was hugely beneficial.

Lack of decision management will typically result in the following commentary...

- **DC Manager** – “I receive an automated report when a store receives a carton as damaged in the inventory system. What am I supposed to do with this alert?”
- **Buyer** – “It would take a lot of time and effort to always consider chargeback trends when issuing new PO's, so I only review them before seasonal PO's.”
- **Accountant** – “I run a report on all chargebacks that are pending, and then have to email each supplier/buyer pair individually. It would be better if the alerts were system generated directly to the affected parties.”

5. Outcome-Based Metrics and Performance

Achieving representation, accessibility, intelligence, and decision management enables the highest form of big visibility—outcome-based metrics and performance. A necessary outcome of our evolving supply chain networks will be to make sure we place the right assets in the right place at the right time in the right amounts, all bound by real time collaboration and big data visibility. Included in this evolution will be simultaneous efforts focused on organizational change, process reengineering, and lean/six sigma program management.

When data is leveraged against an advanced supply chain network deployment it has the potential to drive up to a 4% increase in sales, a 10% reduction in operating expense, and a 30% reduction in inventory.

As Michael Porter proved in his work on market competition, the choice for any company to remain on the fence in terms of adjusting strategy based on foreseeable market shifts will result in ultimate business failure.⁸ Think about the typical supply chain infrastructure. Structured integration and communication vehicles like EDI aren't going away, but the ability for the traditional supply chain design to react and respond, given all the information and lead time delays both upstream and downstream, is simply not competitive. The frequency and fidelity of available data across our demand/supply ecosystem is growing at a geometric rate. This data is an incredible asset and One Network has seen with its clients that when this data is leveraged against an advanced supply chain network deployment it has the potential to drive up to a 4% increase in sales, a 10% reduction in operating expense, and a 30% reduction in inventory.

Deming pointed out long ago that not only is variation the enemy of process improvement, but you must also be able to effectively measure a process to improve it.⁹ A typical multi-echelon, multi-partner global supply chain deployment is rife with variation in practice, measurement and decision making. Descriptive analytics as well as more advanced predictive and prescriptive analytics can help to identify root cause related to process variation. A properly designed workbench will allow users at various levels within an organization to gain visibility to both process performance and process outcomes,

as well as execute actions to improve both the process design itself and the outcomes it generates.

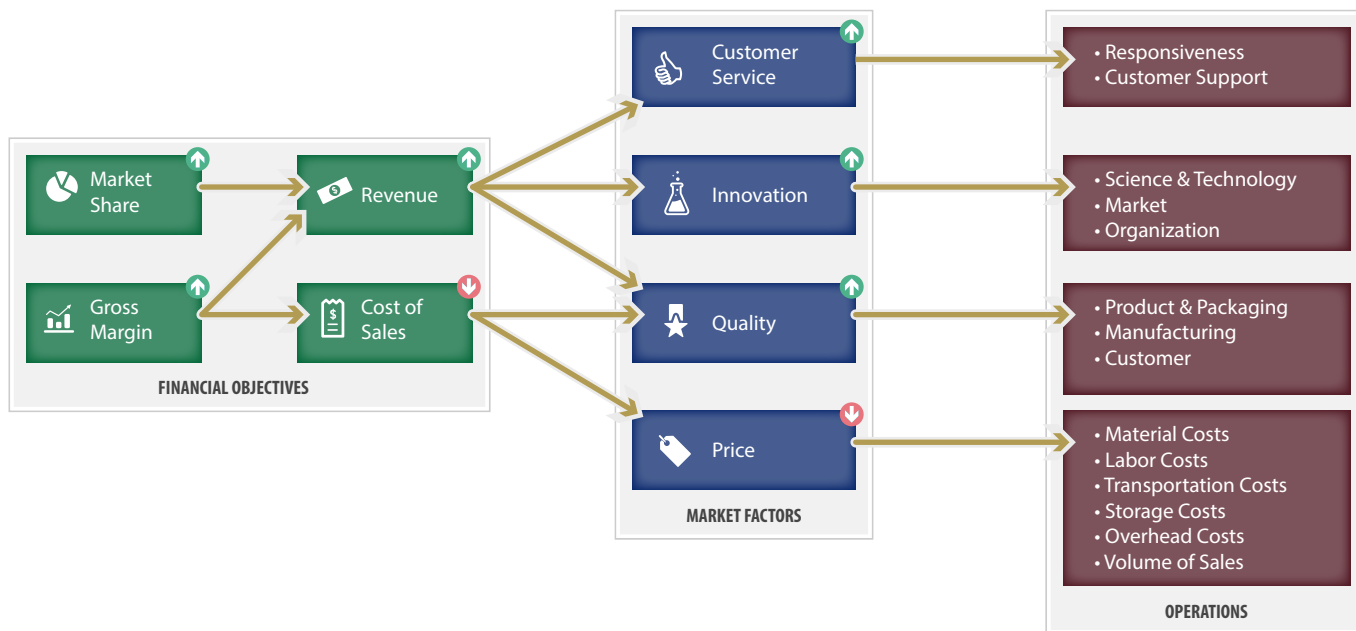
Variation is most likely the biggest cause for poor performance in any supply chain. All our calculations related to forecast accuracy, cycle stock, safety stock, order performance, order quantities, delivery performance, etc. are designed to accept variation and make allowances for it in our demand, material, and capacity performance. Given that we now have the power to significantly reduce variation, given the data and technology available today, it is poor form not to attack variation with renewed vigor, challenging concepts hardened by the dominant ERP architectures of today.



8. Michael Porter, "Competitive Strategy: Techniques for Analyzing Industries and Competitors", Free Press.

9 W. Edwards Deming, "Quality Productivity and Competitive Position", MIT.

BIG VISIBILITY: OUTCOME-BASED METRICS AND PERFORMANCE



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One Network can help you achieve big visibility

By partnering with One Network, companies are achieving unprecedented levels of visibility across their supply chain. One Network’s cloud platform, the Real Time Value Network™, is designed to solve the complex problems in your end-to-end supply chain by offering a full suite of advanced analytics and automated services that enable a 360 degree visibility of the consumer’s order, from the time it is created to when it is sourced and eventually delivered to the customer—while managing all demand, supply, and logistics processes throughout.

As the only “many-to-many” technology designed for today’s supply chain—One Network uniquely enables all participants to connect just once to the network to be able to work together to quickly deliver the product to the end customer. Thousands of leading organizations have turned to One Network for its advanced visibility capabilities, including Go Pro, Sinopharm, Kroger, Safeway, and the US Department of Defense.



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