IBM Transparent Supply Chain Case Study
How Artificial Intelligence Transforms the Supply Chain
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IBM operates a nearly $80 billion-dollar business across more than 175 markets. Well known for its software, cloud and services offerings, Big Blue also remains a leader with its more than $7.5 billion hardware and hardware systems business.¹

Any supply chain leader can understand the challenges of managing a supply chain organization that must meet the demands and material flows to deliver high-end technology infrastructure and machines. The IBM Supply Chain organization exceeds 20,000 professionals around the globe and executes more than $40 billion in materials and services spend.

IBM has long prided itself on operating a first-class supply chain organization and has long been recognized for its leadership including for Supply Chain Social Responsibility (SCSR)², Supplier Diversity³, Manufacturing Leadership⁴ and Innovation Leadership. However, like most best-in-class supply chain organizations, the leadership sought continuous improvement.

The company’s supply chain leadership specifically recognized that the organization could improve its performance and speed in identifying, managing and mitigating disruptions – a core responsibility and focus of the organization. They also recognized that the disparate and siloed nature of their supply chain data was a major hurdle to having a complete picture of a situation and a major drag on the speed in responding to events.

They further understood that the market was at a new inflection point with several transformative technologies – including Cloud, analytics, the Internet of Things (IoT) and artificial intelligence (cognitive technologies) – reaching a level of maturity, ubiquity and affordability that made them useful for and, in fact, necessary for supply chain organizations.

Artificial intelligence, also known as cognitive technology, in particular, seemed promising, as it can help drive significantly greater visibility across the supply chain – and improve forecasting and predictive capabilities. IBM Supply Chain leaders knew cognitive technology could enable new ways of optimizing supply chain operations for efficiency, responsiveness and cost, as well as drives optimal outcomes in areas such as supply assurance, procurement and inventory:

¹ IBM, IBM Reports 2016 Fourth-Quarter and Full-Year Results, January 2017
² Manufacturing Executive, Manufacturing Leadership Awards
³ IBM, Corporate Social Responsibility Report: Awards and Recognition
⁴ Manufacturing Leadership Awards: Collaboration Innovation Leadership, June 2017
Supply Assurance

Business Challenge

As mentioned, the company’s supply chain leadership specifically had a desire to improve planning and supply assurance – and performance and speed in managing and mitigating disruptions and risks – a core responsibility and focus of the organization. There also was a specific focus on reducing expedite costs while still maintaining supply assurance.

The genesis of the renewed commitment to improvement in supply assurance was a ‘Black Swan’ event, that would disrupt supply chains around the globe. As most will recall, following a 9.0 magnitude earthquake off the coast of Japan, a nearly 50-foot tsunami hit mainland and caused an accident at a nearby nuclear power plant. As all major weather, political and other disruptions do, the Fukushima accident caused major disruptions to global supply chains. The automobile, electronics and technology industry supply chains were particularly hard-hit as key component suppliers were impacted by the earthquake, tsunami and nuclear accident. IBM was among those companies whose supply chain was greatly impacted. And the lessons learned from that event provided the initiative for change.

IBM’s supply chain teams had previously mostly assessed disruption and risk events using spreadsheets and assembling personnel from around the world using conference calls. A tremendous effort was typically exerted to:

- identify and prioritize potential disruptions and risks
- draw up resolution options for those disruptions
- assess collateral damage impacts, and
- conduct trade-off analysis across the supply chain

As summarized in a whitepaper examining the IBM Supply Chain Transparent Supply Chain Initiative: “As one IBM executive noted, ‘we didn’t identify risks and issues early enough.’ In retrospect, the signs of a disruption were usually evident, but the company did not have sufficient data and insight to consistently look for them ahead of time. The pace of information and team response went along like a raft on a river. The organization was not consistently looking ahead or steering the raft. It typically was a reaction to events.”

Leadership recognized that this exercise happened daily in the organization, just at differing scale, speed and impact.

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5 The Evolution of the Transparent and Cognitive Supply Chain by Dr. Robert Handfield, August 2017
6 IBM, Transparent & Cognitive Supply Chain Presentation, June 2017
7 IBM, Transparent & Cognitive Supply Chain Presentation, June 2017
8 IBM and Dr. Handfield of North Carolina State University, The Evolution of the Transparent and Cognitive Supply Chain, September 2017
Watson Supply Chain

Solution

IBM Supply Chain leadership sought to improve the organization’s performance and speed in managing and mitigating disruptions. They recognized that the disparate and siloed nature of the data they needed to do their jobs was a major hurdle to having a complete picture of a situation and a major drag on the speed in responding to an event.

In addition, they saw a need to improve communication and collaboration across their thousands of employees globally – and they saw a need to be able to do this a 24-hour electronic or online environment. It seemed a definite challenge, but they believed a global supply chain organization with thousands of staff could communicate clearly – and collaborate and coordinate nearly flawlessly. They could operate as a true team, and operate agile, but they needed to be ‘on the same page’ in terms of the facts, they needed ‘end-to-end visibility.’

Out of this assessment and desire, IBM launched a strategic initiative that it called the Transparent Supply Chain (TSC). The primary objective of the Transparent Supply Chain Initiative was to bring supply chain people together with the intelligence and capabilities to prevent and respond to disruptions and events. Further, it was designed to generally improve collaboration and information flows for various supply chain management tasks.

To accomplish this, the team believed it was critical to establish greater and quicker visibility into the end-to-end supply chain. To establish a ‘single source of the truth’ across the company’s more than 30 Enterprise Resource Planning (ERP) systems, other internal and external sources of data, and with third-party logistics providers (3PL). The IBM Supply Chain organization, frequently an early adopter of new technologies, recognized that multiple aspects of this challenge could be addressed with the artificial intelligence or cognitive technologies its company was developing and implementing at Fortune 1000 companies and other leading organizations. The supply chain leaders understood that the market was at a new inflection point with several transformative technologies – including Cloud, analytics, and cognitive technologies – reaching a level of maturity, ubiquity and affordability that made them useful for and, in fact, necessary for supply chain organizations.

The cognitive technology would be used to derive data and insights by drawing directly from the organization’s 30 ERP systems and other internal and external sources of data. The ability to draw data directly and analyze in real-time would accelerate data collation and mining of insights and analyses, as well as provide speed and confidence in those insights and in decision-making.

In addition, cognitive technology and analytics would be leveraged to aggregate Key Performance Indicators (KPIs) and produce smart, mobile alerts for personnel. “Some of the company’s risk management systems provided alerts. However, like an alert on a car dash panel, they didn’t provide information about the nature of the problem, nor the technical details on how the problem could be solved. IBM thought it was critical to identify the elements associated with events/problems, as well as the touchpoints in the network that needed to come together to address these issues. The leadership team defined an ideal alert and solution as

What is Cognitive Technology?

Cognitive technologies are systems that can actually understand, reason, learn and interact. They use natural language processing and machine learning to learn about and analyze data – and do so at tremendous scale and speed. Cognitive technologies can understand all forms of data – both structured and unstructured, both internal and external – and can be taught to correlate this data and extract insights, augmenting the intelligence of the operator. As the capstone, cognitive systems can continually build a knowledge base on that data and related subjects.

For more information about cognitive technology and its application to supply chain, download The Cognitive Supply Chain Journey.

9 IBM, Manufacturing Leadership Award Nomination for IBM TSC, Q4 2016
10 IBM, Manufacturing Leadership Award Nomination for IBM TSC, Q4 2016
characterized by immediate notification accompanied by the right information to make a decision.”

Leadership, knowing that decisions were being made by cross-enterprise and cross-functional teams, decided to leverage online collaboration technology to improve coordination and quickly bring teams together to make disruption and risk mitigation decisions. The team named these online collaboration platforms, ‘Resolution Rooms.’ A new resolution room is established for key events, and the cognitive technology aids this process by providing relative intelligence in advance to the team.

The team also recognized that while learnings and insights were gained while dealing with each event, that institutional knowledge was not captured or shared with the local or global team. In response to a disruption or issue, there was no standard and effective way to capture and apply the key lessons learned.

They sought to address this with cognitive technology and the TSC as well. Over time, the cognitive technology learns the organization’s supply chain history, preference and best practices – building a body of knowledge by learning about how issues were best addressed. IBM used this capability to develop ‘supply chain playbooks’ that were automatically provided to teams when they were dealing with a similar event in a ‘Resolution Room.’ This enabled greater speed and accuracy in responding to future events.

**Results\Value**

The Transparent Supply Chain Initiative and the application of cognitive technology has enabled real-time, end-to-end supply chain visibility at IBM – and greatly increased the organization’s capacity for orchestration and collaboration in preventing and mitigating disruptions and events. The TSC initiative and cognitive technology:

- Improved consistency, proactivity and speed in managing disruptions and risks
- Improved collection, correlation and interpretation of data
- Improved transparency and established ‘one version of the truth’ for supply chain data and events
- Empowered personnel with cognitive insights and playbooks, as well as recommendations
- Enabled faster, more accurate and significantly more informed decisions, resulting in confidence in decision making

IBM has since seen its data retrieval times reduced by more than 75 percent – and supply chain disruption management shortened from 18-21 days down to just hours since the organization leveraged cognitive technology. As the cognitive system learns over time about past decisions/actions, response time was further reduced in many cases to just minutes.

As just one example of this, IBM leveraged the platform to avoid revenue impact from a component shortage. By reducing critical parts shortage resolutions from 50 down to 15 days, IBM could avert the revenue impacts that would have resulted from a failure to deliver on customer orders. As one example, IBM Supply Chain used this time advantage to successfully mitigate an industry-wide Flash shortage which saved the company more from a potential $60+ million impact to revenue.

In 2016, IBM recorded a 52% reduction in expedite costs. And the company has experienced no major supply assurance impacts in more than 3 years.

**Resolution Rooms** capability provides natural language search to provide cognitive-enabled insights, recommends experts and provides actionable advice based on learned best practices. This helps drive automation and collaboration in responding to disruptions and events.

**Digital Playbooks** use cognitive technology’s capability to develop a body of knowledge by learning about how issues were best addressed in the past. This enables greater speed and accuracy in responding to future events.

11 IBM and Dr. Handfield of North Carolina State University, *The Evolution of the Transparent and Cognitive Supply Chain*, September 2017
13 The Evolution of the Transparent and Cognitive Supply Chain by Dr. Robert Handfield, August 2017
14 The Evolution of the Transparent and Cognitive Supply Chain by Dr. Robert Handfield, August 2017
15 IBM, Transparent & Cognitive Supply Chain Presentation, June 2017

IBM, Transparent & Cognitive Supply Chain Presentation, June 2017
Procurement

Business Challenge
With more than $40 billion in materials and other spend, lowering costs is obviously a primary focus for the IBM Supply Chain team and, as most supply chain professionals understand, this becomes increasingly challenging year-over-year as costs must continue to be reduced. Every year the IBM Supply Chain team is challenged to take out more component and structural costs.

One area of inefficiency at most complex manufacturing companies, such as IBM, is the communication and exchange of data between the sales-side of the organization – and the customer-order and supplier-side. The reality for most complex manufacturing companies is that the coordination between these silos is often managed via spreadsheets – and inefficiencies and miscommunication tend to cause delivery delays, disruptions and increased costs.

In addition, a lack of visibility and information about suppliers and supplier performance put the business at a disadvantage when negotiating with current and new suppliers. Further, the organization was consistently challenged to find qualified suppliers, sometimes in very short order, to meet certain specifications and standards.

The Supply Chain leaders at IBM were looking for solutions that could help them achieve continuous improvement in cost reductions – and specifically cost savings by improving the communication and visibility between the sales-side and the supplier-side of the business. They specifically sought to improve Supplier Available to Promise (ATP) performance – on supplier quotes for available quantity and delivery dates for orders.

The organization recognized that a key roadblock to lowering costs and negotiating with suppliers was a lack of comprehensive supply chain visibility. And, specifically, that that challenge emanated from the separation of the ‘towers of information’ contained in different systems, in this case, multiple and separate ERP, purchase order (PO) and order management systems.
Solution
The IBM team knew that access to deeper insights into the supply chain – to understand cost drivers and inform actions to proactively reduce costs – would be of great value. In addition, they knew that expediting costs were driving up their component costs.

In discussions with suppliers, those suppliers had indicated that if IBM could more accurately predict their demand for components, than the suppliers could reduce costs and pass on a significant percentage of the savings.

As part of the IBM Transparent Supply Chain Initiative, IBM Supply Chain leaders decided to apply cognitive technology to build links between sales, order management and supplier systems to better understand and sense demand and supply. IBM leveraged cognitive technology to correlate data from, and provide end-to-end visibility across, these systems.

From the outset, the cognitive technology helped the organization to corral, correlate and make sense of data from disparate external and internal sources – and provide comprehensive and rapid intelligence, insights and analyses.

As one IBM executive noted, “We had cognitive technology sit on top of our order management and production systems to understand what sales was selling, what production could build and then provide that insight to suppliers so they could understand what the demand was, in detail, and what components and delivery timelines would be needed. We provided a more accurate and detailed picture to IBM’s suppliers. We provided better visibility all around and that allowed us to help our suppliers reduce costs ... and thus helped IBM reduce costs.”

After success in this area, IBM began leveraging higher levels of cognitive capabilities to mine predictive insights for orders – and how those orders might impact suppliers and ATP performance.

Results\Value
By leveraging cognitive technology, IBM provided efficient data and information exchange between the sales-side of the organization and order management and suppliers, improving Supplier Available to Promise (ATP) performance and reducing expediting costs. In addition, IBM gained deeper insights into its supply chain in terms of understanding cost drivers; which informed actions to improve quality, delivery and further reduce costs.

From the outset, IBM could retrieve sales, order and supplier data and analyses up to 90 percent faster than previously executed. Next, IBM reduced late orders by 75 percent \(^{19}\) which lowered product, as well as delivery and logistics costs. As a result, in 2016, IBM reduced structural\piec part costs by 2.5 percent.\(^ {20} \)
Business Challenge:
- Reduce amount of inventory held thus freeing up working capital

Solution:
- Leverage cognitive technology for more accurate requirements, forecasts and planning – to drive reductions in buffer inventory.
- Establish a single source for all inventory data and reports, reducing manual workload, improving visibility and delivering deeper analytic and cognitive insights.

Result/Value:
- Realized an 18% reduction in inventory levels held over the course of the last three years
- Maintained greater than 95% of serviceability targets
- Attributed a 1.5% reduction in [working capital] related to inventory savings and the cognitive initiative
- Saved millions based on reductions in inventory and freight costs

Inventory

Business Challenge
Another key area of focus for the IBM Transparent Supply Chain Initiative was reducing inventory and working capital. The company’s supply chain leaders recognized that improvements in inventory management would translate directly into reduced disruptions; greater customer satisfaction; and impact on the bottom line.

They recognized that although inventory management systems go a long way to helping an organization manage related issues – that more efficiencies could be gained by making better connections and correlations from the inventory-side of the business and the demand-side, [including ERP and related supply chain systems.] The company sought a closer connection between demand forecasting and inventory management – both organizationally and technologically – to better plan, predict and meet customer demand. They knew this would give them greater capability to reduce inventory and greater capability to meet market changes and growth demands.

Solution
The IBM Transparent Supply Chain Initiative leveraged cognitive technology to extend and connect existing inventory solutions, as well as more than 30 ERP systems, to more effectively match supply volume to customer demand; lower safety stock and inventory levels; and thereby reduce working capital.

The effort sought to more accurately predict demand spikes and changes – and compare those with inventory – by correlating all structured supply chain data related to inventory – and supplement that structured data with third-party and ‘dark’ data sources.

Leveraging cognitive technology to establish greater data integration and correlation to provide comprehensive visibility was the first step in the program, and allowed the company to achieve more accurate demand and inventory data, analyses and predictions, as well as increase speed and agility, thereby lowering inventory levels.
IBM used cognitive technology to rapidly and comprehensively read, understand and correlate data – from across disparate sources, silos and systems, both internal and external – and provide real-time analysis and insights based on interpretation of that data.

The cognitive technology’s capability to be educated, and interpret and correlate data, in a similar way to the human mind but at incredible scale and speed, enabled significantly greater supply chain insights and visibility.

The ability to understand and correlate dark data was particularly important to the demand side of the business. More than 80% of all data is dark and unstructured\(^{25}\) – everything from weather and political reports, to news accounts and social media feeds.

Providing visibility into and understanding of that previously unavailable ‘dark’ data greatly augmented demand-supply intelligence.

Demand forecasting is a difficult task, and applying cognitive technology to complement existing solutions with demand-supply predictions and analyses, was a tremendous strategic advantage for the organization.

Once the supply chain team and the cognitive system adapted and learned more about the company’s inventory trends and actions, further value was derived from the predictive capabilities of the cognitive system. This allowed the supply chain team to more accurately forecast demand and inventory levels, and anticipate possible disruptions to determine the best course of remediation and action, including identifying substitute suppliers and delivery options.

**Results**

IBM leveraged cognitive and analytical capabilities to greatly improve visibility into and understanding of the demand-supply balance of the supply chain, allowing the company to improve predictive accuracy and reduce inventory levels and costs. This allowed for reduced inventory levels and reduced working capital locked in inventory and the supply chain.

IBM realized an **18% reduction in inventory levels** held over the course of the last three years of the program\(^{26}\) – while maintaining greater than 95% of serviceability targets.\(^{27}\) This company attributed a **1.5% reduction in [working capital]** related to these inventory savings and the cognitive initiative.\(^{28}\) As an example of the savings these reductions bring, not counting the business and revenue impacts of disruptions and risks, **IBM has saved has saved millions of dollars alone based on reductions in inventory, freight costs and structural cost take outs.**\(^{29}\)

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\(^{25}\) IDC, 6 The Thinking Supply Chain, IDC, March 2017  
\(^{26}\) IBM, Transparent & Cognitive Supply Chain Presentation, June 2017  
\(^{27}\) IDC, 6 The Thinking Supply Chain, IDC, March 2017  
\(^{28}\) IBM, Transparent & Cognitive Supply Chain Presentation, June 2017  
\(^{29}\) The Evolution of the Transparent and Cognitive Supply Chain by Dr. Robert Handfield, August 2017
Summary

The Transparent Supply Chain Initiative and the application of cognitive technology has enabled real-time, end-to-end supply chain visibility at IBM – and greatly increased the organization’s capacity for orchestration in preventing and mitigating disruptions and events.

In addition, cognitive technology enabled the IBM Supply Chain organization to:

- **Correlate Data at Incredible Scale and Speed:** Process and correlate multiple data sources in a systematic manner to provide rapid insights into supply chain events in real time.
- **Proactively Drive Collaboration:** Enabled cross-functional decision-making using a single shared ‘source of truth.’
- **Empower Personnel:** Grew and preserved institutional knowledge by capturing expert decisions.

IBM Supply Chain’s application of cognitive technology resulted in:

- **Supply Assurance:** Critical supply chain disruption management shortened from 18-21 days down to just minutes. IBM recorded a 52% reduction in expedite costs – and the company has experienced no major supply assurance impacts in more than 3 years.\(^{30}\)
- **Procurement:** Supplier analyses produced up to 90 percent faster, late orders reduced by 75 percent\(^ {31}\), and reduced piece part costs by 2.5 percent.\(^ {32}\)
- **Inventory Management:** Realized an 18% reduction in inventory levels held over the course of the last three years of the program\(^ {33}\) – while maintaining greater than 95% of serviceability targets.\(^ {34}\), and attributed 1.5% reduction in [working capital costs] to inventory reductions and the cognitive initiative. Saved millions of dollars alone based on reductions in inventory and freight costs.

For further information about IBM’s Transparent Supply Chain Initiative, download Dr. Robert Handfield’s whitepaper, *The Evolution of the Transparent and Cognitive Supply Chain.*

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30 IBM, Transparent & Cognitive Supply Chain Presentation, June 2017
31 IBM, Transparent & Cognitive Supply Chain Presentation, June 2017
32 IBM, Transparent & Cognitive Supply Chain Presentation, June 2017
33 IDC, 6 The Thinking Supply Chain, IDC, March 2017
34 IBM, Transparent & Cognitive Supply Chain Presentation, June 2017