Supply Chain for Business 4.0

The Innovation & Transformation Group,
Manufacturing Industry Solution Unit.
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Dear Readers,

The previous edition of our Journal of Innovation and Transformation (JIT) focused on transforming customer experience in the manufacturing industry. You read articles about how manufacturers are focusing on enriching customer experience through various touchpoints in the digitally connected world.

The new paradigms of customer experience - multiple channels, segment-based customization, wait time reduction, to name a few - have added to the already rising pressure on the supply chain. Also, the focus on cost and efficiency has increased than ever before.

For example, a humble item like a front bumper of a car can have hundreds of different buildable combinations to cater to the needs of every customer - with 20 different colors, 10 different fog lights, 8 different headlamps, 10 different parking sensors, 5 different cameras, and so on. The biggest challenge faced by manufacturers is how to manage such complexity, and how to manage their supply chain - from planning, sourcing, to ensuring availability of required materials at the point of assembly.

To combat this challenge, reimagining business processes, enabling collaboration, and providing foresights to supply chain executives play a vital role. We leverage the digital forces - Automation, Analytics, Cloud, and the Internet of things (IoT), to enable supply chain executives drive exponential value with foresights and predictive capabilities.

The foundation to survive and excel in the digital world is to become connected - Connected Products, Connected Assets, Connected Workforce, and Connected Operations, including the supply chain.

Collaboration is the next key ingredient in adapting to the changes in the digital world. Collaboration with customers as well as suppliers enables the manufacturing organizations to quickly adapt to the changes in customers' needs and expectations, even in a long supply chain environment.
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Being collaborative and connected, gives access to large volumes of data, from the physical supply chain through traditional means such as EDI and through digital means such as sensors in the physical supply chain. The ability to work with the data to go beyond the traditional reporting (such as Predictive Analytics and Machine Learning) and drive actionable insights forms the differentiating factor for organizations to be in the forefront of the change. Many manufacturing organizations have already introduced the role of Chief Data Officer or Chief Digital Officer who is responsible for data and the insights associated with it.

Building cognitive ability in your business processes with the use of data is one of the key differentiating factors in becoming truly customer-centric and insights-driven organization.

The above three form 3Cs of the digital supply chain – Connected, Collaborative, and Cognitive, and prove to be game changers and key propellers in adapting the supply chain to improve customer experience continually.

Now that the industry is moving towards Business 4.0, businesses will be more connected and smarter than ever before. Evolution of a traditional supply chain into the smart and connected supply chain is a crucial step towards realizing the vision of Business 4.0.

In this edition, I invite you to read how organizations can transform their supply chain to live up to the expectations of customer experience designed by the sales and marketing functions. The central theme, connected supply chain, brings in a dedicated flavor of Business 4.0 – where lies the future of the industry.

Our authors and analysts bring you experiential points of view on key themes in the digital supply chain: digital planning, maximizing supplier value, understanding and managing supply chain risks, and managing inventories using demand-driven concepts.

I welcome you to be a partner in the exciting journey to the evolving world of Business 4.0.

Happy Reading!

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Head, Supply Chain Consulting
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Putting these concepts into effect will require working with a consulting organization with the right supply chain software partners, the ability to integrate to a variety of systems, data streams, and data scientists, master data management capabilities, and an understanding of change management.

For further details on Digital Integrated Business Planning, please read the complete ARC View here:

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From Integrated Business Planning to Digital Integrated Business Planning

By Steve Banker

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Realizing a Customer Centric Digital Supply Chain: Connected, Collaborative, and Cognitive

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A supply chain redesign mandates breaking 'silos and suspicions' both, within the enterprise and across supplier communities, and truly embracing collaboration across the network. The supply chain should be tightly interconnected to maintain accurate and consistent flow (of materials and information) throughout the network. According to an article in the SCM World, 41% of companies believe strategic supplier management is very important to their competitive advantage. How can manufacturers enable this collaboration? How do they ensure flow of information and materials in near real time? How can they manage variability in demand in a long, complex supply chain, while also optimizing inventories and working capital?

This paper attempts to answer these questions by taking an automotive value chain as example. We believe that the three pillars necessary to redesign your supply chain are Connectivity, Collaboration, and Cognition, the 3Cs of Supply Chain. Increasingly pervasive digital technologies can help the supply chain record dynamic changes in demand and planning, analyze data from different streams across the network, and re-position the supply chain to stay relevant, resilient, and responsive.

The strategies outlined here need to be applied in tandem with the right data and information model that will mine the events, signals, and operational elements to keep the flow of material and information smooth. Adoption of analytics to send demand and supply signals in real time and apply contextual intelligence to dynamically adjust inventory levels will ensure continuous availability of right materials at the right place and time. This paper touches upon these strategies to develop an interconnected, collaborative, and cognitive supply chain of the future that will render end-to-end visibility.
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Source: 1. SCM World- A Gartner Community: Delivering Value Through Collaborative Relationships March 2015
Introduction

Manufacturers today use customer experience as the focal theme in designing, planning, manufacturing, and selling their products. This shift is being driven by digitally aware, connected consumers and products, and with it, the traditional 4Ps of sales - Product, Price, Place, and Promotion – have been transformed into the digital 4Ps - Platform (PAAS), Purpose (contextual experiences), Presence (omni channel), and Personalization (Segment of One).

To help deliver the promised experiences to the customer, the supply chain today deals with a plethora of challenges:

- Multiple channels of commerce
- Proliferation of products/SKUs
- Global manufacturing and supply footprint leading to variable lead time, erratic demand, and supply side risks and uncertainties
- Faster product life cycles and reduced shelf life
- Shorter delivery time and higher service level expectations

In the following sections we use the supply chain of sequenced automotive parts as an example to delve into the challenges of today's supply chain and how current planning models such as lean and MRP are inadequate to address them.

The challenge of sequenced parts in automotive assembly: A case in point

Automotive OEMs offer many product and part variants across feature sets to capture every customer in every segment. OEMs often use sequenced parts assembly, which involves bringing the sub assembly for varied sets of parts from different suppliers to exactly match the vehicle variant and trim being produced. This is a highly complex supply chain coupled with a high-speed assembly line, considering that typically between one to three vehicles are rolled out every minute from the final assembly, depending on model volumes.

About the Author

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In such a setup, non-availability of sequenced parts in the final assembly proves expensive for the OEM, bringing the line to a complete halt. As per an estimate provided by an executive from Ford Motors, large global OEMs lose around USD 7000 every minute an assembly line is down. Depending on the criticality of the sequenced parts, the entire vehicle may need to be scrapped. As a preventive measure, OEMs build in huge penalties in their contracts with Tier 1 suppliers in case of such disruptions. Often, the non-availability of sequenced parts are known in advance and OEMs are forced to change their build sequence. This also creates disruptions, because when OEMs pull forward a vehicle from its original sequence, it puts pressure on the respective suppliers to be ready with their parts and sub-assemblies.

Overview of the current process

OEMs send different types of messages to sequenced suppliers at different points of the manufacturing process so that they can plan, make, and deliver to the point of fit. The three to four types of messages, electronically sent to the sequenced suppliers, are depicted in Figure 2:

1. **DELFOR**: T-18 to 24 weeks
   - High level forecast | No visibility into variant level demand

2. **Weekly Message**: T+4 to 8 weeks firm demand
   - OEM Demand vs Supplier Capacity planning

3. **Daily Message DELJIT**: T+1 to 3 weeks firm demand
   - Next 2 Weeks production | Day wise variant level demand

4. **Hourly Broadcast**: Current Day Production
   - Hourly requirement of variant level for sequenced parts

Figure 2: Different type of messages sent by OEM to Tier 1 suppliers

Limitations of current process to handle complexity

The current process works when there is no change in the OEM’s plan. However, demand spikes and supply chain uncertainties are a given, and the current forecast based systems are inadequate to handle these. Therefore, manufacturers and their suppliers need to take cognizance of these challenges and prepare themselves to build a demand centric supply chain.

From a technology point of view, current processes and tools (mostly spreadsheet driven) are inadequate to simulate and analyze the impact of the demand changes in near real time. Even if we assume the capability to simulate revisions, OEMs would not know which of the sub-assemblies are going to be available for the revised sequence. Planners use traditional methods - phone or email to connect with suppliers to know the status of their sub-assemblies to the revised sequence.

[1] Understanding: Manufacturing Automobile Seats, TLC; https://www.youtube.com/watch?v=JTJLhWGVQQs&feature=youtu.be; Published December 9, 2008; Accessed December 18, 2017

The 3C framework for a digital supply chain

We believe that the three pillars necessary for a supply chain to address the complexities of a demand driven model sustainably are Connectivity, Collaboration, and Cognition. Increasingly pervasive digital technologies can help the supply chain record dynamic changes in demand and planning, analyze data from different streams across the network, and re-position the supply chain to stay relevant, resilient, and responsive. Figure 3 outlines how digital technologies can be used to enable demand driven supply chain management, while Figure 4 defines the operational steps needed to build a truly customer centric organization.

**Figure 3: Framework for a digital supply chain: connected, collaborative, and cognitive**

**Autonomous and Automated**
- Self Learning and Contextual Insights for Automation
- Self-sustaining Processes for Course Correction
- Actionable Alerts for Human-machine Shared Controls

**Cognitive Supply Chain (Automation)**
- Supply Visibility
  - Lead time/Inventory/Quality/OEE
- Sizing Buffer Levels and Thresholds
- Intelligent Applications & Collaboration Platforms

**Collaborative Supply Chain (Contextual Intelligence)**
- Identify De-coupled Nodes and Parts in BOM
- End to End Data Integration
- Supply Strategy-BTS vs PTS vs VMI

**Connected Supply Chain (Integrated Data Strategy)**
- Connected, Resilient and Responsive

**Figure 4: Operationalizing the 3C framework**

**Connected**
- Building digital capabilities to achieve a single version of truth across all data silos, enabling visibility and agility in the supply chain

**Collaborative**
- Enabling transparency and real time data sharing across network partners in tiers 1-n to propagate holistic and integrated decision making across the supply chain

**Cognitive**
- Driving automation using digital technologies and machine learning for shared, consistent, and rationalized decision making
There are numerous digital technologies, including but not limited to analytics, IoT, mobility, blockchain, and robotics that are being successfully leveraged to enable a digital supply chain. To begin with the transformation, manufacturers can focus on specific segments of the supply chain where the benefits or the returns are expected to be high; for example, sequenced parts or long lead supply chains.

**Digital supply chain for sequenced parts**

Visibility is required at multiple levels for different functions to ensure timely delivery of sequenced parts in a supply chain. A role-based and time horizon-based approach (i.e., how far in advance you need visibility) is required to address this challenge. This will decide the solution and technologies involved in achieving a digital supply chain. Figure 5 illustrates the different segments and time horizons of visibility needed across an auto OEM supply chain roles.

**Figure 5: Visibility needs and time horizons across auto OEM supply chain roles**

**Segment 1**
- Material management expeditors on shop floors
- Visibility should cover six to ten hours starting from the time of broadcast to suppliers up to the time sub-assemblies reach the point of fit
- Require solutions like in-transit visibility and dynamic routing

**Segments 2 and 3**
- Planners and follow up teams
- Visibility of two to three weeks
- Ability to simulate various possible impacts to the plan or sequence, and identify the plan or sequence that is achievable with reasonable confidence
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**Solution architecture for segment 1**

The key aspect of the digitalization solution for segment 1 is the acknowledgement of receipt of the broadcast sent out to the suppliers/third part logistics providers (3PLs) within the six hour window. This can be enabled via electronic data interchange (EDI) or similar technologies.

1. From 3PL: A mobile notification informing the readiness of the trucks or otherwise can help in making alternate arrangements.
2. From Suppliers: An Advance Shipping Notice (ASN) with expected time of arrival to the point of fit significantly improves the visibility and reduces the risk of material unavailability.
3. Mobile tracking technologies like GPS can help in dynamic re-routing during supply disruptions.

There are multiple points of failure in this six hour window, and identifying these points of failures, analyzing the exceptions, and alerting the right stakeholders are key elements in this segment of the supply chain.

**Figure 6: Solution architecture for segment 1**

**Solution architecture for segments 2 and 3**

In segments 2 and 3, the time horizon for required visibility is longer. The suppliers would not have started production, or would at best be in early stages of production. The planners need to determine if the sub-assembly will be available on time for future production. Being able to do this requires two key components:

1. A data driven model of the supply chain of each sequenced part or sub-assembly
2. Exception alerts generated through predictive analytics, based on suppliers’ historical performance and events that may impact deliveries, like quality rejects, natural calamities, and so on

Let’s see how these requirements can be operationalized.
Modeling the critical supply chain data points

Every part or sub-assembly that goes into a vehicle has different supply chain elements: the number of nodes, the supplier(s), source location, manufacturing processes, logistics service providers, the number of hops it goes through, etc. For each assembly line, manufacturers should be able to identify the suppliers beyond tier 1, the critical manufacturing operations involved in the sub-assembly, where inventories should be held in the supply chain, and so on. Essentially, manufacturers should be able to model the supply chain with these critical data points; in other words, create a digital twin of the supply chain.

Using the example of a seat assembly operation (see Figure 7), let us see how a thorough understanding of the supply chain can be achieved.

1. Model the value chain using known information from contracts, bill of materials, and interviews with relevant stakeholders including, but not limited to, shop floor personnel and suppliers.
2. Model lead times for the supply chain based on historical data.
3. Form a cross functional team to identify the critical parameters in the supply chain: critical parts, nodes, actors, and so on. For example, identify the tier 2 suppliers providing seat frames.
4. Determine the data collection strategy across the chain; from using traditional ERP data to deploying sensors and Internet of Things (IoT) and cloud technologies to help collect, process, and store the data.
5. Define the range of critical parameters for smooth operations; for example, at any given point in time, the number of seat frames in inventory should be between 400 and 600. This is the most important step. Demand driven supply chain principles can be used to develop the critical inventory ranges and ensure continuous availability of critical parts.
6. Model this supply chain digitally and create mechanisms to maintain it. For example, any dip below the threshold in the inventory levels should raise an alert to the OEM planners/schedulers, allowing them to work with suppliers for corrective measures.

Figure 7: A digitally modeled car seat supply chain
Exception Alerts through Advanced Analytics

Advanced analytics help generate insights by connecting various events. For example, connecting a newsfeed to tier 2 suppliers’ social media profiles can help gain insight on supply disruption due to natural calamities. This is not possible manually given the volume of data generated globally. Based on the parameters and established thresholds predictive analytics can be deployed to provide forecast driven exception alerts to buyers. Issue creation and resolution through tickets based on potential problems impacting the supply of components will help mitigate risks with supplier input and collaboration. Initially, advanced analytics may raise false alerts but it is possible to teach the system over time to improve the accuracy of the alerts.

![Figure 8: Advanced analytics insights generated by connecting the dots](image)

Conclusion

According to Center for Global Enterprise (CGE), companies with digitized supply chains can lower procurement cost by 20% and supply chain costs by 50% while boosting revenue by 10%.

In today’s ecosystem, achieving customer centricity and cost control requires CXOs to realign their supply chain and embrace digital technologies to build connected, collaborative, and cognitive supply chains. Even one percent improvement in on-time delivery translates to huge business benefits like fewer discounts, optimal inventory and, efficient flow of working capital. The approach and solution outlined here, while illustrated using an auto OEM example, reinforce the fundamental concepts of a demand-driven supply chain that is attuned to ensure predictability of ‘flow’ in alignment with customer demand.

Realizing a Demand-Driven Supply Chain

Today’s business landscape is best characterized by the notion of VUCA – Volatility, Uncertainty, Complexity and Ambiguity. Supply chains across the world are under tremendous pressure with high inventory levels, poor service levels, and high cost of service. In this paper we talk about the two main reasons why companies still find supply chain management challenging in spite of having invested in state-of-the-art technology solutions. The first is the use of the outdated Materials Requirement Planning (MRP) model for formal planning, while the second is inability to adopt effective pull-based models available owing to certain misconceptions. These factors have led to a lot of inefficiencies in supply chains as planners resort to manual methods of planning and execution using excel spreadsheets. We also introduce the concept of Demand Driven MRP (DDMRP), which can help businesses overcome supply chain inefficiencies by enabling automation of planning and execution to a large extent, as well as improving the visibility along the supply chain.

The use of DDMRP framework could potentially reduce inventory by over 21%.
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About the Authors

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Ramesh Srinivasan is a Consulting Partner with the Innovation and Transformation Group in the Manufacturing business unit at TCS. He has over 25 years of experience spanning the entire value chain, from product development, manufacturing, and supply chain to product costing and marketing. He has led several supply chain improvement initiatives for consumer electronics, high-tech, aerospace, and industrial clients, including the development of a unique outsourced international purchasing office.
Surviving the New Supply Chain Reality

With the proliferation of product and service varieties, distribution channels, and locations, the global sourcing and manufacturing landscape has become more complex than ever before. While the markets were primarily supply driven prior to the 1980s, today manufacturing companies need to respond effectively and swiftly to changing demand patterns across a huge variety of products and services. In other words, supply chains need to be demand driven (customer centric) to help companies maintain high customer service levels coupled with optimal working capital. This is very important to ensure a good ROI for the company’s shareholders.

To achieve the vision of demand driven supply chain, companies embark on several supply chain initiatives such as connected or digital supply chain, Integrated Business Planning (IBP), Sales and Operations Planning (S&OP), and so on. However, from our experience, most of these initiatives fail to deliver the vision of demand driven supply chain as they do not address the following two obstacles:

- Widespread use of formal planning and execution methods such as push-based MRP that are unfit for today’s highly variable and uncertain business landscape
- Misconceptions around pull-based improvement methods like lean and theory of constraints, which arise from failing to understand the fundamental distinction between ‘push’ and ‘pull’ strategies

Push-based MRP:

Static Forecasts in a Dynamic Market

A majority of manufacturing and distribution companies have implemented some form of an ERP system to support their planning and execution processes. However, most ERP systems are based-on-the outdated MRP method conceived in the early 1960s. Essentially, MRP uses forecasts of finished products to calculate component requirements based-on the Bill of Materials (BoM), and schedules the production or procurement of components based-on the respective lead times.

For MRP to work effectively, the forecast at the SKU level has to be highly accurate. However in today’s volatile and dynamic world, accurate forecasts are difficult to get. Furthermore, MRP is a highly interconnected way of planning. Any noise in the form of inaccurate forecasts gets amplified across the system. For example, any small change in the plan such as unavailability of a machine or a component has a cascading impact on the overall plan. This makes it difficult for planners to use the output of MRP for executing day-to-day shop floor activities, and it is no surprise that planners resort to using spreadsheets for planning. Hence, it is very important for companies to rethink the applicability of MRP logic in their supply chain planning.

A leading industrial goods manufacturing company based-in Europe operated in a business environment characterized by high variability in demand and supply. The company relied on forecast-based MRP for production and inventory planning, and used spreadsheets for daily execution.
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The company's business unit had an inventory turnover ratio of about four, while on-time delivery (OTD) based on customer requested date was about 70%. The root cause analysis of low inventory turnover, depicted in Figure 1, showed that about 50% of inventory was in excess, of which 35% could directly or indirectly be attributed to inaccurate forecasts. This clearly proves the damaging consequences of using inappropriate methods to manage dynamic supply chains.

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**Causes for Non-Optimal Inventory**

<table>
<thead>
<tr>
<th>Related</th>
<th>Cause</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Customer</td>
<td>Lack of effective collaboration with customers</td>
<td>11%</td>
</tr>
<tr>
<td>Internal Process</td>
<td>Excess and obsolete inventory (non-moving stock)</td>
<td>20%</td>
</tr>
<tr>
<td></td>
<td>due to inaccurate forecasts</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Misalignment between inventory and demand</td>
<td>8%</td>
</tr>
<tr>
<td></td>
<td>(in cycle stock) due to inaccurate forecasts</td>
<td></td>
</tr>
<tr>
<td>Supplier</td>
<td>Supplier volume agreements based on forecasts</td>
<td>7%</td>
</tr>
<tr>
<td></td>
<td>Lot sizes greater than optimal</td>
<td>4%</td>
</tr>
<tr>
<td></td>
<td>Total inventory analyzed</td>
<td>100%</td>
</tr>
</tbody>
</table>

Figure 9: Root cause analysis of low inventory turnover

**Misconceptions Around Pull-based Methods**

Demand variability and uncertainty have been longstanding challenges for most business operations. This is why, since 1970s, we have seen the evolution of various methods such as Lean, Six Sigma, Theory of Constraints, and so on, to help improve business planning and execution processes.

These improvement methods aimed to handle variation and uncertainty better through various techniques, instead of trying to predict the future via improved forecast accuracy. However there are some misconceptions that prohibit their enterprise wide adoption.

Let’s take a look at some of the main misconceptions around the pull production method:

**Misconception #1: Pull is Make-to-Order**

According to popular notions, the pull production system is customer order driven, while push is based on forecasting. In other words, pull is Make-To-Order (MTO), while push is Make-To-Stock (MTS). Though at a strategic level this distinction makes sense, at an operational level it does not. This can be understood in the context of a supermarket. The supermarket cannot be customer order driven in an operational sense as it cannot start procurement after the customer walks into the store. This implies that the supermarket needs to stock its goods before the customer arrives. Hence, it must operate on an MTS mode based on some form of forecasting.

Can it be categorized as a ‘push’ system because of its dependence on forecasting? Not necessarily. The very idea of ‘pull’ originated when Ohno, who conceived the Toyota Production System (TPS), observed replenishment of the supermarket shelf from its storeroom, wherein the supermarket replenishes only what has been picked up by the customers. Pull systems apply the same principle to the factory floors. Due to this misconception, many organizations erroneously think that if they cannot follow MTO strategy, they cannot implement a pull-based system.

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http://www.economist.com/node/13941150
Misconception #2: The customer order decoupling point is the push-pull boundary

The supply chain can be depicted, at a high level, as having two parts (MTO and MTS) separated by an inventory buffer point known as the Customer Order Decoupling Point (CODP), as shown in Figure 2. Depending on where the CODP is located, the fulfillment strategy is classified as MTS, Assemble-to-Order (ATO), or MTO.

It is often erroneously assumed that the part after the CODP is always pull, and the part preceding the CODP is always push. Therefore, the CODP is often considered to be the push-pull boundary. In reality, CODP can be either push based or pull based, depending on how the CODP or the inventory buffer point is planned and replenished. If it is based on forecasts, then it would be right to say that it is a push system, but if it is replenished based on a pull trigger, then it is actually a pull system.

To reduce lead times on customer order fulfillment, companies typically adopt the CODP approach. But in most cases, the CODP point is planned based on time-phased forecasts via MRP, leaving the efficacy of the supply chain at the mercy of forecasting accuracy. Companies can significantly improve their response to demand signals by planning CODP based on pull triggers. In addition to CODP, there can be other additional (strategic) decoupling points that help the supply chain become truly demand driven.

Figure 10: Positioning of CODP in the supply chain

Misconception #3: Pull systems do not have anything to do with forecasting

It is erroneously believed that pull systems do not leverage forecasting. In a pull system, unlike traditional forecasting based MRP, forecasts are not used to generate the supply orders, and hence time-phased forecasts are not used. Pull systems are based on an established inventory level (target level) that triggers the replenishment order, whenever the actual inventory level falls below the target level. Often this target level can be estimated using the forecasts of demand during lead time. Hence, pull systems can make use of forecasts.
**Misconception #4:**
**Pull is all about making suppliers stock up**

Another notion is that pull is all about making the companies’ suppliers stock components on their behalf, enabling companies to ‘pull’ the components from suppliers when required. This concept is called Vendor Managed Inventory (VMI) or sometimes it is implemented in the name of Consignment Stock (CS). This has led to the creation of an ecosystem of suppliers with manufacturing facilities or warehouses in close proximity to their customers, as is common in the automotive industry. The problem with this notion is that companies have become dependent on their suppliers to implement pull. Furthermore, merely transferring inefficiencies to the suppliers is not a sustainable proposition.

**Misconception #5:**
**Pull is only for raw materials and low value components**

Many companies implement pull replenishment mechanisms only for C-class (less critical or low value) parts or parts that experience steady demand, as they do not have to change the re-order points and safety stock levels often. Due to this, opportunities for holding optimal inventories for A and B class items are missed.

All these five misconceptions have created confusion around the applicability of pull techniques in an enterprise.

**Key Enabler:**
**Demand Driven MRP (DDMRP)**

In the recent years an effective method known as Demand Driven MRP (DDMRP) has been introduced, effectively combining the best features of both, MRP (push/interconnected) and Lean (pull/decoupled). By adopting the DDMRP model for planning, companies can realize the vision of the demand driven or customer centric supply chain. It is being increasingly adopted by many companies across the world, and ERP companies like SAP have already started offering software support for this method.

**Three Steps to Transform to a Demand Driven Supply Chain**

Aligning processes, people, technology, and measurements is an important element in any transformation journey. We recommend that organizations embed the following three steps in their transformation to a demand driven supply chain.

**Step 1: Identify strategic decoupling points for inventory positioning**

The main focus here is to identify nodes in the BoM or locations in the supply chain network that can act as strategic decoupling points. The key criteria to identifying these points include customer tolerance time, market potential lead time (or a shorter lead time for which the customer is willing to pay a premium), supply and demand variability, BoM, supply and distribution network, and critical resource considerations. Positioning of decoupling points where demand variability is lower (for example at a central warehouse) helps improve customer service, and eliminates the need to hold inventories at every retail location.

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Step 2: Implement an effective pull solution

Each decoupling point, or inventory buffer, should be replenished based on the pull mechanism through the following measures:

- Estimate the inventory or target level based on the traits of each part such as variability and lead time. Use simulation and what-if scenarios to arrive at effective values.
- Set up a pull mechanism to replenish the decoupling point.
- Adjust the target level dynamically, in tune with demand patterns and the company's ability to invest up to the target levels.
- Use long-term forecasts to set the target level for seasonal events and capacity changes.
- Consider any sporadic large orders (beyond a threshold) as additional requirements to ensure that they do not overwhelm the inventory buffers or result in longer lead times for large orders.
- Drive visible and collaborative execution based on stock buffer priority rather than due date priority.

Step 3: Drive efficient change management

Planners and other upstream and downstream stakeholders must be made aware of the misconceptions about pull and push, and the positive impact of practicing the new method on supply chain performance. Companies can initially conduct general training and game sessions to eliminate misconceptions, followed by collaborative workshops conducted at regular intervals to help the organization shift to a demand driven supply chain.

Using the DDMRP framework: A case study

A leading power and automation technology company analyzed its inventory levels leveraging the DDMRP framework to estimate the potential for improvement. It specifically aimed to:

- Release cash locked in working capital as inventory
- Drive inventory re-alignment and optimization for better service levels coupled with lower inventory levels

The company used the DDMRP framework to calculate the ‘should be’ inventory for a total closing stock worth around USD 250 million and compared it with the company’s current inventory levels. The results of the study showed that inventory could potentially be reduced by over 21%. But, more importantly, the company found that the framework can help it align its inventories with demand patterns, thus improving fill rates and on-time delivery. This, in turn, is likely to have a substantial impact on its sales revenue and net profits.

Conclusion

To achieve an enterprise-wide demand driven supply chain, manufacturers will need to bring about a cultural shift in their organizations. The misconceptions discussed in this paper are at the heart of many partial and failed adoptions of the pull method. Addressing the reasons for these misconceptions, re-educating supply chain stakeholders, and winning their buy-in will be key to successfully transitioning to a demand driven system.
Maximizing Supplier Value with a Performance Management Framework

Globalization and tough economic conditions are pushing manufacturers to increasingly rely on global suppliers. With more partners located in various geographies, the competitiveness of manufacturers depends on their ability to manage supplier relationships optimally. This requires manufacturers to ensure internal alignment of supplier performance measures with larger organizational objectives, as well as a more collaborative approach towards the measurement and improvement of performance of their suppliers.

However, the inherent complexities in supplier networks spread across multiple locations make it difficult to manage and track supplier performance. According to the Gartner-SCDigest Supply Chain Study 2015, only 5% of organizations have achieved Level 4 maturity under the Demand Driven Value Network (DDVN) maturity model, indicating that they leverage technology for collaborative and mature extended supply chain management. Today, there is a definite need for manufacturers to go beyond quick fixes, and adopt a more holistic and digitized approach towards supplier performance management. This white paper discusses a 360⁰ framework to manage supplier performance in the modern supply chain.
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About the Authors

Madhukar Patil

Madhukar Patil is a Domain Consultant for Supply Chain management in the Manufacturing business unit at Tata Consultancy Services (TCS). He has over 13 years of experience in manufacturing and consulting. His functional focus areas comprise strategic sourcing, procurement, and logistics management. He has a Six Sigma Green Belt certification and is a trained consultant for e-procurement technologies. He has successfully executed projects for leading manufacturing companies, driving cost savings, sourcing innovations, and process improvement.

Saurabh Tiwari

Saurabh Tiwari is a Domain Consultant for Supply Chain management in the Manufacturing business unit at TCS. He has 11 years of experience across various manufacturing segments such as metals and mining, engineering, procurement, and construction (EPC), and industrial manufacturing. He is an American Production and Inventory Control Society (APICS) certified supply chain management professional with experience in sourcing and procurement, manufacturing operations, and sales and operations planning.

Why Supplier Performance Management Matters

Over the last couple of decades, the manufacturing industry has witnessed the emergence of several new trends due to growing globalization, consolidation, and digitization. These trends are, in turn, increasing manufacturer dependence on a widely dispersed supplier base with special focus on low cost countries.

While this move provides specific advantages such as cost, efficiency, and business value for manufacturers, it also increases risks. The 2015 Allianz Risk Barometer, a survey of corporate insurance experts and risk managers, highlights business interruptions and supply chain risks as a primary concern for business leaders. To manage this concern and drive continuous improvement, businesses need to monitor supplier performance and manage relationships effectively.

Roadblocks to Supplier Performance Management

Despite the importance of Supplier Performance Management (SPM), most manufacturers continue to grapple with insufficient and inconsistent SPM capabilities. Recent technological advancements help manufacturers manage supplier performance to some extent through supplier scorecards, surveys, and dashboards. However, aligning SPM with organizational objectives continues to be a challenge due to the lack of a holistic digital framework.

Here are some key challenges manufacturing companies face in implementing effective SPM:

- Lack of organizational commitment to investing in the SPM process and aligning it with organizational objectives
- Absence of standardized methodology and approach to SPM across geographies
- Legacy systems and disparate IT portfolio leading to inconsistent processes and data
- Dearth of accurate and granular data
- Lack of a suitable reporting platform for effective insights on supplier performance
- Inadequate collaboration platforms to engage with suppliers on improvement initiatives and drive continuous enhancements

To address these challenges holistically and improve effectiveness, manufacturers need to approach SPM as a strategic initiative aligned with organizational objectives, rather than through discrete solutions such as supplier scorecards and surveys.

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Leveraging a Comprehensive SPM Framework

A comprehensive SPM framework helps counter implementation challenges, and provides a platform for collaboration between manufacturers and suppliers. It uses automation, analytics, and a structured approach to deliver optimized benefits for manufacturers. As indicated in Figure 11, the framework encompasses end-to-end SPM processes, and is built around the four pillars of supplier strategy, collaborative performance planning, sustainable execution, and analysis and benchmarking.

Figure 11: 360° Supplier Performance Management Framework

Pillar 1: Determining Supplier Strategy

Even though manufacturing organizations tend to have a vast portfolio of suppliers, every supplier does not add equal value to the business. It is therefore essential to segment and group suppliers, and measure and manage their performance accordingly (Figure 12).

Figure 12: Supplier Segmentation and Mapping with KPIs
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**Defining KPIs and Weights for Supplier Segments**

A four step method can help businesses identify relevant KPIs for each of the supplier segments:

1. Define the business objectives period
2. Translate the business objectives into measurable goals
3. Determine KPIs to measure performance of each of the goals
4. Determine the weight of each KPI depending on its impact on the business objectives

To ensure accuracy of the weights assigned, it is essential that stakeholders from various business functions participate in the exercise. Statistical methodologies such as the Analytic Hierarchy Process (AHP) can be used to arrive at the right weightage for KPIs. AHP is a Multi Criteria Decision Making (MCDM) method that helps decision-makers faced with multiple conflicting and subjective criteria. For SPM, it enables stakeholders to assign weights to KPIs and metrics based on their relative importance, as shown in Figure 13.

**Strategic:** This segment includes suppliers with highest value generation capability. Supplier value in this segment should be measured on strategic KPIs such as co-innovation, sustainability, and risk, keeping the strategic relationship in mind.

**Potential:** With the potential to grow into strategic suppliers, this segment is highly preferred. It has low to medium spend and adds moderate to high value to business. Tactical KPIs such as quality, cost, delivery, and service (QCDS) need to be defined and monitored for this segment.

**Standard:** This segment is comparatively less risky with lower switching costs. A set of operational KPIs with minimal monitoring is sufficient to gauge the performance of this category.

**Commodity:** This group includes suppliers with lowest switching costs, with multiple alternatives available to manufacturers to choose from. As a result, operational KPIs combined with minimal monitoring are ideal for this segment.

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**Figure 13: Illustration of AHP Methodology**

<table>
<thead>
<tr>
<th>Verbal Judgment of Preference</th>
<th>Numerical Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>Extremely preferred</td>
<td>5</td>
</tr>
<tr>
<td>Strongly preferred</td>
<td>4</td>
</tr>
<tr>
<td>Moderately preferred</td>
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</tr>
<tr>
<td>Equally to moderately preferred</td>
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</tr>
<tr>
<td>Equally preferred</td>
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</table>

<table>
<thead>
<tr>
<th>Quality</th>
<th>Cost</th>
<th>Delivery</th>
<th>Services</th>
<th>4(^{th}) Root of Product</th>
<th>Priority Vector</th>
<th>Weightage</th>
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<tbody>
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<td>3.00</td>
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<td>5.00</td>
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</tr>
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<td>1.00</td>
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</tr>
<tr>
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<td></td>
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<td>5.38</td>
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</tr>
</tbody>
</table>
Basically, the supplier strategy pillar of the collaborative framework helps prioritize suppliers based on their contribution to the business. It also helps define KPIs and metrics to evaluate supplier performance.

**Pillar 2: Ensuring Collaborative Planning**

The second pillar of the framework emphasizes collaboration and interaction with suppliers on a regular basis. In order to draw maximum value from supplier relationships, it is crucial to interact using a collaboration model that defines the rules of engagement for its participants.

Such a collaboration model ideally enables:

- Sharing information on performance against KPIs and value that suppliers add to business
- Setting up supplier scorecards, audit forms, audit frequency, and feedback mechanisms
- Determining tools and frequency of tracking, measuring, and reviewing the performance of suppliers across QCDS metrics, including receipt of quality assessment data from suppliers
- Devising and implementing action plan to improve supplier performance

**Pillar 3: Driving Sustainable Execution**

Business transactions with suppliers generate large amounts of data that are gathered systematically over time. Analyzing this data helps sustain the momentum and drive continuous improvement in supplier performance. Organizations also need to process and transform the data captured in ERP and legacy systems to perform KPI measurements. To enable regular monitoring, and ensure that the processes and procedures previously agreed upon are followed by suppliers, the quality assurance department should conduct supplier audits and surveys periodically (say, annually or bi-annually). A feedback loop from the suppliers, through which they provide inputs to manufacturers, is essential for the success of the supplier strategy.

**Pillar 4: Conducting Analysis and Benchmarking**

The results of the KPI measurement exercise, including the supplier audit score, are used to analyze each supplier for a particular duration. The performance ratings of suppliers are benchmarked and compared to make appropriate adjustments to the supplier segments. During this process, in case of poor supplier performance, root cause analysis is performed to feed into the supplier strategy and action plan.
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A Digitized 360-Degree SPM Framework

Figure 14 represents the potential for digitizing important elements of the SPM framework.

It demonstrates how each pillar of the framework can be designed as modules digitized by relevant solutions or applications. For example, the strategy pillar can be digitized through modules that perform supplier segmentation and metric management.

A digitized SPM framework makes it easy for organizations to:

**Drive Supplier Strategy:** Advanced analytics can segment suppliers into different categories based on their maturity assessment, considering factors such as dollars spend, product complexity, breadth of the supply base, and volume. This ensures accurate, fast, and objective assessments across diverse and complex parameters.

**Adjust KPIs Dynamically:** Analytics and machine learning techniques can help manufacturers dynamically determine KPIs and weights to better manage the parameters based on suppliers’ performance score. With the collaborative platform enabling real-time updates to all stakeholders, managers can devote greater focus on devising improvement action plans to ensure timely correction in performance.

**Utilization of Scorecards and Surveys:** Easy-to-use form design templates, including ‘drag and drop’ capability, help users create highly customized surveys for various segments of suppliers, and enable suppliers to respond through an easily accessible supplier collaboration portal.

**Automate Workflows:** The performance improvement module helps manufacturers design and monitor specific improvement projects for suppliers based on their performance ratings. Managers can track project status through dashboards to provide quick approvals for improvement initiatives.

**Create Integrated Dashboards:** The digital framework allows manufacturers to source data from ERP, legacy, and other systems to offer a single source of truth for supplier performance results. Using an intermediate data layer that consolidates data from different systems, the integrated dashboard calculates KPI ratings and determines supplier performance in real time, enabling faster and optimal decision making.
Implement Portal for Supplier Collaboration: A digital portal enables faster and more transparent communication through sharing data on improvement plans, surveys, and supplier feedback, while also allowing real-time messaging and support to suppliers. Thus, a digitized SPM framework offers the following advantages to manufacturers:

- Integrates end-to-end supplier management processes from strategy to feedback, and enables suppliers' active participation in the relationship management process.
- Enables alignment of SPM objectives with organizational goals to enable profit-driven decision making and deliver early return on investment.
- Helps manufacturers achieve greater visibility through vertical and horizontal integration, and enables advanced risk management through scenario analysis to avoid potential supply chain disruptions.

Using Supplier Performance Data to Drive Better Supplier Value

The complex global operating environment requires manufacturers to minimize supply market risk, enhance supplier relationships, and drive improvements in KPIs. An integrated SPM framework can help achieve these goals through supply chain optimization and establishment of closer ties with high-value partners. For example, insights into the value generated by a specific supplier can help drive effective sourcing negotiations, enabling manufacturers to adopt aggressive strategies for low-value suppliers and a more balanced approach for high-value suppliers. Similarly, the transparency provided by supplier performance data can make it easier to assess the impact of a product recall by a supplier.

Data-driven SPM thus emerges as a key focus area for manufacturers embarking on the path to optimizing supplier value. Adopting a digital, integrated SPM framework is the first step towards realizing a holistic and collaborative approach that emphasizes transparency, strategic planning, and benchmarking.
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Optimizing Inventory Through Periodic Inventory Analysis

Inventory is one of the largest continuous investments an organization makes, so getting maximum return on investment is crucial for success. Working capital and space costs are directly associated with inventory and can be adversely impacted if it is not managed efficiently.

A disciplined and scientific approach towards inventory optimization can help achieve optimal inventory levels across the supply chain. Inventory optimization is a mindset focused on efficiently achieving required service levels while keeping inventory levels and associated costs as low as possible—irrespective of high fluctuation in demand and short product life cycle.

Inventory optimization is not a new challenge to organizations but it has attained importance over the past decade as competition drove organizations to provide better value to customers at same or lower costs. This forced organizations across sectors to have leaner processes and manage working capital effectively. Inventory optimization is a major function that organizations can use to control and positively impact bottom line.

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Optimizing Inventory Through Periodic Inventory Analysis

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Typical Inventory Optimization Challenges

- Material Classification and Standardization: Lack of proper standards on material classification and standardization leads to part number duplication, which in turn results in high inventory levels, lack of leveraging power with suppliers, and higher administration costs.
- Material Planning and Scheduling: Using a forecast driven logic leads to high inventory levels for some parts blocking working capital and results in stock outs of certain parts at the same time impacting customer service levels.
- Demand Management: The nature of slow moving, lower volume products makes it challenging to predict demand as variability is very high. There are other factors such as product and SKUs proliferation and changes in customer preferences which add to demand variability. Rudimentary or highly inaccurate forecasting processes lead to ordering of material either in excess or not procuring the right material for production.
- Supplier Issues: Lead time constraints for high lead time parts and supplier uncertainty due to issues with quality, delivery, and capacity result in high inventory levels.
- De-centralized Inventory Planning: Lack of synergy between plants or warehouses of a business unit spread within or across regions and having same supply base leads to high stock levels.
- Inventory Management: Irregular Root Cause Analysis (RCA) of slow and non-moving stock, high safety stock levels to tide over process inaccuracies, and low inventory accuracy due to technology, process, and people issues are some of the common pain areas in inventory management.

Excess inventory to meet fluctuating customer demand and to minimize the impact of long lead time increases inventory carrying cost. Similarly, maintaining less inventory to avoid holding cost may create stock-out situation. Failing to provide customers the right goods at the right place and time often leads to lost sales and hence lost customers.
The goal of an inventory planner is to establish a balance between supply and demand so that the appropriate level of inventory is maintained to meet demand without running out of stock and compromising customer service levels. Excessive inventory investment can block capital whereas inappropriate inventory investment can lead to insufficient inventory. De-centralized and inconsistent inventory optimization policies multiply the magnitude of the problem.

Organizations should assess their inventory management maturity levels and aim to reach the stage where inventory management strategies are devised across echelons thus optimizing working capital across the supply chain. The need of the hour is to make supply chain agile and responsive by empowering inventory planners and managers.

**Typical Inventory Optimization Challenges**

Inventory optimization challenges span across areas such as master data management, planning, demand management, as well as incorrect inventory policies and supply issues. Strategies such as decentralized stocking and empirical inventory policies coupled with variable demand patterns pose significant challenges for inventory optimization.

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Inventory Optimization Maturity Curve

The inventory optimization maturity curve for any organization across sectors and industries can be broadly classified into three levels on the basis of process maturity and technology in use.

- Inventory optimization at a part level for specific location(s) using empirical techniques
- Inventory optimization at an echelon level using scientific techniques
- Inventory optimization across echelons using advanced inventory optimization software and techniques

Inventory optimization at part level for specific location(s) using empirical techniques

Inventory managers at this level of maturity set inventory policies at part level for a specific location. The parameters are set for each part locally without considering the impact across the supply chain or the next node. This leads to excess buffer levels and high days of supply thus impacting working capital management.

The tools used for inventory planning at this level are spreadsheet models that have higher chances of errors due to incorrect data inputs, are time-consuming, and are manual. The inventory classification techniques used are elementary at best, such as ABC classification with parameters being decided empirically i.e. based on experience or rule of thumb, rather than scientifically or statistically.

Strategies used to manage inventory are at an operational level, which leads to firefighting and limited inventory visibility. This, in turn, leads to high inventory levels for certain parts, whereas some parts will have frequent stock outs. Demand variability is managed by maintaining high stock levels and relying on premium freight shipments. Forecasting methods used are qualitative and rely on expert judgment rather than quantitative analysis.
Inventory optimization at echelon level using scientific techniques

Organizations at this level of maturity set inventory policies such as continuous review (inventory reviewed every day) or periodic review (inventory review at regular intervals) considering safety stock, supplier lead time variability, internal cycle time variability, demand forecast variability, order policies, min-max levels, and reorder points at a single echelon level within the supply chain. The organization usually depends on a robust ERP system for setting inventory policies using different inventory classification techniques such as ABC (consumption valuation), FSN (fast, slow and non-moving), PQR (closing stock valuation), and XYZ (demand variability). Inventory managers use cross plots of these techniques to focus on appropriate parts at echelon level.

Scientific or statistical techniques are used to derive the inventory policies, which are automatically set and reviewed in the ERP system. Both quantitative and qualitative forecasting techniques are used. KPIs such as inventory turnover, inventory accuracy, and inventory carrying costs at a single echelon are measured and monitored. At this level, the inventory optimization occurs at a single node in the supply chain with limited inventory visibility of other nodes. This thus leads to sub optimization of the inventory across the supply chain.

Inventory optimization across echelons using advanced inventory optimization software and techniques

Organizations at this level are leaders in the inventory optimization maturity curve. The inventory optimization is at a strategic level involving echelons across the supply chain thus minimizing inventory levels and buffers across the supply chain, helping the supply chain become lean, agile, and responsive.

ERP systems are integrated with best-in-class inventory optimization software based on modern, demand-driven inventory optimization frameworks. Dynamic policy settings, which are demand driven help in managing real time changes in the supply chain thus responding to internal and external customers on time and effectively. KPIs such as inventory turnover ratio and inventory accuracy are calculated and monitored for a node, and across nodes, and process changes are effected through best in class systems and shift in enterprise structure (shift from planning in silos to collaborative planning) to keep up with the frequent changes in demand. The major differentiator at this level is the adoption of demand driven planning and inventory management.
Optimization of High Impact Business Units/Plants

For companies with multiple divisions, business units, and plants across the globe, it is important to identify the high impact plants across the business where they will have to focus their inventory optimization efforts. Prioritizing these critical business units or plants provides a chance to improve inventory turns significantly and thus show quick improvements in the working capital management.

The process should start by identifying the interdependencies between divisions, Business Units (BU), product groups, and plants, which may share many-to-many relationships. To efficiently manage inventory, it is imperative that inventory managers, planners and controllers, buyers, master schedulers, and demand planners from one business unit collaborate effectively with each other and with other BUs within the division. It often takes a company-wide effort to achieve success. The data on inventory turns, sales volumes, and planning strategy for each selected division or business unit is then extracted and analyzed. A heat map can then be prepared to help identify the critical plants for inventory optimization.

Figure 17: Plant Prioritization Heat Map

Plants with higher sales-to-inventory turns value are the ones delivering lower inventory turnover despite high sales, which indicates higher inventory levels. These plants will yield the highest benefits of interventions made to optimize inventory levels and thus increase inventory turns. Along with plant comparison, organizations will also need to consider the planning strategy in place at the plant (for example, Make-to-Order, Make-to-Stock), as comparing plants with different strategies in a single division will provide an incorrect heat map.

Case Study

A leading global manufacturer with discrete manufacturing units spread across all geographies, needed solutions to reduce finished goods inventory across its different regions. The manufacturer was challenged with low inventory turnover ratio, excess and obsolete inventory, manual forecasting leading to low inventory accuracy level, high demand fluctuation, and unreliable delivery.

The manufacturer carried out a detailed inventory analysis along with root cause analysis of excess inventory. By applying different inventory classification and analysis techniques, the company identified quick wins for inventory reduction of USD 49.8 million across locations and planned interventions for inventory reduction.

The root cause analysis of slow moving and excess inventory highlighted issues such as minimum order quantity constraints, master data issues, incorrect demand pulls, and project inventory. Recommendations, which included quick wins as well as tactical interventions for inventory reduction, were to liquidate non-moving stock, dynamically update planning parameters based on a demand driven framework, and review and reduce lot size constraints and lead time, master data maintenance and planning strategy review.

Conclusion

Inventory is usually a company’s biggest asset. According to both Aberdeen Group and AMR Research, inventory optimization is currently the topmost supply chain initiative that companies are pursuing to improve efficiency and increase shareholder value. Optimized inventory levels can quickly and effectively increase order fulfillment rate while reducing inventory costs over the entire supply chain.

The first step for organizations is to understand where they lie on the inventory optimization curve, based on which they have to first identify critical business units, plants and/or regions, then select the appropriate inventory classification and analysis techniques, frameworks, and tools to identify root causes or pain areas, and finally address them on a continual basis to progress towards maintaining optimal inventory across the supply chain. Moving up in the inventory maturity curve by setting up inventory policies, classifying inventory, and implementing techniques in a phase wise manner is the best way to kick-off the journey and start reaping the benefits of optimized inventory.
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Stronger Together: Leveraging a Robust Supply Chain Convergence Framework to Ensure Successful Mergers and Acquisitions

In today's competitive markets, it is nearly impossible for an organization to achieve its aggressive targets through organic growth alone. A well planned and managed Mergers and Acquisitions (M&A) strategy and flawlessly executed integration create substantial business value, leaving the new organization with a redefined focus and stronger competitive position. At the same time, in a highly connected business environment, managing supply chain convergence as a result of M&A activities can be extremely complex.

Lessons from past mergers between large global corporations such as Renault-Nissan and Fiat-Chrysler underscore the need for a well-defined approach to plan, communicate, and execute supply chain convergence. Using a robust approach can help manufacturers obtain synergistic savings and ensure M&A success.

In this whitepaper, we outline the '3-4-5 framework' for effective supply chain convergence in the post-M&A scenario, focusing on unlocking operational synergies and effectively integrating the relevant organizations. The paper addresses the challenges in merging the supply chain of two organizations and details how the recommended framework can act as a key enabler.

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Varad Govindrajan is working as a Consultant with the Innovation and Transformation Group in the Manufacturing industry unit at TCS. He has 17 years of experience in IT consulting and project delivery in the manufacturing domain, in the areas of demand and order management. His work spans the entire value chain including inventory management, scheduling and sequencing, material requirements planning, supplier relationship management, warranty, and logistics. Varad has an engineering degree from Bharathidasan University and is a Certified Demand Driven Planner (CDDP) from International Supply Chain Education Alliance (ISCEA).

Supply chain convergence in M&A

Mergers and Acquisition (M&A) activities are the key strategic levers for organizations to achieve growth, diversification, and strategic alignment objectives that can help unlock substantial shareholder value. However, merging companies is an invariably complex exercise, which if not done with the appropriate strategy, comprehensive planning, and due care and attention, can leave the new company in a sub optimal operational position.

Supply chain performance is being increasingly perceived as a competitive differentiator in the M&A space. A study by Georgia Technical Institute states that the stock price of an organization can plummet by 8% on a day when a supply chain problem is unearthed. The importance of the supply chain thus cannot be ignored, especially in an M&A deal.

Depending on the objectives of M&A, some mergers are supply chain focused, while others deliberately keep the supply chains of the merging companies separate. The merger of Kmart and Sears in the retail sector, and Coors and Coataors in the food industry, are good examples of supply chain focused mergers. On the other hand, in 2008 when Tata Motors Limited took over the reins of Jaguar-LandRover (JLR) from Ford, they decided to operate the two companies separately, with separate supply chains, given the differences in their key market segments and business models.

Key functions in supply chain convergence

Any supply chain convergence should focus on four important functions as shown in the figure below. Each of these functional areas has its own risks and rewards in a merger scenario. For example,
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Renault and Nissan have enjoyed an integrated purchasing organization for more than a decade, while generating €1.036 billion savings in synergies.\(^\text{10}\)

Fiat and Chrysler are working towards convergence in different functional areas within the supply chain to leverage scale and achieve operational efficiencies, including the establishment of a common supply base, and design anywhere-build anywhere capabilities.

Lafarge and Holcim merged to mitigate the impact of soaring raw material prices, decrease operating costs and capital expenditure, and gain access to the global cement market, while benefitting from larger economies of scale. The strategy has paid off resulting in synergies of €340 million in purchasing, €250 million in sales, and savings of €200 million in financial costs in 2014.\(^\text{11}\) In this instance, supply chain convergence included the establishment of a global purchasing organization, rationalization of supply bases, and a common platform to simplify global procurement and achieve cost savings.

### The 3-4-5 supply chain convergence framework

Not all M&A deals add value; in fact, research\(^\text{12}\) shows that around 75% of the larger mergers destroy rather than create shareholder value. Some of the typical challenges faced in execution of supply chain convergence are:

- Shifting from local to global supply chains
- Non-congruent supply chain strategies between the merging organizations
  - Incorrect integration strategies
  - Technological challenges, like non-complementary IT strategies
  - Supply chain regulations when venturing into new geographies or new business lines
- Cultural alignment challenges
- Rationalization of workforce between the organizations

Thus, when faced with the task of converging two distinct supply chains, organizations look for a framework that can help minimize the risks, maximize the benefits, and aid in achieving the objectives of the merger. The answer lies in adopting a systematic and rational approach, backed by a supply chain convergence framework. Such an approach will help answer important questions around the current state, end objectives, current gaps, and the concrete steps needed to reduce these gaps.

The ‘3-4-5 Convergence Framework’ is one such enabler and advocates a holistic approach to supply chain convergence. The framework encompasses the following keys of successful convergence:

- **3 Pillars:** People, Process, and Technology
- **4 Phases:** Discovery (of current state), Definition (of end state), Differential (gaps between current and end state), and Destination (convergence)
- **5 Influencers:** Objectives, Strategies, Policies, Value Drivers, and Change Levers

In this framework, each of the three pillars evolves through the four phases of convergence, with the five influencers governing each phase. As a prerequisite, the influencers have to be identified and clearly defined for the target organization. The framework can then be applied to the convergence of all functions of a supply chain to arrive at a unified supply chain for the newly formed organization.

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Discovery phase:
Understanding the current state

For effective convergence, it is essential to understand and baseline the current state. For example, from a process standpoint, this involves analyzing each process, the sequence in which activities are performed and their triggers, as well as how and when they are performed. Understanding the current state of the supply chain in the light of merger objectives and strategies will form the going-in-position for the next phase.

Definition phase:
Defining the end-state of the merged organization

The definition phase reflects the future state of the supply chain in the merged organization. Using the target state influencers as the prism, this phase determines the relevance of the process, technology, and people structures underlying each function for the merged supply chain. For instance, if the merger strategy is to keep the supply chains separate and operate as individual units, then the end state will be defined for two supply chains driven by common objectives, policies, and value drivers. On the other hand, in a supply chain focused merger, the objective is to derive synergies from the merging supply chains while the value driver is cost optimization. In this case, the end state will focus on taking the best of both the supply chains to form a unified supply chain. The end state needs to be arrived at in collaboration with the leadership team and by applying industry best practices.

Differential phase:
Defining the roadmap to the end-state

This phase is all about defining how to address existing gaps in the three pillars to achieve the desired end-state.

In order to simplify the process convergence, each of the processes across both merging companies needs to be scored on parameters, measuring its alignment to influencers as well as business impact. Based on the scores, each process falls into one of the four categories: Retain, Integrate, Reengineer, or Extend (RIRE) in the grid (Figure 2).
Critical success factors for the convergence.

Integration plan, and effective change management right from the discovery phase are

Design and delivery, robust risk and program management, a comprehensive

team, a cross-functional integration task force that will be responsible for integration

identifying the strategic direction and investments required. Creating a core project

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Governance at strategic, tactical, and operational levels is absolutely vital to M&A

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Other factors. Once the methodology is defined, the right partner can support

convergence, business priorities, impact on business, ROI, and ease of change, among

approach. What this means for supply chain convergence is that rather than optimizing

Convergence in M&A is moving from a traditional ‘one system fits all’ to a ‘best-in-class’

realization of M&A objectives, and enhanced stakeholder value.

Accelerating time to value

Delivering holistic convergence

It ensures a smooth transition and mitigates unexpected risks in the process of

integrating the supply chains, while meeting the strategic objectives of the M&A.

The 3-4-5 framework gives organizations a well-defined and simplified approach to

Supply chain convergence is crucial to the success of mergers and acquisitions.

Benefits of applying the

by defining various activities involved, resulting in faster

by looking at the supply chain in its entirety, covering

Conclusion

It starts with identifying a convergence methodology. This could be a big bang approach in which convergence happens simultaneously across the entire organization or a phased approach across regions, business units, processes, or other units. The approach is chosen based on the magnitude of convergence, business priorities, impact on business, ROI, and ease of change, among other factors. Once the methodology is defined, the right partner can support execution.

Partners can include external stakeholders such as suppliers, dealers, Third Party Logistics (3PL) providers, and IT vendors. It is important to define the roles and responsibilities of each of the partners and involve them right from the start of the convergence journey. In the execution phase, all three pillars of process, technology, and people come into play.

The importance of governance and change management

Governance at strategic, tactical, and operational levels is absolutely vital to M&A integration in general and the success of supply chain convergence in particular. It starts with defining the executive team responsible for integration plans, and identifying the strategic direction and investments required. Creating a core project team, a cross-functional integration task force that will be responsible for integration design and delivery, robust risk and program management, a comprehensive integration plan, and effective change management right from the discovery phase are critical success factors for the convergence.
Benefits of applying the 3-4-5 framework

Supply chain convergence is crucial to the success of mergers and acquisitions. The 3-4-5 framework gives organizations a well-defined and simplified approach to integrating the supply chains, while meeting the strategic objectives of the M&A. It ensures a smooth transition and mitigates unexpected risks in the process of convergence.

- **Accelerating time to value** by defining various activities involved, resulting in faster and more holistic integration of the supply chains, with seamless adoption, faster realization of M&A objectives, and enhanced stakeholder value.
- **Delivering holistic convergence** by looking at the supply chain in its entirety, covering process, people, and technology, providing a broader coverage of convergence lifecycle from pre-convergence to defining the target state, and identifying ways to achieve convergence.
- **Driving innovation** by enabling the organization to adopt new technologies, define new business models, accelerate time to market, and optimize costs.

Conclusion

Convergence in M&A is moving from a traditional ‘one system fits all’ to a ‘best-in-class’ approach. What this means for supply chain convergence is that rather than optimizing individual operations such as planning, manufacturing, warehousing, and transportation, the future convergence initiatives will be focused on optimizing the entire flow of material, money, and communication across the value chain. Supply chain convergence is also breaking the barriers of orthodox concepts like economies of scale and moving towards major structural transformation of the entire industry or multiple industries.

The automotive sector is a great example. Consumers now expect the same speed of innovation in their vehicles as in electronics they own. The growth of self-driving, connected cars has initiated a multi-industry convergence of automotive and high tech sectors, while also establishing the need for a global mega supplier. The two industries are interdependent in their business relationships and therefore in their supply chain systems. Soon enough OEMs may find themselves competing with high-tech companies for supplier capacities, which will inject the need to form closer supply chain networks with their supplier base.

This is but one example of what supply chain convergence could mean in future. The next generation of converged supply chains will target supply chain 4.0 and therefore support smart factories. Supply chain strategies like segmentation will become part of the convergence stage itself. These transformations further highlight the need for a holistic and mature framework that can help define and establish a best of breed converged supply chain of the future.
About TCS' Manufacturing Business Unit

TCS helps global manufacturers reduce operational expenditure, utilize capacity optimally, and increase efficiencies while meeting safety and regulatory norms. We are the preferred partner for a third of the Fortune 500 manufacturers, and have a record of enabling business innovation that helps them meet the objectives of global operations.

The core strength of our solutions lies in our rich experience across discrete (automotive, industrial manufacturing, and aerospace) and process industries (chemicals, cement, glass, and paper). Our vertical focused Centers of Excellence (CoE) leverage this rich database to cross-reference learning and drive innovation in business solutions for standardized processes, assets and templates, ERP implementation, and continued support services.

Our solutions and services portfolio spans IT-led business transformation; design, development, and support for IT solutions; and value-added services such as infrastructure management and consulting.

Contact

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About Tata Consultancy Services Ltd (TCS)

Tata Consultancy Services is an IT services, consulting and business solutions organization that delivers real results to global business, ensuring a level of certainty no other firm can match. TCS offers a consulting-led, integrated portfolio of IT and IT-enabled, infrastructure, engineering and assurance services. This is delivered through its unique Global Network Delivery Model™, recognized as the benchmark of excellence in software development. A part of the Tata Group, India’s largest industrial conglomerate, TCS has a global footprint and is listed on the National Stock Exchange and Bombay Stock Exchange in India.

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