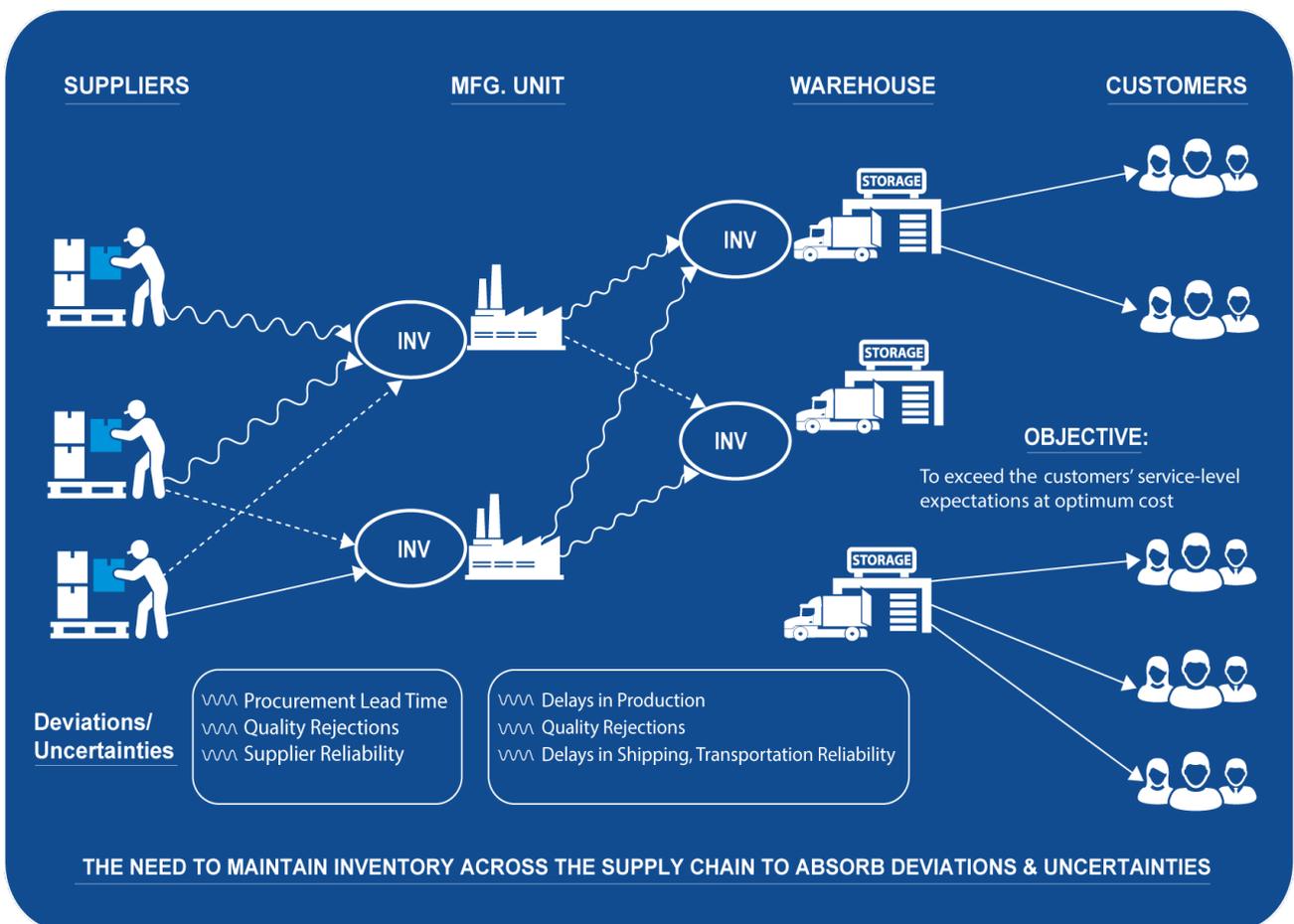


# RESPONSIVE SUPPLY CHAIN:

## Designing and Evaluating an IT Solution



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## ABSTRACT

### Making Supply Chain more 'Responsive'

The Supply Chain Management (SCM) solutions - designed & customized to the Business Process Requirements and scenarios typical of an enterprise - help in handling cross-functional business processes in an integrated manner, which effectively improves the performance of supply chain operations for the parameters they are designed for. However, in real life situations, many internal and external factors do impact performance of the supply chain adversely. It is essential to sense such potential disturbances in advance, and respond to the same in time so as to minimize their adverse impact on the performance of the Supply Chain. The Supply Chain could be designed to make it 'responsive' to such unforeseen conditions and trigger necessary corrective actions proactively. Such corrective actions could be in the form of adjustments and corrections, triggered manually at the final stage of executing certain process-steps in the Supply Chain. Moreover, the responsiveness can be improved significantly by enhancing the SCM solution with process-steps, features and tools designed specially with this objective.

This White Paper provides an overview of the approach to make Supply Chains more 'Responsive'. It also provides checklists that may be used to identify critical SCM process features. These features are in the context of the existing SCM solution deployed in given business conditions and also evaluate/compare multiple SCM application options being considered for implementation.

## Introduction

### Supply Chain Management (SCM)

Supply Chain Management is the oversight of Materials/Products, Information, and Finances as they move in a process from Supplier to Manufacturer to Distribution Centre to Retailer and finally to the end Customer. SCM covers planning, coordinating and integrating these flows both within and among enterprises, which are called Supply Chain Nodes. The ultimate goal of any effective SCM process is to make the products available to customers as requested and meeting the standards of customer service at minimum overall cost.

The SCM process typically covers:

- **Demand Planning:** Forecasting of market demand without considering any constraints.
- **Supply Planning:** Planning of Supplies across the Supply Chain with the objective of fulfilling demand and exceeding the Customer Service Level expectations. Supply Planning could be performed constrained or unconstrained.
- **Production Planning and Scheduling:** Evaluating the status of available capacity and sequencing the production activities to optimize capacity utilization and meeting delivery requirements.
- **Distribution/Transportation/Delivery:** Demand-Supply matching and product allocations, rescheduling, and delivery confirmations.
- **Supply Chain Collaboration:** Collaboration of Manufacturing Plants, Distribution Centers and Warehouses with Suppliers and Customers to bring end-to-end visibility across the supply chain.

## Responsiveness of the Supply Chain

While designing a Supply Chain, it is important to ensure that it is efficient as well as responsive. A responsive Supply Chain requires policies and information flow from the market place to the supply chain members. This helps in balancing inventory and production capacity available against the uncertain and changing nature of demand. The best Supply Chains aren't just fast and cost-effective, they are also agile and adaptable.

For the given level/set of variables and the supply chain management tools/practices followed, the trade-off between responsiveness and efficiency can normally be plotted as graph A - B - C, as shown in the pictorial below.

- **Supply Chain A** : Higher responsiveness at the cost of lower efficiency
- **Supply Chain C** : Higher Efficiency with lower Responsiveness
- **Supply Chain B** : Moderate level of Responsiveness with moderate Efficiency.



The graphic above shows various Supply Chains as evaluated on two measures: Responsiveness and Inventory Efficiency. It is typically noted that a Supply Chain designed for higher level of Inventory Efficiency is poor in its 'Responsiveness', and vice versa. The success in design of a Supply Chain which is most effective in the given situation, lies in setting up tools and process steps that raise the Supply Chain performance in the direction of B to D to E, as shown above.

The execution of Supply Chain process steps is impacted by unforeseen conditions caused by internal or external factors. In order to ensure the desired level of performance of Supply Chain Operations, it is essential to locate / track such conditions and respond to the same by initiating appropriate corrective actions in time. The timely response of a Supply Chain in identifying potential variations and initiating necessary corrective actions is very important to ensure an improvement in the service level and overall effectiveness of the Supply Chain.

- A Responsive Supply Chain:
  - Enhances Customer Service level and reduces order lead time
  - Gains visibility into supply chain performance metrics
  - Efficiently balances demand and supply to help attain financial targets.

## Approach to 'Respond'

### Deviations encountered while executing a Supply Chain Plan

The Supply Chain typically consists of a network of Nodes or Locations of different categories like:

- Suppliers
- Manufacturing Plants
- Distribution Centers
- Warehouses
- Wholesalers/Retailer Outlets
- End Customers

The Supply Chain is defined with parameters like Capacity, Lead Times and Costs as relevant to individual Nodes on the Supply Chain. The Planning/Control functions across the Supply Chain are designed and set up based on these parameters, and normally function in an integrated manner, to meet the business requirements. However, in real life, certain internal or external factors impact the inputs to these Nodes or Values Definition of the parameters set.

Following are a few examples of such deviations:

- **Changes in Demand:** Unforeseen demand of certain products from customers, cancellation of demand due to changes in the market conditions
- Additional or high priority demand from special customers
- Delay in supplies from suppliers of products or raw material components
- Reduction in availability of production capacity due to breakdowns/rework/quality rejections
- Delayed shipments, transportation issues due to external conditions resulting in delayed delivery of products to the customer.

### Anticipating Deviations and Proactive Impact Evaluation

In order to minimize the impact of unforeseen deviations in external conditions on the effectiveness of the Supply Chain, it is very important to sense and anticipate such changes in advance, and initiate necessary corrective actions in time.

#### 1. Review planning results

Have a look at the outcome of your planning runs and forecasts, and begin to identify any potential problems like stock shortages, capacity overloads, or other bottlenecks.

#### 2. Generate Timely Alerts

Evaluate any deviations observed between planned and actuals of the key figures, and generate alerts to report such exceptions. The alerts could be of different categories like Material Shortages/Capacity Overloads/Delayed Deliveries.

### 3. Increase end-to-end visibility

Any deviation/non-conformance or alert at a Supply Chain node could potentially have an impact on the complete supply chain, also covering other supply chain objects linked with this node. End-to-end visibility across the supply chain facilitates identifying such impact and responding to the same.

### 4. Set up Simulation Scenarios reflecting the anticipation of change in conditions:

Based on your findings from the review of Plan/Forecast in the live system and also based on certain inputs you have received from external sources - which have the potential to impact the Supply Chain planning and execution - you need to evaluate their impact in advance. It is normally not advisable to evaluate this impact by making changes in the live environment. Setting up multiple 'what-if'/simulation scenarios for such evaluation is the right approach. You may make the following changes based on the inputs and indications received for the purpose of evaluating their potential impact:

- **Changes in Demand:** Update the Forecast/Sales Order/Safety Stock Demand elements. Update Priority /Delivery Dates of individual Demand Elements. The priorities could be re-defined by maintaining penalty cost parameters.
- **Changes in Capacity:** Update setting of any Capacity Master which directly impacts/constrains the production output and deliveries to the customer. This covers Capacity of Production/Transportation /Storage resources across the Supply Chain. Define alternative resources/capacities with respective cost parameters.

While setting up and evaluating the Simulation scenarios, it is important to have a trade-off between:

- Fulfillment Cost vs Penalty Cost
- Inventory Carrying Cost/Storage Cost vs Set up Cost/Transportation Cost.

## Initiating necessary corrective actions to minimize the impact

After evaluating the alerts or exceptions encountered and reviewing the results of Simulation runs, also involving concerned stake-holders from the business, the changes can be finalized and activated in the live planning run.

This will facilitate initiating necessary corrective actions in the execution of supply chain operations.

Examples:

- Re-allocation of Products
- Reservation of Production/Storage capacities
- Prioritized Transportation and handling of Shipments
- Resetting Target Stock Levels at different Nodes, across the Supply Chain
- Expedite Deliveries from Suppliers
- Increase Production Capacity (add a Shift/Overtime/Equipment/ etc.)
- Develop an alternative source of Supply
- Explore possibility of using alternate resource/capacity
- Explore usage of 'interchangeable' Products.

These corrective actions are expected to help enhance Customer Service and optimize the overall Supply Chain costs.

## IT Solutions to enhance 'Responsiveness'

The process -steps/guidelines as covered in the previous sections of this White Paper can effectively be implemented only with an IT solution which is designed, set up and implemented considering these process guidelines.

## Evaluating the existing Business Process Conditions/SCM Solution

The SCM solution currently in use can be evaluated for features as listed below. This evaluation will help in identifying the areas of concern and potential enhancements.

<b>SCM Process Features/Performance Indicators</b>	Status in the context of existing business conditions and SCM solution: Evaluation Scale: 0 to 10
Forecast accuracy	
Extent of changes in demand in shorter time horizon	
Criticality of Product Shelf Life/Expiration	
Cost/limitation of Storage Capacity	
Reliability of Supplier Commitments	
Extent of Penalty costs for delayed delivery	
Extent of Penalty costs for non-delivery	
Reliability of the availability of Production Capacity	
Volume of changes in priority of Demands at short notice	
Volume of cancellation in demand at short notice	
Reliability of Transportation Lead Time	
Extent of multiple/alternative sources of supply	
Cost of changing production setups	
Extent of customer-specific customization in the product design	
Scope, extent of running the planning process in simulation	

## Designing a Responsive SCM solution

While designing a SCM solution, making it ‘sense’ the pattern of changing demand situation and ‘foreseeing’ any disturbances in Supply situation will make it more Responsive. It is very important to incorporate these features which help sense demand/supply deviations and trigger necessary corrections in the supply chain process-steps/parameters.

Following is an overview of the features that may be incorporated while designing an SCM solution, covering the Demand Planning, Supply Planning and Supply Chain Collaboration process-steps:

a. **Sensing the changing trend in Demand:**

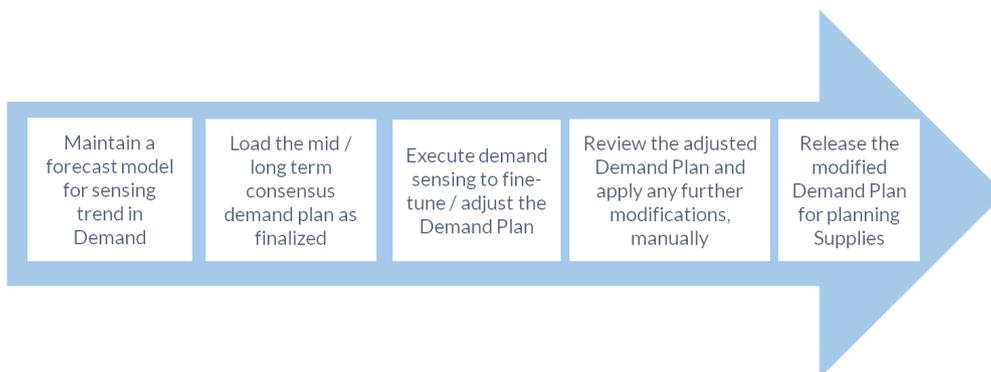
The Sales Forecast/Demand Plan is initially arrived at with statistical forecasting techniques, and reviewed with all concerned stake-holders to reach a consensus. It can further be adjusted and fine-tuned by sensing the pattern of firmed demand in the recent past. This adjustment can be based on algorithms set to sense the trend of Customer Demands/Sales Orders booked in recent past.

- During this phase of ‘Sensing Demand’, the system evaluates the prevailing Demand situation and fine-tunes the same based on the trend of ‘Firmed Demand’ elements (example: Sales Orders, Deliveries) created and updated in the recent past. This helps to ensure the Demand Plan is adjusted to reflect any recent changes in the pattern of Demand.

The Demand Sensing algorithms could be set up to ensure the following:

- Adjust the Forecast Demand based on the forecast bias identified: The system adjusts forecast for the periods in future based on its correlation with the changing pattern of firmed demand in the recent past.
- Adjust the Forecast Demand based on the pattern of Open Firmed Orders: The system adjusts forecast for the periods in future based on the current status of all Open Firmed Orders.
- Disaggregate the Forecast into finer planning buckets: The system disaggregates the Monthly/ Weekly forecast using Weekly/Daily profiles of signals and optimized weightages for finer level of planning buckets.

The pictorial below shows the process of adjusting the Demand Plan by sensing demand patterns.



b. **Optimizing Inventory:**

Inventory is normally maintained to cover for the uncertainties in demand/supply situation. In case of a Supply Chain having multiple levels and nodes, maintaining inventory at every node may result into excessive storage/inventory carrying cost, and still may not ensure desired service level. So it's very important to optimize the inventory levels across the supply chain, in response to the dynamic nature of the demand/supply situation. Inventory optimization determines/adjusts the Inventory plan based on the results of demand sensing process, as executed dynamically. It calculates inventory targets for each product at each location/node in a supply chain, considers and compensates for uncertainties in demand forecasts, supply timing, and supply quantity deviations. The inventory plan serves as an input to the sales and operations planning process, which plans for related Supply elements over and above the Sales/Forecast Demand.

**c. Collaboration across the Supply Chain:**

It is important to have real-time collaboration with all partners across the Supply Chain. This includes key customers and suppliers, along with the internal Manufacturing Plants/Distribution Centers. During the pre ‘Sales and Operations planning’ phase of the process, all the concerned stakeholders representing the business functions of Sales, Finance, Marketing, Production and Demand Planning try to resolve deviations between the constrained supply and consensus demand plan, and agree upon a solution to trigger the supply plan, responding to the dynamic nature of demand situation. This response can be made more effective with real time collaboration across all Supply Chain nodes.

**Evaluating alternative SCM Solution options**

The evaluation of the ‘As Is’ process, as covered above, would highlight the features / parameters that are critical to consider for designing an SCM solution, which is effective and adds value to the prevailing business process conditions.

With this background, the following check-list would help in evaluating multiple options / alternatives of SCM practices / applications under consideration:

The SCM Solution Feature/Functionality	Evaluation Rating on 0 to 10 scale			
	‘As is’ Solution	Solution Option A	Solution Option B	Solution Option C
Incorporation of the significant ‘Sources of Demand’ (example: key Customers) in the Supply Chain Model				
Incorporation of the significant ‘Sources of External Supply’ (example: Vendors, Sub-contractors) in the Supply Chain Model				
Effectiveness of Customer collaboration				
Effectiveness of Vendor collaboration				
Frequency/quality of generating alerts related to the demand situation				
Capability of the Solution to plan Inventory levels at individual Supply Chain Nodes, dynamically and optimally.				
Application features to ‘sense’ trend in the changing demand situation, and applying the same to fine-tune Demand Plan				
Frequency/quality of generating alerts related to the supply situation				
Capability to set up and evaluate multiple simulation scenarios, also with respective cost parameters				
End-to-end visibility of the Supply Chain conditions and demand / supply situation at granular level				

## Conclusion

This White Paper explains the need of making Supply Chains more 'Responsive', in addition to being efficient. It covers an overview of the approach to identify deviations in managing a supply chain and responding to the same, with the objective of minimizing their impact and ensuring desired level of supply chain performance. It is very important to evaluate the business process conditions and the SCM solution currently in use to initiate necessary enhancements. This White Paper provides certain guidelines and checklists that will be helpful in the process of 'system audit' and also while comparing multiple alternatives of SCM Applications. This is expected to facilitate designing and blueprinting of SCM solution, which will improve the supply chain performance, despite any internal/external factors impacting the same.

In summary, if the IT Solutions addressing SCM process requirements are designed/built/evaluated for the features as listed below, the same are expected to help us make Supply Chains more responsive, in addition to being more efficient:

- Demand-driven supply chain planning based on demand sensing, analysis, and predictive forecasting
- Responsive planning with advanced algorithms, optimization, and what-if scenario simulation planning
- Multi-stage inventory optimization at multiple levels of the Supply Chain.

## About the Author



### **Kishore D Kulkarni**

Kishore Kulkarni is a Principal Solution Architect working for the DiSC (Digital Supply Chain) Practice of Bristlecone. He holds a Master's Degree in Industrial Engineering/Operations Management from NITIE (National Institute of Industrial Engineering), India, and has over 30 years of professional experience.

He has about a decade of domain experience in Discrete Manufacturing Industry, followed by more than two decades of experience in design, configuration, implementation, management of cross-functional enterprise solutions, globally. He specializes in SAP SCM (Supply Chain Management) and ERP (Logistics) functions as relevant across Industry Verticals. Kishore has been an effective 'hands-on' leader who has worn different hats in his professional life from being a Functional Consultant and Solution Architect to donning the roles of Delivery Manager and Competency Manager.

He enjoys reading, travelling and spending time with his family, when he gets time from his busy work schedule.

## About Bristlecone

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