



## An integrated approach to global capacity management for automotive manufacturers

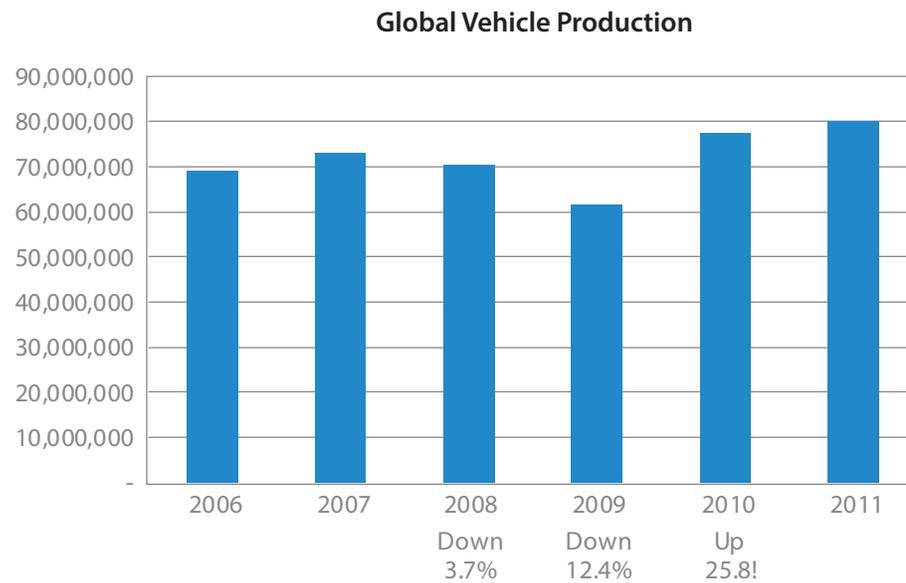
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To compete effectively, automotive and industrial equipment manufacturers must develop strong capacity management competency on a global basis. See which characteristics of an effective global capacity management platform can boost competitive advantage, increase revenue and sustain market share.

Global automotive and industrial equipment manufacturers face an unprecedented challenge today as they strive to align supply with projected demand across their worldwide operations. They are experiencing the conditions of a perfect storm (in a supply chain management sense) — significantly increasing yet uneven global demand, constrained supply, and the globalization of the supply chain.

### **Growing, uneven demand**

The economic downturn of 2008 hit global manufacturers and their suppliers very hard. Many went out of business and those that didn't, batted down the hatches to try to ride out the storm. However, almost as quickly as the economic storm swept in, it abated, resulting in a rapid spike in demand in 2010 and beyond. But as would be expected, the increase in demand is not occurring evenly around the world — some regions such as BRIC countries (Brazil, Russia, India and China) are experiencing unprecedented growth, yet for other regions, demand remains relatively flat. As a result, the required capacity footprint by region may differ significantly from the capacity available within that region.



Source: Based on 2011 data from [OICA \(The International Organization of Motor Vehicle Manufacturers\)](#)

### **Constrained supply**

And while the global economy has recovered to a large degree, the aftershocks are still being felt. During the downturn, many suppliers went bankrupt and those that survived streamlined their organization and reduced capacities. Even though demand has rebounded, suppliers today are more risk averse and have been reluctant to increase capacities to keep pace with growing demand. In addition, capital markets remain tight, making it more difficult for suppliers to increase capacities. As a result, global supply is now severely constrained and relatively inelastic.

### **Global platforms**

Increasingly, global automotive and industrial equipment OEMs are utilizing a common global platform across multiple regions and models. As a result, it is more and more common for components sourced in one region to be utilized in another region for assembly. To be effective, capacity must be managed on a global basis, requiring a global aggregate view of demand and supply.

Unfortunately for most large global manufacturers, their processes and systems aren't able to meet this challenge. Their supply chain continues to get more complex, but currently planned and managed by disparate regional systems. These silos of information make it impossible to plan and manage their global supply chain dynamically in response to updated demand forecasts and capacity constraints. And those that leverage optimization-based planning systems on a local level are finding that this approach is not feasible at the global level.

Global capacity management has become a critical business competency and the implications of not doing it well can be harsh. Ineffective processes take too long, are labor intensive, and do not yield accurate and timely results. Protracted planning cycles and an inability to respond quickly to changes in demand and supply result in misalignment, raising costs and negatively impacting revenue and market share.

*Globalization of the supply chain, constrained supply and uneven demand necessitate that global manufacturers align capacity with projected demand on a global basis.*

Yet despite these challenges, or perhaps because of them, a best-in-class global capacity management process will result in competitive advantage. This paper will outline:

- ▶ An integrated approach to global capacity management that incorporates capacity planning, capacity monitoring, and constraint management to address both global and regional requirements
- ▶ Key characteristics of a global planning, monitoring, and response platform that will enable this to be done effectively

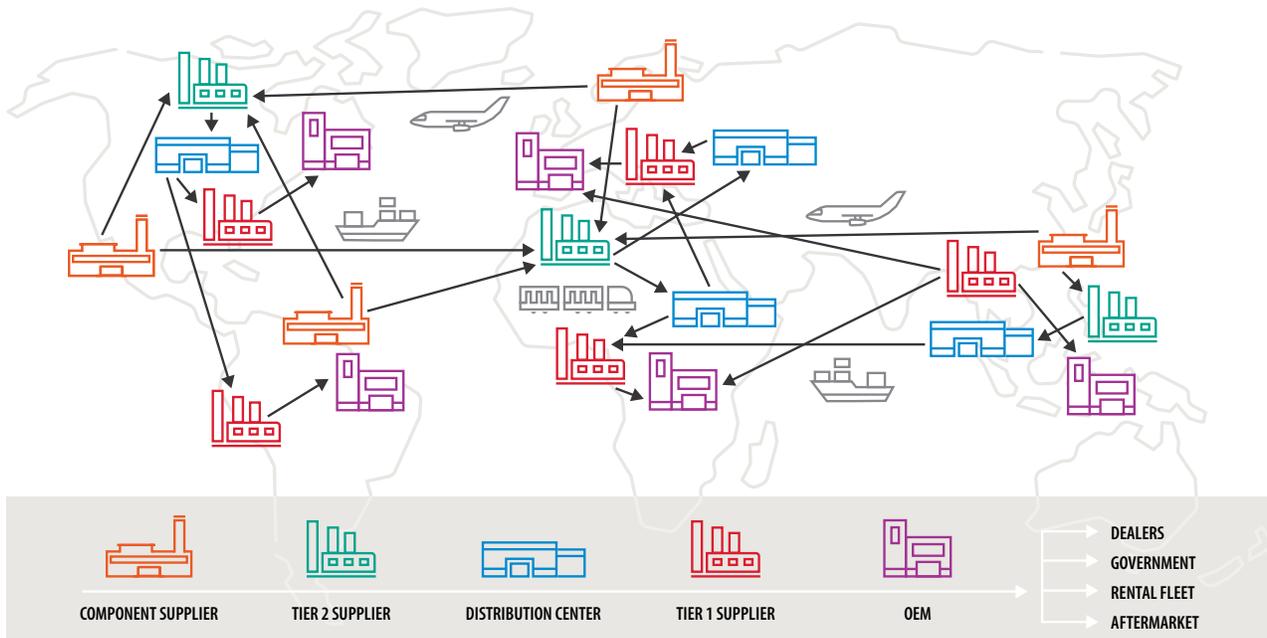
## The challenge of capacity planning on a global basis

It has always been a challenge to effectively align supply with demand. But for large global automotive and industrial equipment manufacturers, capacity planning has become even more daunting.

### Complex supply chain

These global OEMs have complex, global supply chain networks comprised of fulfillment sites, distribution centers, assembly facilities, warehouses, and multiple tiers of supply — and many of the interconnected nodes are on different continents. The number of pathways in this worldwide network is staggering and the distances and time-zones involved present a significant hurdle for planning, collaboration and global supply chain management.

**Representative global supply chain – Multi-product, multi-source, multi segment**



## Complex products

By their nature, the products these companies manufacture are also complex and comprised of many sub-assemblies and components leading to large and often deep, variant bills of material (BOMs). But even more significantly, these products typically have many models, trims, options, and packages with complex and cascading rules to determine required components in an order-specific bill of material.

To accurately model demand and supply at the global level, these manufacturers need to plan capacity first at the aggregate level, and then ultimately at the configured product level. Planning at this level of detail can involve millions of demand records and require massive computational power. As a result, some global manufacturers plan only at the aggregate level or use approximation models - but neither of these approaches yields sufficient accuracy, impacting the quality of decision-making.

## Common barriers to effective global capacity management

Indeed the challenge of managing a complex global supply chain for a complex product line is formidable. Yet today's global planning processes tend to share a number of characteristics that contribute to their ineffectiveness.

### Silos of information

The planning processes and systems of most global manufacturers still tend to be organized on a regional basis. For example, North America, South America, Europe, and APAC have typically each been responsible to plan capacity and supply to meet demand within their region, leveraging their own supply base. Even where global purchase agreements exist, each region has tended to plan its supply independently. This creates artificial boundaries and handoffs, resulting in lack of global visibility to the statement of demand and supply.

Even within regions and certainly at the global level, demand planning, supply planning, and financial planning may leverage separate, non-integrated systems. Unless the information within these systems of record is integrated into one common platform, it is not possible to clearly understand the implications of increasing demand, modifying inventory policies, or adjusting supply and tooling constraints.

And having "multiple versions of the truth" leads to significant data integrity and credibility issues as planning process participants try to understand the information they are looking at and determine which data is correct.

### Rigid, sequential process

While it is great to have a regular planning cadence for demand and supply planning, it is not sufficient. If these disciplines are only performed on a fixed schedule and in series, the best alignment of demand and supply cannot be achieved. A rigid, unidirectional process is wholly unable to respond to sudden and unexpected changes in demand and supply.

### Planning in isolation

For the most part, planning still tends to be done utilizing spreadsheets or stand-alone planning systems and is often disconnected from execution and performance management systems. This makes it practically impossible to connect the dots between the planned future, present reality, and historical performance.

*Some global manufacturers plan only at the aggregate level or use approximation models — but neither of these approaches yields sufficient accuracy, impacting the quality of decision-making.*

## Business impact of ineffective global capacity management

The global automotive and industrial equipment markets are extremely competitive and effective capacity management is fundamental to their long-term success. The primary objective of global capacity management is to effectively and continually align supply to stated future demand — manufacturers that do not have effective processes and systems in place to do so are at a significant disadvantage. They likely are (or soon will be) feeling the impact in the following areas:

## **Stress**

Supply chain planners and their executives know they are accountable for the business impact of the plans they create. Most are bright, capable people who want to do their job well. But their role can lead to significant stress when they don't have the tools needed to be effective, need to work excessive over-time to make up for inherent process inefficiencies, and are under the gun to produce an accurate plan, now! These high levels of stress are not sustainable over the long term.

## **Inefficiency**

Managing separate processes and systems, importing/exporting data from system to system, reconciling discrepancies between systems and models, and trying to create one integrated, unified view from many sources adds significantly to the non-value added planning effort and increases overhead costs.

## **Non-responsiveness**

An ineffective capacity management process also leads to protracted planning cycles that can take a full month or longer to complete. When a significant change occurs in demand or supply, decisions are needed in days or even hours. If the planning cycle takes too long, that decision will either be delayed until the next planning cycle, or made prematurely, before the alternatives have been explored and the implications understood. In either case, opportunities to better align supply with demand are missed, impacting both the top-line and bottom-line.

*In today's world of constrained supply, executives need to make tough decisions about how scarce supply will be utilized. If they are not able to understand the tradeoffs involved in various supply allocation scenarios, the resulting decisions will be less than optimal.*

## **Higher COGS, inventory**

Misaligned supply and demand (failing to have the right parts available in the right place at the right time) ultimately results in increased expediting and premium shipping charges. It typically also leads to higher inventory levels, tying up scarce capital and, down the road, higher obsolescence charges.

## **Lost revenues, market share**

Ultimately, not having enough product to meet available demand will result in a loss of revenue and market share. Customers that are not able to take delivery of their preferred product at their desired time and location will seek to purchase it from another manufacturer. Furthermore, in today's world of constrained supply, executives need to make tough decisions about how scarce supply will be utilized, determining which demands (for which models in which markets) will be satisfied and which demands will remain under supplied. If they are not able to understand the tradeoffs involved in various supply allocation scenarios, the resulting decisions will likely be less than optimal.

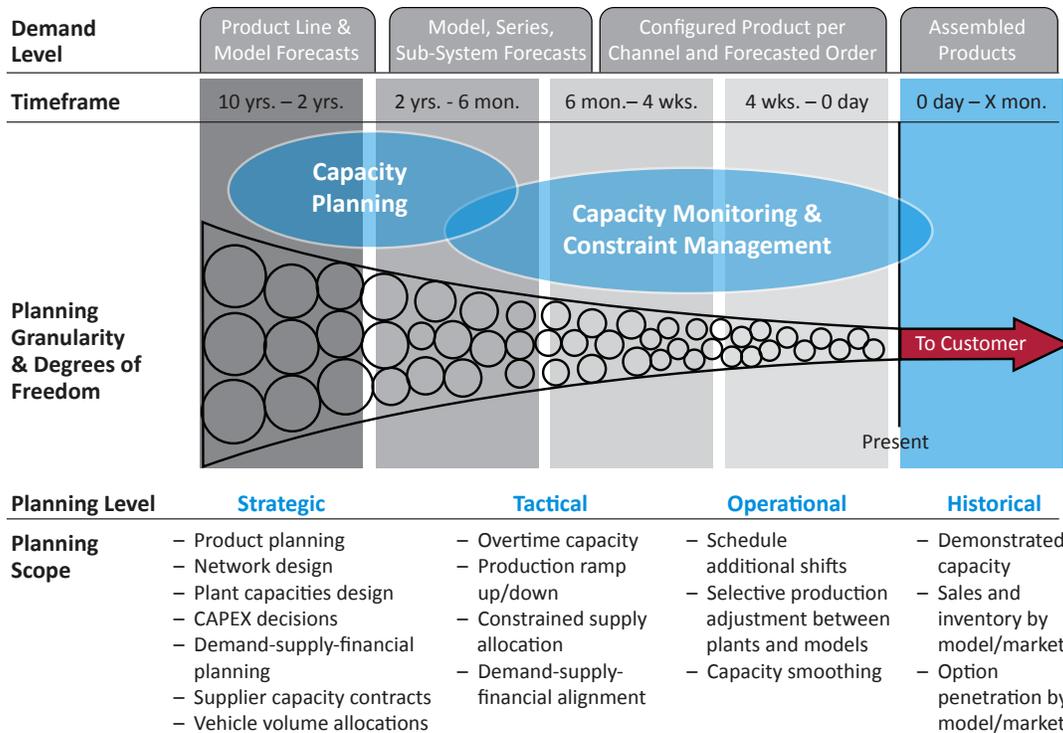
## **A model for global capacity management**

The characteristics of the global supply chain that make effective capacity management difficult for large global manufacturers (complexity, growing demand, constrained supply, global platforms) are not likely to be simplified going forward — in fact, it is likely that the supply chain will become even more complex over time. To meet these challenges and operate effectively and profitably, most manufacturers will need to implement a fundamentally new global capacity management process.

Global capacity management strives to continuously align supply capacity with projected demand across the full planning horizon, from today's shippable product all the way out to four or more years into the future. It incorporates capacity planning, capacity monitoring, and constraint management. As the time horizon gets closer to the present, the planning granularity increases and the degrees of freedom decrease. To be effective and efficient, the transition from macro to micro planning must be smooth, involving collaboration and iteration.

## Capacity planning

Capacity planning is focused on the mid to long term horizon (e.g. 6 months out to 4 years or more) incorporating elements of both strategic and tactical planning. It is in the capacity planning phase that the capacity footprint can be adjusted. It is also a key input into supply network design and decisions regarding new plant construction and tooling investments.



### Global capacity management across the time horizon

Capacity planning begins by determining the capacity required to satisfy projected future demand:

- ▶ For existing products, and planned new products
- ▶ In existing markets, and planned new markets
- ▶ Through existing channels, and planned new channels
- ▶ At the product line, model and trim level initially, and then dropping down a level to include sub-systems

The next step in capacity planning is to explore what capacity will be available in existing production and assembly facilities and from existing suppliers, taking into account known constraints. In the event that supply is not sufficient to meet demand, alternatives to increase capacity need to be explored such as capital expenditures (CAPEX), additional suppliers, new sourcing contracts, or increased production (additional shifts, lines, or headcount).

In the event that planned supply is not sufficient to meet projected future demand, tradeoffs must be made to allocate the constrained supply to the highest priority demand. In order to effectively synchronize demand and supply, rough cut planning is required which can comprehend the entire supply chain network and provide quick “what-if” capabilities to provide directionally correct answers.

For large automotive and industrial manufacturers, this process has a worldwide focus - products can now be sold anywhere, built anywhere, and sourced anywhere. As a result, capacity planning is no longer primarily a regional activity. That said, regions must contribute to and collaborate within the global planning process and then must refine and expand upon the planning detail within their region.

## Capacity monitoring

Capacity monitoring is focused on the present to mid-term horizon (e.g. from now to 6 to 12 months into the future), where the capacity footprint is largely fixed. During this phase, demand must be disaggregated into greater levels of granularity, ultimately down to the configured product level based on channel orders and detailed forecasts. During this phase, the focus is on monitoring for changes in demand, supply, and capacity and working to align and allocate supply to the greatest degree possible.

Capacity monitoring is focused on monitoring for changes and variances in the plan:

- ▶ Changes in demand
- ▶ Changes in capacity and planned supplies
- ▶ Inventory variances to plan
- ▶ Misalignments of planned supply to demand
- ▶ Variances to projected business performance

*In order to effectively synchronize demand and supply, rough cut planning and quick “what-if” capabilities are required to provide directionally correct answers.*

## Constraint management

Constraint management is also focused on the present to mid-term horizon (e.g. from now to 6 to 12 months into the future) with the goal of managing available capacity as effectively as possible and responding to misalignments and unplanned events by:

- ▶ Refining supply allocations
- ▶ Refining production and supplier schedules
- ▶ Expediting in-bound or out-bound shipping
- ▶ Utilizing alternate suppliers or components if feasible
- ▶ Adjusting the inventory plan
- ▶ Refining capacity (shifts, headcount, or overtime)

It also includes reviewing the recent past to gain an understanding of demonstrated capacity as well as sales, inventory, and option penetration by model and market. This critical information is utilized to refine the capacity planning model.

To be effective, global capacity management must include the following characteristics:

### Seamless transition

There needs to be a seamless transition from long-range “volume” planning through mid-range “mix” planning, and then through near-term production and supplier scheduling. The artificial boundaries and hand-offs between each layer of planning need to be eliminated.

### On-demand

While there needs to be a regular cadence to the planning process, it must be streamlined and flexible enough to be leveraged on demand to support event-driven response. This agility is required to resolve misalignment in the supply-demand balance and to respond to unplanned disruptions (some of which will likely be major such as the tsunami in Japan that instantly took many sources of supply off-line).

### Bi-directional and iterative

Capacity planning begins with determining the capacity required to satisfy projected demand. But when capacity is not sufficient to meet all projected demands, there needs to be back and forth dialog and collaboration to refine the demand plan and determine how best to allocate scarce supply. This should be iterative as consensus regarding the best way forward takes shape.

### Planning, monitoring, and response

Capacity management must include not only planning, but also monitoring for misalignment and unplanned events (impacting both short term and long term plans), and then determining the best response given the circumstances.

## Characteristics of a global capacity management platform

Global capacity management is primarily being “powered” by spreadsheets which attempt to unify and model the output of demand planning, order management, supply planning and ERP systems. But this quickly becomes unwieldy, inefficient, and error-prone — it cannot enable global planners to align global capacity to dynamically changing demands across multiple markets. Implementing a best-in-class global capacity management process requires a global capacity management platform.

### Single, global platform

First and foremost, the global capacity management platform must be a single system that models the entire integrated supply chain at the aggregate level (model, trim) and down the product hierarchy (sub-system, configured product with sub-assembly and component). It must incorporate all viable product configurations, all demand (configured orders as well as forecast with projected take rates), all supply (inventory, capacity and constraints), and associated financial projections (revenue, cost, margin, inventory \$).

In order to be a fully integrated platform, it should also support other key planning and execution elements such as demand planning, sales and operations planning (S&OP), master production scheduling, material planning, and supplier collaboration.

The global capacity management platform should include the following characteristics:

- ▶ **System integration** - It will likely be the case that the authoritative data required for global capacity management exists within an organization's ERP system and perhaps various point solutions as well (e.g. demand planning). And these systems may vary from region to region. The global capacity management platform must seamlessly incorporate this information as well as close the loop back to the execution systems with updated plans.
- ▶ **Data integrity** - By pulling authoritative data from the system of record, data integrity of the global capacity management system can be assured. There is only one version of the data and any updates to that data will be reflected in the planning system.
- ▶ **Scalability** - As already mentioned, the scale of the data required to model a global multi-tier supply chain is enormous and the computing power required to explode demand and net requirements across the global integrated supply chain is considerable. Yet this is what is required to manage global capacity effectively – an aggregate or approximate model is not sufficient.
- ▶ **Configurability** - Since no two global manufacturers have the same requirements and processes, the platform must be configurable to support current processes and user preferences. This includes planning rules, views, workflow, and reports. This configurability will also enable the system and processes to evolve over time without customizations.

*Implementing a best-in-class global capacity management process requires a global capacity management technology platform.*

- ▶ **Extensibility** - Related to this, the platform should support the creation of extensions to automate, streamline, and integrate with existing systems and processes (for example, leveraging an integration based upon open standards and a service-oriented-architecture).
- ▶ **Simplicity** - Given the above this may sound unlikely — but this system cannot take years to implement and be only utilized by PhDs. It must be deployed in months, be utilized by senior planners, and provide insight to managers and executives.

### Enabling competencies of global capacity management

- ▶ New program planning
- ▶ Demand consolidation and normalization
- ▶ Option demand management
- ▶ Global demand review
- ▶ Multi-tiered component planning
- ▶ Global supply review
- ▶ Demand-supply-capacity balancing
- ▶ Supplier collaboration
- ▶ Financial analysis and reconciliation

## **Simulation**

Having complete visibility to global demand and supply in one platform is a significant achievement. But the real power of a global capacity management platform is experienced when different demand and supply scenarios can be tested, evaluated and compared, often referred to as “what-if analysis”. This enables planners to understand what the capacity requirements are for various demand scenarios or what the impact of a proposed change is. It can also enable them to determine where capacity is projected to be overloaded and what impact firm constraints will have on the achievable fulfillment plan. By presenting views containing both units and currency, the simulation output can be leveraged within the business planning process.

## **Speed**

In order to be leveraged on-demand, bi-directionally, and iteratively, the platform must be able to run through the netting and explosion algorithms for the entire supply chain in near-real-time (ideally seconds, perhaps minutes, but not hours or days). Given this, the optimization approach is not feasible – it just takes too long. And while simplifying the optimization model can increase the speed, approximations render the output noncredible.

## **Collaboration**

The global capacity platform must also enable the members of the global and regional planning teams to come together to work collaboratively through the planning process and iterate their way towards an updated plan. They should also be able to work together to respond quickly and effectively to unplanned events, making viable and vetted decisions.

## **Visibility**

Gaining a holistic view of the multi-tiered, global supply chain is often cited by supply chain executives as one of their most pressing challenges. Indeed, providing visibility to planned and current demand, inventory, capacity, constraints, and supply at any desired level of the product hierarchy is a fundamental building block of a global capacity management system. Such a system should also provide summarized views and dashboards depicting the current plan, performance to plan, and the financial implications of the plan. Timely visibility provides the opportunity for action.

## **Alerting**

Alerting is a more advanced and intelligent form of supply chain visibility. The global capacity management platform should detect and notify planners and managers when reality is not unfolding according to plan. In fact, the alerting mechanism should incorporate an awareness of not only the exception triggering the alert, but more importantly, the implications of the exception. This enables the highest priority risks to be actioned first.

*The power of a global capacity management platform is experienced when multiple demand and supply scenarios can be tested, compared, and shared quickly to make viable, vetted decisions.*

## **Conclusion**

To compete effectively, global automotive and industrial equipment manufacturers must develop a competence in capacity management on a global basis. The complexity and characteristics of their supply chain make this very difficult and the barriers to improvement are real and significant. And yet the need is greater than ever.

By implementing an integrated global capacity management process that seamlessly spans the planning horizon and incorporates capacity planning, capacity monitoring, and constraint management, global manufacturers can gain competitive advantage, increase revenues, and sustain market share.

Global capacity management must include a regular planning cadence yet be flexible and responsive enough to update the capacity plan when needed — this process must be bi-directional, iterative, and collaborative. Yet planning is only one of three foundational elements — effective global capacity management must also incorporate monitoring and response.

Global capacity management must be powered by a single integrated platform that models and provides visibility into the entire multi-tiered supply chain. It must support rapid simulation of various plans and alternative approaches, enabling the players involved in the planning process to collaborate effectively together to develop and update the global capacity plan. And it must alert appropriate participants when significant misalignment or unplanned events occur that impact the achievability of the plan.

Spreadsheets are not able to effectively support this kind of a process. Neither are ERP systems, optimization and traditional APS engines, or rough-cut approximation models. It requires ground-breaking technology to power a best-in-class global capacity management process.



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## About Kinaxis Inc.

Offering the industry's only concurrent planning solution, Kinaxis helps organizations around the world revolutionize their supply chain planning. Kinaxis RapidResponse, our cloud-based supply chain management software, connects your data, processes and people into a single harmonious environment. With a consolidated view of the entire supply chain, you can plan expected performance, monitor progress and respond to disconnects when reality hits. RapidResponse lets you know sooner and act faster, leading to reduced decision latency, and improved operational and financial performance. We can prove it. From implementation to expansion, we're here to help our customers with every step of their supply chain journey.

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