Hype Cycle for Supply Chain Planning Technologies, 2020

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Supply chain technology leaders can use this Hype Cycle to help transform their supply chain planning. It gives guidance into the maturity and viability of various capabilities and underlying technologies that will be used to transform the way planning decisions will be made in the future.

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What You Need to Know

This 2020 Hype Cycle focuses on supply chain planning (SCP) technologies — those required to support planning decision making at all levels of the supply chain. It covers key capabilities, frameworks and technologies that enable companies to make more-effective and higher-quality planning decisions. It includes more mature planning solutions, as well as emerging technologies, to help illustrate what next-generation SCP landscapes could look like.

SCP is a well-established technology market, but SCP is being redefined by drivers such as digitization, supply chain disruptions and volatility. In response, companies are faced with a multitude of challenges, such as exploding data volumes, low planner productivity, uncertainty, highly dynamic environments and new competition. Leaders are reimagining how they make planning decisions so they can capitalize on these opportunities and challenges. Next-generation SCP is being sculptured by the technologies on the left of this Hype Cycle. Those on the right are supporting a more traditional, steady-state approach to planning.

The Hype Cycle

Traditionally, in SCP, as in most other areas, process trumps technology. A company designed its business process and then looked for technology to enable it. The evolution of technology, therefore, followed process evolution. Technology now trumps process. A company cannot evolve its processes fast enough to take full advantage of the new technologies. Leading companies are in full swing to digitize their SCP, and this is opening up opportunities they didn't think about initially. With well-thought-out digital planning technology initiatives, these companies get to innovate their planning on an almost continual basis. This is important because it helps them to compete better by:

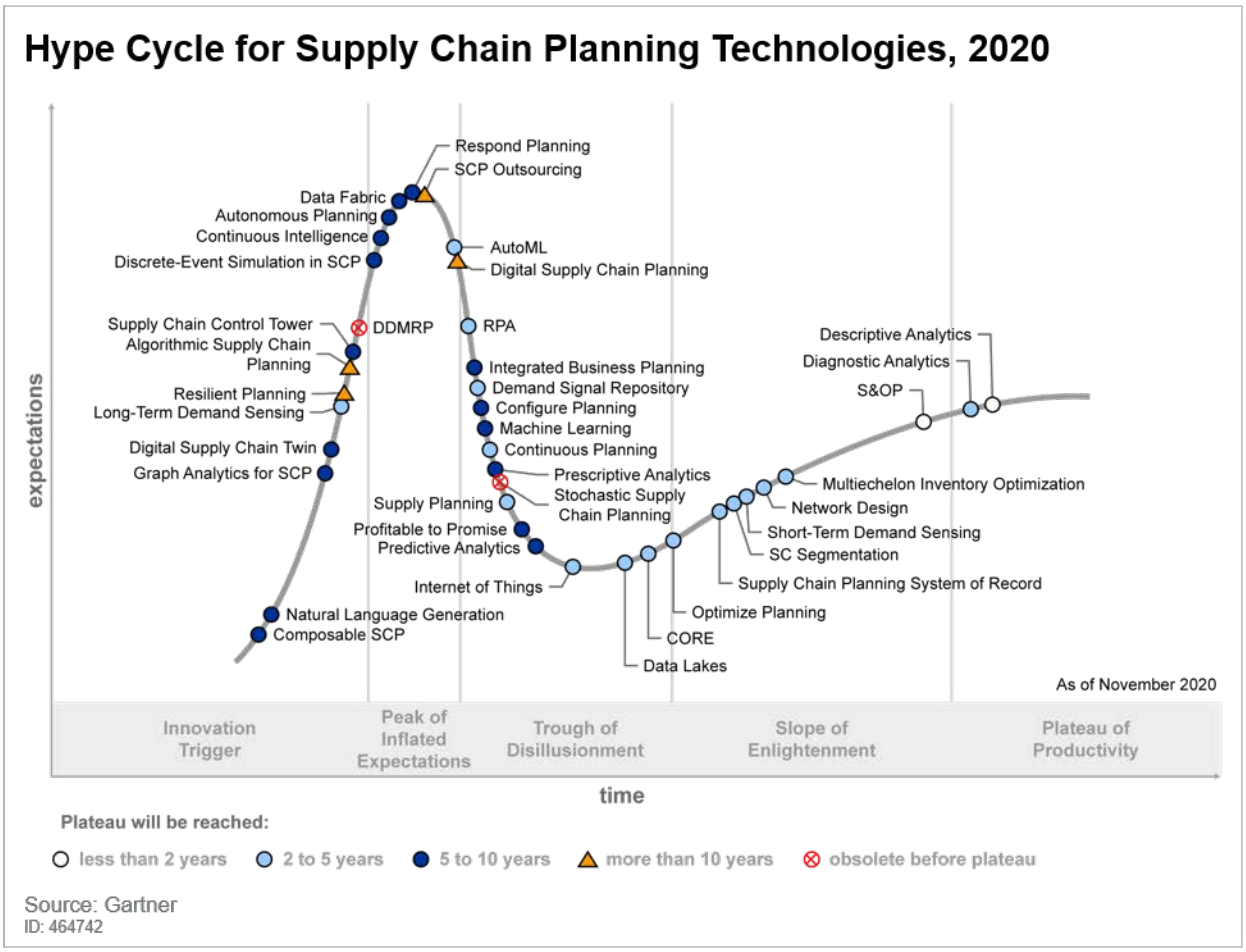
- Improving decision making in global supply chains and across ecosystems — especially with constrained resources
- Planning new and innovative ways to serve customers

- Driving higher planner productivity through decision automation
- Developing new insights and value from exponentially growing data volumes and types (including taking advantage of new data sources)
- Balancing speed, responsiveness, agility, and resiliency with cost and efficiency
- Aligning planning decisions horizontally and vertically across a supply chain ecosystem to ensure compliance with corporate goals
- Experimenting with new planning paradigms to generate further business value

A company's journey to digital planning must include acquiring and assembling the necessary technology to satisfy these needs. However, the SCP technology market is changing. The last two to three years have seen an explosion in hype around artificial intelligence (AI) and machine learning (ML) in planning, for example. New technologies are being applied to SCP, and new entrants are trying to disrupt what had been a stable and mature market. These innovations are represented in this Hype Cycle.

To have a competitive advantage in SCP, a company must figure out how to embrace these innovations into their SCP roadmap — the left-hand side of this Hype Cycle (see Figure 1). Those with a more risk-averse approach to new technologies should focus more on the right side, but be aware that this is not competitive advantage territory for many industries.

Figure 1. Hype Cycle for Supply Chain Planning Technologies, 2020



Source: Gartner
ID: 464742

The Priority Matrix

When considering SCP investments, companies should relate potential investments to their overall supply chain strategy. Prioritize investments to the role and maturity-level needs of SCP within that strategy (see Figure 2).

Companies at the lowest level of planning maturity will be using and acquiring technologies that have exited the far right of this Hype Cycle, such as basic demand planning, replenishment planning and ERP-based planning. Companies looking for incremental improvements in planning decision quality (Stage 2 maturity) will be mainly focused on the right side of this Hype Cycle. Those looking to integrate their planning should be thinking about capabilities in the middle of the Hype Cycle. Leading companies should be experimenting with the technologies on the left side in areas such as digital supply chain twins, resilient planning and composable SCP.

Technologies that offer moderate or high business benefit to SCP, which may plateau within the next two to five years, focus mainly on traditional SCP. Examples of these include demand sensing and

demand signal repository, data lakes, multiechelon inventory optimization, and optimize planning. Support for segmented SCP and the use and speed of processing big data across the supply chain also contribute to the utility of some of these solutions. The application of these technologies can kick-start a change in the nature of planning decision making through the use of more decision-grade data and advanced analytics.

Technologies forecast to plateau in five to 10 years enhance and transform planning decision-making quality through the application of automated predictive and prescriptive analytics (AI/ML). The convergence of near-real-time planning decisions and execution visibility (CORE) is enabled through the digital supply chain twin, respond planning, machine learning and IoT, for example. Ultimately, these various emerging SCP technologies will coalesce into what Gartner calls algorithmic SCP (that may be also architected to be composable in nature) and will eventually enable new planning paradigms such as resilient planning.

The majority of the technologies represented on the left side of this Hype Cycle represent the key building blocks for next-generation SCP — for example, digital supply chain twin, continuous intelligence, composable SCP and resilient planning.

Figure 2. Priority Matrix for Supply Chain Planning Technologies, 2020

Priority Matrix for Supply Chain Planning Technologies, 2020

benefit	years to mainstream adoption			
	less than two years	two to five years	five to 10 years	more than 10 years
transformational		Internet of Things	Continuous Intelligence Data Fabric Digital Supply Chain Twin Graph Analytics for SCP Integrated Business Planning Machine Learning	Algorithmic Supply Chain Planning Digital Supply Chain Planning Resilient Planning
high		AutoML Continuous Planning CORE Demand Signal Repository Long-Term Demand Sensing Multiechelon Inventory Optimization Network Design Optimize Planning SC Segmentation Short-Term Demand Sensing Supply Chain Planning System of Record Supply Planning	Autonomous Planning Composable SCP Configure Planning Discrete-Event Simulation in SCP Predictive Analytics Prescriptive Analytics Profitable to Promise Respond Planning Supply Chain Control Tower	
moderate	Descriptive Analytics S&OP	Data Lakes Diagnostic Analytics RPA	Natural Language Generation	SCP Outsourcing
low				

As of November 2020

Source: Gartner
ID: 464742

Off the Hype Cycle

The innovations selected for this Hype Cycle are constantly reviewed to try to best reflect those that will have the greatest influence on the SCP solutions of the future.

Several innovation were retired from this Hype Cycle:

- Cognitive Computing — A confusing term used for multiple different capabilities
- Distributed Order Management — Too focused on execution and retail
- Supply Chain Convergence — Too focused on execution and also covered by CORE
- Supply Chain Visibility — Inherent in SCP system of record and supply chain control tower

Other changes to this Hype Cycle include the addition of:

- Data Fabric
- Composable SCP
- Graph Analytics for SCP

On the Rise

Composable SCP

Analysis By: Tim Payne

Definition: Composable supply chain planning designs its business models, technology architecture, data management and integration, and partnership ecosystems in a modular manner. This is done to enable an SCP technology landscape that can be rapidly and safely changed and recomposed at any moment of need.

Position and Adoption Speed Justification: The core principles of the composable enterprise — modularity, efficiency, continuous improvement and adaptive innovation — are familiar to most organizations and have begun to be talked about in various application areas, such as ERP. But these are typically large application footprints where business processes could be enabled by fairly large components being brought together appropriately.

In SCP we have a more tightly focused application area — but the notion of composability will become highly relevant. For a couple of years now, Gartner has been seeing the very initial signs that the SCP technology market is changing. Currently, the market has discrete planning solutions that tightly bundle data, data model and predictive analytics together into a single application to facilitate supply chain planning. This will change to a technology market where users can source data, data model and analytics (both predictive and prescriptive) from a variety of different sources into an environment that enables their supply chain planning. This change means that users can easily incorporate different and changing data sources into their planning; they can create a single data model (aka digital supply chain twin) from that data to drive decision alignment. It also means

they can easily plug in the most appropriate planning analytics to create and manage the various plans, all run off the digital supply chain twin.

The move to composable SCP will be driven by companies' desire to digitalize their planning and eventually achieve Stage 5 planning maturity — both characterized by agility and innovation. Therefore, it will be, to some extent, tied to these initiatives in a company. The challenge to achieving consistent benefits of composable SCP is not any one particular investment, but the essential underlying requirement for the pervasive practice of "composable enterprise thinking." This fundamentally cultural change — from the rigidity of the familiar supply chain structures to the elasticity of active continuous change — is the most significant barrier to achieving the benefits of composable supply chain.

User Advice: Supply chain leaders guiding their organizations in the process of digital transformation should:

- Devise an SCP technology strategy that includes the hallmarks of composable SCP — or lose the ability to adapt and gain effectiveness in your SCP. Therefore, reimagine your SCP to align with the emerging generation of applications, architectures and technologies. The old monolithic SCP mindset and practices must go away.
- Ensure that this strategy covers the acquisition and management of data and the association of that data into a meaningful digital supply chain twin. Also ensure that it has the ability to plug and play configurable predictive and prescriptive analytics from a variety of sources into that twin.
- Don't limit your thinking to just traditional SCP resources such as materials and machines. Eventually, all constrained resources (e.g., people, finance, space, GHG, transportation) will need to be included to ensure that feasible plans are created.
- Invest in enabling technologies along your SCP journey — data integration and management capabilities, digital supply chain twin, AI, low-code/no-code development, API, event management, open data, and analytics ecosystems must all be part of a composable SCP strategy.

Business Impact: Organizations that adopt the model of composable SCP in their business, technology and culture achieve a new level of resiliency and a transformative access to planning decision innovation. They move from the rigid and inefficient traditional norm of hierarchical and siloed thinking, to the active agility of a composable planning experience. Such an organization assembles (integrates) its planning decision-making experiences from internal and external ecosystems of components (called "packaged business capabilities" that can cover data and/or analytics) to empower their organization to actively track and support the specific (and dynamic) requirements of its users and supply chain.

Benefit Rating: High

Market Penetration: Less than 1% of target audience

Maturity: Embryonic

Recommended Reading: "Future of Applications: Delivering the Composable Enterprise"

"Application Leaders: Master Composable Enterprise Thinking for Your Post-COVID-19 Reset"

"2020 Strategic Roadmap for the Future of Applications"

"Innovation Insight for Packaged Business Capabilities and Their Role in the Future Composable Enterprise"

"Predicts 2020: Application Leaders"

Natural Language Generation

Analysis By: Noha Tohamy

Definition: Natural language generation (NLG) automatically creates linguistically rich description of insights found in data. Within the analytics context, the narrative changes dynamically as the user interacts with data to explain key findings or the meaning of a chart or dashboard. NLG combines natural language processing with machine learning and artificial intelligence to dynamically identify the most relevant insights and context in data (trends, relationships, correlations).

Position and Adoption Speed Justification: Although still in the early stages of adoption, NLG can be used effectively to reduce the time and cost of interacting with supply chain analytics technologies. Use cases for interacting with supply chain users through NLG range from quickly identifying supplier risk exposure and sharing trends in supply chain performance to recommending inventory repositioning.

The combination of NLG with advanced analytics and machine learning is one of the most promising applications to support data-driven decision making. This is because, while advanced analytics and machine learning can enable better decisions and automate actions, many users have yet to develop their technical and analytical skills to interpret and act upon generated insights. With NLG, users can interact with these technologies in more intuitive ways.

With the addition of NLG, analytics solutions can automatically generate a written or spoken context-based narrative of findings in the data. Integration of NLG with analytics and BI solutions and virtual personal assistants — such as Amazon's Alexa, Apple's Siri, or Google Assistant for conversational analytics — will further drive adoption.

The adoption of NLG in supply chain is in its infancy. As supply chain organizations continue to rely on advanced analytics and machine learning, the demand for NLG will grow. The need for supply chain users to synthesize data, seek recommendations and make decisions in dynamic environments quickly will drive further adoption. The ability of the user to pose their queries and receive insights in spoken or written natural language promises an easier, more intuitive approach to relying on advanced analytics in decision making.

User Advice: Supply chain leaders should:

- Investigate the use of NLG as part of new supply chain analytics and ML initiatives.

- Monitor NLG capabilities for different supply chain use cases to account for their ability to be trained and perform in a supply-chain-specific context with the appropriate jargon and tone.
- Monitor the NLG capabilities and roadmaps from vendors that offer embedded analytics as part of their supply chain management suites.
- Be aware of a solution's maturity, particularly in terms of data integration and preparation requirements.
- Understand the platform's self-learning capabilities, upfront setup and configuration required, the range of languages supported, the extent and accuracy of narration.
- Understand potential drawbacks relating to multilingual user scenarios, as NLG requires specific libraries for each language in use.
- Recognize that NLG could be attractive to organizations to comply with the Americans with Disabilities Act (in the U.S.) and similar mandates in other countries.

Business Impact: NLG offers analytics-generated insights to the business users in a more intuitive way, without the need for technical or analytics background. As such, it expands the adoption of analytics-based solution, which in turn allows organizations achieve higher return on their investments in analytics. NLG provides the user with context-specific insights that can be readily used in their decision making.

Context-specific narration will reinforce mobile BI use cases, where a lack of screen space is a major impediment to information consumption.

Benefit Rating: Moderate

Market Penetration: 1% to 5% of target audience

Maturity: Embryonic

Sample Vendors: Narrative Science; Salesforce (BeyondCore); SAS Visual Analytics; Yseop

Recommended Reading: "Magic Quadrant for Analytics and Business Intelligence Platforms"

"Top 10 Data and Analytics Technology Trends That Will Change Your Business"

Graph Analytics for SCP

Analysis By: Pia Orup Lund; Mark Beyer

Definition: Graph analytics techniques allow for the exploration of relationships between entities such as organizations, plants, people, business partners and transactions. Graph analytics consist of models that determine the "connectedness" and relationships across data points. Graph analytics are typically portrayed via multiperspective visualization for business user consumption.

Position and Adoption Speed Justification: Graph analytics — and the use of graph databases — is gaining traction in the supply chain planning technology space. Specific use cases that require analysis across an exponentially larger amount of heterogeneous data drive interest in graph analytics. Such highly complex models are developed and used within machine learning with the output stored in graph databases. Graph databases present an ideal framework for storing, manipulating and analyzing the widely varied perspectives in the graph model due to their graph-specific processing languages, capabilities and computational power. At the same time, established AI techniques (such as Bayesian networks) are increasing the power of knowledge graphs and the usefulness of graph analytics by introducing further nuances in representational power. Graph analytics provide a much more flexible capability to find distant connections or analyze data based on things like strength or quality of relationship. It is a more effective way to search for indirect and complex relationships between two data points. For supply chain planning, this is of particular interest as the entire supply chain network consists of connections of different strengths. Furthermore, graph analytics can also be used to find connections and correlations in various sets of data within areas such as demand planning, supply planning and inventory optimization.

Graph analytics processing is a core technology underlying many other advanced technologies, such as virtual personal assistants, smart advisors and other smart machines. In supply chain planning, we see graph analytics being used especially to visualize and enrich the knowledge around the supply chain network setup and performance as a foundation for the digital supply chain twin.

Analytics vendors are beginning to claim specialization in graph analytics, and some traditional analytics vendors are offering interactive network graphs. Similarly, supply chain planning software vendors are also incorporating the use of graph technologies in their supply chain planning solutions in combination with other more traditional approaches. The utilization of graph analytics is necessary in order to develop knowledge graphs and hence digital supply chain twins, which are central to obtain true digital supply chain planning.

Commercialization of graph analytics is at an early stage, with only a few emerging players. This is why it is placed in the Innovation Trigger area of the Hype Cycle with a time to plateau of five to 10 years. Graph analytics and the closely related graph databases are driving a demand for new skills related to graph-specific knowledge, which may limit growth in adoption. Almost all incumbent SCP vendors do not use graph technology today, hence it will require a significant rewrite of their solutions in order to leverage this.

User Advice:

- Evaluate opportunities to incorporate graph analytics into the supply chain planning technology portfolio and strategy. This will enable the high-value use cases that are less-suited to traditional SQL-based queries and visualizations (e.g., computing and visualizing the shortest path, relationship between and influence of entities of interest in a network, i.e., creating and enriching the digital supply chain twin).
- Consider using graph analytics to enhance pattern analysis (e.g., within demand planning).

- Implement interactive user interfaces with the graph elements to find insights and analytic results, and store the outputs/results for repeated use in a graph database (e.g., within supply chain network visualization and modeling).

Business Impact: Graph analytics allows for the analysis of underleveraged data to find insights otherwise hidden in complex connected data, which makes this capability extremely relevant for supply chain planning. Graph analytics is highly effective at both assessing risk and responding to it. The engines can also be used to identify peculiarly successful operating units within a larger organization to analyze if their patterns can be repeated. Once a graph process is completed, it can be visualized — using size, color, shape and direction — to represent relationships and node attributes. Additionally, graph analytics enable causality and dependency analyses, thereby increasing transparency in predictive models.

Standard business situations in which graph analytics constitute an ideal framework for analysis and presentation include:

- Digital supply chain twin (creation and maintenance)
- Supply chain network analysis
- Supply chain monitoring
- Route optimization
- Demand pattern analysis
- Market basket analysis
- Hierarchy analysis
- Social network analysis
- Special forms of workforce analytics, such as enterprise social graphs and digital workplace graphs

Benefit Rating: Transformational

Market Penetration: Less than 1% of target audience

Maturity: Emerging

Sample Vendors: Aera; bluecrux; C3.ai; o9 Solutions

Recommended Reading: “Innovation Insight for Digital Supply Chain Twin”

“COVID-19 Demands Urgent Use of Graph Data Management and Analytics”

“Top 10 Trends in Data and Analytics, 2020”

“How to Build Knowledge Graphs That Enable AI-Driven Enterprise Applications”

Digital Supply Chain Twin

Analysis By: Tim Payne

Definition: A digital supply chain twin is a digital representation of the physical supply chain that can be used to drive understanding and make decisions across an E2E supply chain. It progressively replaces all the supply chain models that sit at the heart of any E2E supply chain decision-making solution.

It is built from granular data to form a dynamic, synchronized, real-time and time-phased representation of the various associations between the data objects and entities that ultimately describe and make up how the physical supply chain operates.

Position and Adoption Speed Justification: With the advent of digital business and the resulting drive for digital supply chain, the digital supply chain twin has only come into companies' vocabulary over the last couple of years, to facilitate alignment and automation. A digital supply chain twin is a digital representation of a supply chain, either enterprise or multienterprise in nature. A digital representation of a single node (e.g., a warehouse) or a function (e.g., distribution) is not a digital supply chain twin, as neither of these types represents an E2E supply chain of their decision making. Companies are beginning to recognize the importance of having a single digital representation of their E2E supply chain.

For organizations looking to build a digital supply chain twin, the technology choices are unclear. Some SCP vendors are renaming their single data models to digital supply chain twins while others are trying to make these single data models more reflective of reality. Some visibility vendors are doing likewise. However, in many cases, these models are still mainly using stale and static transaction data.

New entrants into the supply chain market, coming from a big data and AI background, are starting to make an appearance in the digital supply chain twin environment, but these offerings are also nascent.

User Advice: The key objective for a company on a journey to improve their supply chain decision making is to reduce the number of models they use across the E2E supply chain. Having more than one model degrades the quality of any E2E decision making. The ideal is to get to a single model that fully aligns and supports high-quality decision making.

Organizations should use a digital twin for all levels of supply chain decision making, from strategic through to executional. Appropriate predictive and prescriptive analytics, including machine learning (ML) and artificial intelligence (AI), should be applied to the digital supply chain twin, enabling aligned (and to various degrees automatic) decisions to be made. By being a truer representation of the real-world physical supply chain, these decisions would be faster and of a higher quality.

Examine early opportunities to add digital-supply-chain-twin-like capabilities (e.g., predictive lead-times and throughput rates) to your existing technology landscape. Most likely, this will involve pairing up the new capability with existing supply chain visibility and/or planning and/or executional solutions. Be prepared to experiment and/or go outside of your usual technology providers to get this capability. Over time, expand the scope of digital twins derived directly from the data as you get

to leverage more granular data from different parts of the internal and external supply chain. Finally, recognize that the digital supply chain twins are emerging and still underdeveloped.

Business Impact: The impact of the DSCT is transformational as it enables end-to-end decision making by being in lockstep with the real-world supply chain. Therefore, a digital supply chain twin is at the heart of any digital supply chain effort. It is through this twin that a company can drive the alignment of its decisions both horizontally and vertically throughout its supply chain. This alignment is key in the effort to significantly improve decision making and the associated business value. It ensures balance across the supply chain and the execution of strategy down through the organization by mapping the relationships between the different data objects (e.g., events, attributes, orders) and entities (e.g., products, customers, suppliers, locations, assets).

Through its linkage to the real world, resulting situational awareness, supply chain decision making and risk management are greatly enhanced. It supports deciding how to change some of these relationships — for example, push an order through an alternative route in the supply chain or build a new warehouse. Some of these decisions can be fully automated (typically the short-term ones). Ultimately, it creates end-to-end visibility and supports end-to-end decision making by being in lockstep with the real-world supply chain. Through this linkage to the real world, situational awareness, supply chain decision making and risk management are greatly enhanced. Moreover, a digital twin provides the basis on which all existing and new predictive and prescriptive analytics can run, allowing their full value to be realized by the organization.

Benefit Rating: Transformational

Market Penetration: Less than 1% of target audience

Maturity: Emerging

Sample Vendors: bluecrux; Cosmo Tech; DCbrain; eccenca; E2open; o9 Solutions; r4 Technologies

Recommended Reading: “Supply Chain Brief: Digital Planning Requires a Digital Supply Chain Twin”

“Digital Business Will Require a Forward-Thinking Supply Chain Planning Talent Strategy”

“Top 10 Strategic Technology Trends for Manufacturing Industries: Digital Twins”

“Mastering Uncertainty: The Rise of Resilient Supply Chain Planning”

“Innovation Insight for Resilient Planning”

Long-Term Demand Sensing

Analysis By: Pia Orup Lund; Tim Payne

Definition: Long-term demand sensing (LT DS) provides integrated business planning and supports long-term planning over the two- to five-plus-year time horizon.

The intent of LT DS is to predict future trends in market demand for a company's products or services considering the impact of macroeconomic factors (e.g., GDP, inflation), leading indicators and long-term causal influencers. LT DS utilizes machine learning and multiple external datasets to predict the market demand levels.

Position and Adoption Speed Justification: As companies extend the time horizon in an integrated business planning process, they will need to model leading long-term demand indicators. The SCP and analytics software markets are starting to deploy features that provide support for LT DS. Market pull for this type of software is still low, but is increasing as many companies experience a higher urgency to increase their planning horizons due to the current — and likely also future — highly volatile market conditions.

As incumbent SCP vendors continue to make investments in AI, ML and advanced analytics, they will enhance their IBP/S&OP product offerings to include more comprehensive support for LT DS. New entrants into the SCP market focus on AI/ML, and big data will also enter this area. However, to be successful, vendors will require to have both the analytics and the necessary external data to help their customers.

User Advice: To take advantage of emerging LT DS solutions companies should:

- Have a strong configuration planning capability that allows them to model their end-to-end supply chain over long-term time horizons.
- Get access to relevant data streams that represent the influencing factors that will provide appropriate insights into their long-term market demands.
- Have matured sales and operations planning process to create long-term plans through the instigation of IBP.
- Evaluate vendors on their LT DS capabilities. It may be necessary to procure LT DS capabilities from a vendor different from your primary SCP vendor.

Business Impact: The impact of LT DS is dependent on a company's ability to link/align decisions from strategy to execution, support for scenario modeling and collaboration, and its ability to find insights in large amounts of external data. These capabilities can be strengthened using a software solution that has features designed to adequately support IBP.

The benefit of LT DS increases as an IBP process becomes more mature and integration between S&OP and corporate financial planning tools is more pronounced. When this occurs, long-range scenarios and trade-offs can be evaluated with a higher level of confidence, which can lead to improved decision making in the configure planning processes.

Benefit Rating: High

Market Penetration: Less than 1% of target audience

Maturity: Emerging

Sample Vendors: Coupa (LLamasoft); Prevedere

Resilient Planning

Analysis By: Tim Payne

Definition: Resilient planning is defined as accurate, executable short-term plans that are balanced by midterm and long-term plans that mitigate against uncertainty by ensuring the right degree of resiliency is constantly being designed in and utilized. To enable resilient planning, a combination of a new planning paradigm, hyperscale cloud platforms, AI/ML, a digital supply chain twin and compliance to CORE is required.

Position and Adoption Speed Justification: Supply chain planning, for most companies, is basically deterministic in nature — especially on the supply side. Planning is fundamentally still based on a nearly 60-year-old planning paradigm that involves forecasting demand and then propagating this signal constantly back up the supply chain. This paradigm was originally encapsulated in the material requirements planning (MRP) algorithm that first appeared in the early 1960s. The whole premise of this planning paradigm is to try to create an accurate plan for the supply chain which can then be executed — hopefully. If there are accurate demand plans, bills of material, lead times, and capacity levels, then the upstream supply plans can be accurately calculated. The hypothesis here is that if there is an accurate plan, then a factory or distribution center or even a supply chain can execute this plan and thereby achieve the goals inherently built into the original plan. However, there is a problem, uncertainty. Or as an old military saying goes, "no plan survives first contact with the enemy."

With the coalescence of new technologies (hyperscale cloud, AI/ML, digital supply chain twin) along with new planning frameworks (e.g., CORE) and new planning paradigms, a company could reimagine its approach to planning and consider resilient planning.

The achievement of resilient planning will be slow. Too many supply chains are still wedded to the idea of planning accuracy (especially the forecast) to seriously get into resilient planning yet. Although the required technology is continuing to mature, there is still lots to do to fully enable resilient planning.

However, the hype around resilient planning and supply chain resiliency has increased significantly (hence the advancement of resilient planning on this year's Hype Cycle) as a result of COVID-19. Unfortunately, very few companies will get anywhere close to achieving true resiliency in their supply chains in the next couple of years.

User Advice: To move toward resilient planning a company needs to combine several technologies together (as well as address company culture):

- Increase the use of ML in order to progressively move from unknown uncertainty to known variability for aspects of entities, attributes and parameters in the supply chain. Leverage ML for cheaper, more expansive and faster predictions. Use this to enable the creation of many plans (to be more probabilistic) instead of just a single deterministic plan.

- To enable the above requires computing power. Leverage hyperscale clouds such as Microsoft Azure, Amazon Web Services or Google Cloud Platform to provide the required level of scalability.
- Achieve the right interplay between planning layers to mitigate against uncertainty and planning executing accurately through the use of a strong digital supply chain twin.
- Build the SCP technology roadmap to encapsulate the layers of the CORE model. All these decision layers are required to support full resilient planning. Each has its own role to play — none can be omitted.
- Change the planning paradigm from a focus on accuracy only to one of resiliency/accuracy balance. That is accuracy in respond planning and resiliency in optimize and configure planning.

Business Impact: Resilient planning represents the future paradigm of planning once all the new and emerging technologies are fully leveraged and the adherence to plan accuracy is broken — especially for the optimize and configure planning layers.

Benefits can be achieved with the traditional accuracy planning paradigm with these new and emerging technologies applied, but this will not represent the full and true value of these technologies in a decision-making context. Companies will continue to see increases in uncertainty and volatility in their supply chain environments. Leaders will seek better ways to manage under such conditions and will eventually migrate toward resilient planning. The benefit for them will be sustaining their competitor advantages in a highly competitive digital world.

Benefit Rating: Transformational

Market Penetration: Less than 1% of target audience

Maturity: Embryonic

Sample Vendors: bluecrux; CAMELOT Management Consultants

Recommended Reading: “Innovation Insight for Resilient Planning”

Algorithmic Supply Chain Planning

Analysis By: Tim Payne

Definition: Algorithmic supply chain planning encapsulates the industrial use of complex mathematical algorithms to drive speed, scale and improved decision making, and appropriate decision automation, through the leveraging of multiple data sources across all categories of supply chain planning (SCP). The algorithms facilitate encapsulation of the genetics, behaviors, decision making and responses of the supply chain to current and emerging environmental stimuli.

Position and Adoption Speed Justification: Traditional, best-practice-focused, manually intensive, people-centric collaborative planning won’t be sufficient to extract maximum business value from the massive amount, granularity and speed of data (including internal, external, networked, structured, unstructured, real-time and IoT data) generated throughout the extended enterprise

business networks and associated connections. Competitive advantage will be determined by speed of understanding and adaptive response to environmental signals to deliver on corporate goals leveraging data visibility, advanced analytics, AI and decision automation. This requires a rethink of planning; it has to become decision-centric, automated, less of a stand-alone domain and more integrated in and across the executional domains of the supply chain.

Planning decisions will be made multiple times per day — getting closer to real time — self-adapting to what is actually happening in execution. Algorithms will enable continuous planning, especially in the short term. Digital supply chains will likely throw up new and disruptive events, where cause-and-effect relationships are unclear. Algorithmic planning will need to respond to these events by supporting appropriate analysis and the subsequent evolution of "emergent" practices that can eventually become good or best practices. Algorithm-supported experimentation will be a key capability to achieve this move.

No vendor is currently supporting full algorithmic planning. Interest in this concept has grown in the last year as it is seen to be the required technology to support high-maturity digital planning. Full algorithmic planning represents Stage 5 planning maturity technologywise.

User Advice: To get value from the growing data, SCP leaders will need to find the right balance between "conscious" and "subconscious" planning — i.e., the point in time and degree to which the different planning decisions can be successfully automated. SCP leaders need to identify where it makes sense to implement algorithms and be very deliberate with such decisions. This involves identifying which activities are most important for the business and where it makes sense to deploy an algorithmic planning approach. These could include:

- Planning decisions where there are too many planners supporting an activity, meaning emerging algorithmic SCP would allow the company to shift planners to more value-added activities.
- Planning decisions that would benefit from an experimental approach to unearth new cause-and-effect relationships (such as incorporating the impact of new data sources to improve a specific planning decision).
- Planning decisions that are close to execution and could become more near-real-time in nature and fully automated.

Examine your company's digital supply chain plans to start to identify relevant data that could be leveraged by appropriate SCP algorithms. Review your SCP roadmap to identify quick algorithmic planning wins — focus on opportunities to automate, reduce bias and improve speed.

Invest in training and development so planners have the appropriate skills to manage (and even create) the algorithms that free up time to shift their focus to other value-adding activities (shift from system-of-record planners to system-of-innovation planners).

Audit your current SCP capability in terms of the Gartner configure, optimize, respond and execute (CORE) model — focus on the type and scope of algorithms required at each layer. Align your corporate analytics strategy with your SCP strategy to leverage predictive and prescriptive

algorithms in support of integrated end-to-end planning, and analytically based experimental techniques to drive a common understanding of complex supply chain planning challenges.

Align your algorithmic planning approach with other digital planning initiatives, as they must support each other.

Business Impact: In deploying algorithmic planning, companies can move from traditional planning centered around people to decision-centric planning centered around outcomes. Processes and organizational structures will change to facilitate this shift. Planners will move from accepting explicit responsibility for a plan or scenario on a case-by-case basis to implicit responsibility through managing the algorithms and the associated business rules themselves. More decisions will move to automated prediction and prescription (also known as autonomous planning).

The planning approach will move from a people-centric batch, sequential, steady-state, aggregated, out-of-date and manual state to a decision-centric continuous, intelligent, self-learning, real-time and automatic state.

Benefit Rating: Transformational

Market Penetration: 1% to 5% of target audience

Maturity: Emerging

Sample Vendors: Adexa; Blue Yonder; CAMELOT Management Consultants; Lokad; o9 Solutions; One Network Enterprises; Solvoyo; ToolsGroup; Vekia

Recommended Reading: “Digital Business Requires Algorithmic Supply Chain Planning”

“Getting Ready for the Digital Future: Strengthen Your Supply Chain Planning CORE”

Supply Chain Control Tower

Analysis By: Christian Titze

Definition: The control tower is a concept combining the capabilities of people, process, data, and organization, facilitated and supported by appropriately combined technology elements, for transparency and coordination. It is about developing a set of playbooks of appropriate actions and reactions: (1) see — enabling visibility into current and projected situations; (2) process — understanding impacts; and (3) act — providing means to suitably resolutions within a business ecosystem.

Position and Adoption Speed Justification: The term “control tower” still means many things to many people, creating a recipe for confusion in the marketplace and making it difficult for buyers to select appropriate control-tower-type capabilities for their needs. Fundamental control-tower-type technology-enabled capabilities, such as exception alerts and interactive dashboards to support areas such as capacity shortage, inventory shortage or late shipments, are now foundational and fairly standard to modern SCM solutions. However, advanced capabilities such as impact analysis, scenario simulation or a collaborative resolution/response room are lagging behind.

Most current available solutions are domain-specific, serving a specific role in supply chain planning or supply chain execution (like logistics control tower) rather than being supply chain end-to-end in support of supply chain convergence. They are also less actionable and mostly provide visualization capabilities (end-to-end data-driven insights) but not related to collaborative resolution (end-to-end intelligent decision making). We positioned control tower just around trigger/peak midpoint, as we refer to end-to-end, yet domain-specific control towers are more mature (around peak/trough midpoint). What you need is end-to-end insights and orchestration, a digital twin in order to allow impact analysis and scenario modeling, and collaboration for intelligent issue resolution.

User Advice: What hasn't changed is this: There are no standards for control-tower-type application requirements or capabilities, making it increasingly challenging for buyers to evaluate vendor offerings and identify potential needs. Therefore, it is essential for supply chain technology leaders to build a comprehensive understanding of the underlying capabilities in parallel — regardless of the terminology — helping remove any confusion and misconceptions. There are different types of offerings marketed as control tower solutions. These are control-tower-type capabilities as an integrated part of a broader SCM platform (either serving supply chain planning [SCP] or supply chain execution [SCE]), or a stand-alone tool that leverages intelligence on top of a data lake.

In order to gain full visibility that is marketed by most of the solutions, companies need to be mindful that they need to map out in their journey an end-to-end control tower versus a more functional supply chain approach. They also need to improve nontechnical capabilities like process management and decision-making capabilities to support a control tower environment.

Recommendations:

- Familiarize yourself with the concept, building blocks and anticipated benefits of control towers so you can properly communicate the value to your peers.
- Invest in control tower capabilities when maturing supply chain processes, scope or technology.
- Pick the right solution offering based on your use case.

Business Impact: Control towers have gained popularity because they are marketed as stitching together complex and siloed supply chains, and they are gaining visibility and insights into the supply chain performance. It is all about getting more transparency (what's happening in my highly volatile supply chain) and coordination (linking to the different layers that will not be replaced by the control tower). Hereby, control towers act as entry points to make better and faster decisions.

A control tower captures end-to-end, data-driven insights for designing and optimizing the supply chain, as well as managing end-to-end exceptions, enabling intelligent end-to-end decisions within the business ecosystem. This can be mapped toward the following detailed activities required:

- Sense (see): Get real-time, end-to-end supply chain visibility
- Analyze (process): Understand and leverage signals from the digital ecosystem
- Predict (project): Utilize advanced analytics for predictions and prescriptions

- Solve (act): Do exception management and scenario modeling
- Execute (respond): Leverage a collaborative intelligent response framework
- Learn (learn): Continuously learn, sense and respond.

Benefit Rating: High

Market Penetration: 5% to 20% of target audience

Maturity: Adolescent

Sample Vendors: Blue Yonder; E2open; Elemica; Infor; One Network Enterprises; SAP

Recommended Reading: "Research Brief: Remove the Clouds of Confusion When Shopping for a Supply Chain Control Tower"

"High-Tech Supply Chainnovator Finalists 2020: Automated Contracts, Planning and Fulfillment"

"Video: Electrolux — Logistics and Customer Service With End-to-End Vision"

"Video: Logitech — Control Tower Evolution"

DDMRP

Analysis By: Tim Payne

Definition: The Demand Driven Institute (DDI) defines demand-driven material requirements planning (DDMRP) as "a multi-echelon planning and execution method to protect and promote the flow of relevant information through the establishment and management of strategically placed decoupling point stock buffers."

Gartner describes it as a basic form of respond planning capability that pulls through the supply chain using actual orders as the trigger aligned with decoupling stock buffers.

Position and Adoption Speed Justification: DDMRP has been in the making a long time (being born out of the MRP world), but only recently began to get noticeable traction in the market. Gartner is now seeing a steady stream of inquiries coming in for DDMRP. These numbers are still dwarfed by those asking about demand and supply planning, S&OP, and AI/ML in planning.

There is often confusion around DDMRP. The "demand-driven" part of the name gets confused with other "demand-driven" approaches. The claim that no forecasting is required with DDMRP causes confusion, as there is always a need to forecast future demand, in some way or other, for a supply chain (and a basic forecast is used in DDMRP for buffer sizing). Compared with forecast-driven MRP, DDMRP uses a single-mode net flow calculation and dynamic inventory buffers.

With the rise of AI/ML in SCP, this "analytics" approach goes head-to-head with the more simplistic pull approach of DDMRP. Currently, the "analytics" approach is winning the mind share war.

DDMRP is evolving with the associated concepts of demand-driven operating model (DDOM), demand-driven S&OP (DDS&OP) and demand-driven adaptive enterprise (DDAE). These additions are currently less well-defined and understood than DDMRP.

With APICS Supply Chain Council now offering training in DDMRP, more companies are being tempted to evaluate the approach. Gartner foresees that new AI-/ML-based planning techniques (e.g., resilient planning) will eventually supersede DDMRP.

User Advice: The easiest option is to consider DDMRP as another planning technique that could be applied to certain products in certain circumstances, just as you would apply statistical forecasting, optimization, lean planning and Kanban. Use a segmentation approach to decide which is the most applicable concept to use. Pilot to prove the value, such as where there is a desire to decouple MRP from the forecast due to poor forecast accuracy.

Discuss with your incumbent SCP vendor how they intend to enable DDMRP, and whether they will get certified by the DDI or go it alone. Several of the leading SCP vendors are certified, or are considering certification for DDMRP by the DDI. Avoid using small consultancy tools or spreadsheets to expand beyond pilots. You will need enterprise-class software for broader rollouts.

If you are looking to move beyond a basic DDMRP deployment, apply healthy skepticism to vendor claims of supporting DDS&OP and DDAE as requirements for these are far from clear or evolved yet.

If DDMRP is being positioned against forecast-driven planning for all or a sizable proportion of the product portfolio, be prepared for significant pushback internally. Broader acceptance of a pull-based approach such as DDMRP requires a culture shift for many companies.

If there is interest in a planning paradigm shift toward concepts involving a pull-based approach, monitor how some of the vendors might be evolving their software to incorporate aspects of AI/ML/advanced analytics to help with the configuration aspects required. For example: the determination of decoupling points in a large E2E supply chain, simulation of a supply chain to assess its degree of resiliency to uncertainty, use of ML to better select and size inventory buffer profiles.

Business Impact: Versus traditional forecast-driven MRP, there are examples of positive benefits in areas such as inventory reduction, service-level improvements and cycle time reductions. In these situations, DDMRP is remedying the known problems with forecast-driven MRP. The main one is that the forecast is always wrong, and this inaccurate signal is simply being propagated back up the supply chain.

Versus optimization-based SCP, the picture is less clear regarding benefits. Where there are supply constraints and optimization is being used to maximize service and/or profitability, some research is indicating a superior performance for the optimization-based SCP approach. However, DDMRP is seen as a simpler approach and can be easier to understand compared to optimization-based SCP.

Until a pull-based approach such as DDMRP evolves to incorporate more advanced analytics and modeling techniques (or the optimization-based SCP evolves to incorporate more uncertainty), there will be a place for both types of approach for the foreseeable future.

Benefit Rating: Moderate

Market Penetration: Less than 1% of target audience

Maturity: Emerging

Sample Vendors: Anaplan; b2wise; CAMELOT Management Consultants; Demand Driven Technologies; OMP; Orchestr8; QAD; SAP

Recommended Reading: "Supply Chain Brief: Enable Your Technology to Support Supply Chain Planning Concepts Like DDMRP"

At the Peak

Discrete-Event Simulation in SCP

Analysis By: Tim Payne

Definition: Discrete-event simulation in supply chains is the application of this approach to detailed models of a supply chain. It helps to better understand how a particular supply chain design/configuration will behave under different operating conditions. It also develops a view of how a supply chain will perform over a period of time (say, a year) while different disruptions/changes (for example, demand, supply or weather) are modeled and applied to it.

Position and Adoption Speed Justification: Generic discrete-event simulation tools have been around for many years. Each event is modeled to occur at a particular point in time, and the event marks a change in the state of the modeled system. The system remains stable until the next event is simulated, along with its impact throughout the whole system.

Some supply chain technology providers are adding discrete-event simulation capabilities. The use of in-memory and cloud computing also allows for much larger datasets and models to be simulated in reasonable amounts of times. These tools allow users to simulate the impact of a period's worth of events to see how the current supply chain configuration (or even options for different configurations) will perform (against a set of selected key performance indicators) in a fraction of that time period. As users see the value that this type of analysis can bring to their decision making, the uptake of this type of simulation capability will grow (albeit slowly) as part of a company's configuration and experimentation capability.

Allied with the digital supply chain twin, discrete-event simulation will find a home in resilient planning as it emerges.

User Advice: Companies have tried to use this type of simulation in a supply chain context, because supply chains can be viewed as complex systems that are influenced by specific events (for example, a customer order, a machine failure, a forecast error or inventory levels dropping below a target). Due to the potential size of most supply chain models and past computing performance limitations, discrete-event simulation was restricted to being used to help model only

small sections of a supply chain (for example, a warehouse layout for forklift truck movements or manufacturing cell for operator sizing).

Discrete-event simulation can be used at a strategic level, such as at a network-design level, to determine how different designs will likely perform under different operating conditions. It can also be used at a tactical or operational level to determine how well specific inventory policies will help mitigate against demand variability, or how a specific production schedule will achieve the right balance between operating cost and due date attainment.

There needs to be an underlying model of the supply chain that the discrete-event simulation capability can leverage; consequently, Gartner expects to see network design and supply chain planning vendors continue to add this capability. Eventually, this will lead to companies running designed experiments on their supply chain to visualize how the supply chain will behave under different conditions.

Discrete-event simulation in the supply chain is likely to be of more interest to companies that are at higher levels of supply chain maturity and have a strong supply chain foundation in place to implement the findings of the simulation exercise.

Business Impact: Discrete-event simulation (as opposed to what-if analysis where two or more different static scenarios are compared) can have a high impact on the performance level of a supply chain. If used appropriately, it can help a company understand the degree to which its supply chain can handle disruptions. This understanding can eventually lead to a form of resilient planning.

Think of it as something to have on the roadmap of supply chain planning capabilities once that strong foundation is in place. Identify opportunities in the supply chain design phase to leverage discrete-event simulation to help with testing the robustness of different supply chain configurations. Plan to add discrete-event simulation for the supply chain into an existing supply chain development function as a means to learn how and where to use this type of capability. If there is an area of supply chain change management that is particularly troublesome, consider using simulation as a means to help stakeholders understand the true impact of the proposed change by “seeing” the results before any change is actually undertaken.

Benefit Rating: High

Market Penetration: Less than 1% of target audience

Maturity: Emerging

Sample Vendors: CAMELOT Management Consultants; LLamasoft; Orchestr8; Simio

Continuous Intelligence

Analysis By: Pieter den Hamer; W. Roy Schulte

Definition: Continuous intelligence is a design pattern in which real-time analytics are integrated into business operations, processing current and context data to prescribe actions in response to business moments and other events. It provides decision automation or decision support. Continuous intelligence leverages multiple technologies such as augmented analytics, event stream processing, optimization, business rule management and machine learning.

Position and Adoption Speed Justification: The current hype is focused on holistic, integrated continuous intelligence solutions that share real-time information from multiple sources with multiple departments and applications to support multiple business functions. Examples include real-time 360-degree views of customers, supply chain networks and enterprise nervous systems in airlines, railroads and other transportation operations. Simpler kinds of continuous intelligence are already common in point systems such as mobile device navigation, monitoring the health of machines, contact center monitoring, pop-up web ads, high frequency trading and package tracking. The hardware and software technologies for holistic, integrated continuous intelligence, including inexpensive sensors, publish-and-subscribe messaging systems such as Apache Kafka, event stream processing platforms and augmented analytics, are available and affordable. However, many companies lack the skills necessary to develop their own custom-built solutions so holistic continuous intelligence will take five to 10 years to achieve 50% penetration of the target audience.

User Advice: Data and analytics leaders should consider continuous intelligence for new business processes and when making significant changes to existing processes. It applies to situations in which real-time data from the last few seconds or minutes significantly improves business decisions. It is not relevant where equally good decisions can be made with data that is hours, days, weeks or older. It goes beyond real-time descriptive, diagnostic and predictive analytics by supplying prescriptive information about the best available action to be taken in response to the situation. The potential role of continuous intelligence should be discussed with business managers and subject matter experts early in the requirements-gathering process. If continuous intelligence is implemented, it will fundamentally affect the design of business processes and their data and analytics. Companies can reduce the effort of achieving holistic continuous intelligence by subscribing to SaaS offerings, or acquiring packaged applications or devices that provide internal continuous intelligence on a point basis. However, holistic continuous intelligence will still entail custom design and integration with multiple applications, including independently owned and operated systems. This will require multidisciplinary collaboration among business domain experts, change managers, architects and developers. It may leverage messaging systems, event stream processing platforms, decision management tools, intelligent business process management suites (iBPMS), IoT platforms or other development, middleware and analytics products.

Business Impact: Continuous intelligence plays a major role in digital business transformation and optimization projects. A key benefit is improved situation awareness and a common operating picture across business functions by providing real-time dashboards, alerts and best-next-action recommendations. Equally important is the capability to trigger automated responses by sending signals to machines or initiating business processes in cases where the decision on what to do can be automated. Systems with continuous intelligence leverage real-time context data to support decisions for customer interaction, manufacturing, fraud detection, supply chain management, or other areas. For example, to allocate resources in the most efficient manner possible. However, enterprises that want to build their own solutions and that do not already have staff expertise in

messaging, stream analytics, machine learning and decision management disciplines may need to hire outside service providers or train their staff on the new disciplines.

Benefit Rating: Transformational

Market Penetration: 5% to 20% of target audience

Maturity: Adolescent

Sample Vendors: Confluent; FICO; RedPoint Global; SAS; Software AG; TIBCO Software; Unscrambl; Vitria; XMPro; ZineOne

Recommended Reading: "Innovation Insight for Continuous Intelligence in Supply Chain"

"Market Guide for Event Stream Processing"

"When to Automate or Augment Decision Making"

"How to Use Machine Learning, Business Rules and Optimization in Decision Management"

Autonomous Planning

Analysis By: Tim Payne

Definition: Autonomous planning is defined as automated prediction (plan creation) and automated prescription (plan judgment). The creation of a plan involves both these elements. There is the prediction or predictions about the future and then the prescription — choice — about which of these futures is most desirable. With autonomous planning, there is no direct human involvement in making the decision.

Position and Adoption Speed Justification: Autonomous planning is becoming more popular for companies that are looking to digitalize their supply chain planning. The increasing automation of supply chain planning is seen by many as one of the key goals of digital planning. Consequently, there is a lot of hype surrounding autonomous planning.

The notion of autonomous planning is new to SCP, which is traditionally a fairly manual activity for most companies. However, for many companies, it is now more of a desire than a realistic goal. No company will achieve autonomy for 100% of its planning decisions. There will always be the need for human involvement and judgment in some planning decisions (mainly prescription) no matter how much AI or ML a company applies. Only certain decision types will be suitable for full automation.

User Advice: Companies need to be realistic about which planning decisions they can make autonomously. The application of a decision type framework such as Cynefin is a good way to help understand the current mix of decision types that exist in their SCP environment. This is then an indicator of which planning decisions are currently of the right type to be fully made autonomously.

Trying to fully automate the wrong type of planning decision will lead to failure.

Companies should align their autonomous planning goals with their digital planning maturity. As they progress in digital planning maturity, the mix of planning decision types will naturally change, and this will facilitate the opportunity to make more of these decisions autonomously. The majority of suitable decision types will be different at the different layers of the CORE model (this reflects the various planning layers that exist in a company).

Having good transparency into any new analytics being deployed will help to drive trust and confidence in these new approaches which will help allow the deployment of more decision automation.

As companies strive for more decision automation, the focus of planning needs to switch from being people-centric (low maturity), through process-centric (midmaturity), to becoming decision-centric (high maturity). With a laser focus on the planning decisions under consideration, a company can keep a close eye on its type and development, and therefore how much automation should be applied at different times.

Business Impact: Autonomous planning is typically considered for two major reasons. The first is about planner productivity. Traditional planning (analog planning) tends to be manual in nature — especially the prescription element (i.e., selecting what plan to go with). With more planning automation, companies can do more with less in terms of human planners. Allied with this is the increasing ability to do things that could not be done before because planning was too manual (e.g., running and comparing high numbers of multiple plans, making decisions as a result of running continuous planning, etc.).

The second area is reducing human decision-making bias from planning decisions. Humans make biased decisions because of the way our brains work. The reduction of direct human involvement in planning decision making will, in some circumstances, help to alleviate some of this human bias.

Benefit Rating: High

Market Penetration: 5% to 20% of target audience

Maturity: Emerging

Sample Vendors: 4flow; Adexa; Aera; Blue Yonder; GAINSystems; Kinaxis; Logility; o9 Solutions

Recommended Reading: “Defining Digital Supply Chain Planning”

“Leverage Gartner’s Digital Supply Chain Planning Maturity Model to Improve Planning Quality”

“Digital Business Requires Algorithmic Supply Chain Planning”

Data Fabric

Analysis By: Ehtisham Zaidi; Robert Thanaraj; Mark Beyer

Definition: A data fabric is an emerging data management design concept for attaining flexible, reusable and augmented data integration pipelines, services and semantics, in support of various

operational and analytics use cases delivered across multiple deployment and orchestration platforms. Data fabrics support a combination of different data integration styles and utilize active metadata, knowledge graphs, semantics and ML to augment data integration design and delivery.

Position and Adoption Speed Justification: The data fabric — as a data management design concept — is a direct response to long-standing issues now being aggravated by digital transformation. These include the multiplicity of data sources and types, the soaring data volume, the increasingly complexity of data integration and the rising demand for real-time insights. Simply put, a data fabric is a design that leverages existing tools and platforms and adds metadata sharing, metadata analysis and metadata-enabled self-healing along with orchestration and administration tools to manage the environment. As a data fabric becomes increasingly dynamic, it evolves to support automated data integration delivery. Data fabrics are almost at the Peak of Inflated Expectations due to the hype in the market and the inherent confusion on how to deliver these. A data fabric is not in itself a tool/platform that can be purchased — it is a design concept that requires a combination of tools, processes and skill sets to deliver. Yet, we witness various tools being developed and sold under the data fabric tag which do not provision all the requirements needed to fulfill a data fabric. Not least the ability to integrate existing data integration technologies together to deliver a dynamic data integration design that uses active metadata to auto-adjust to new use-case requirements.

Data fabrics will, at the very least, need to collect all forms of metadata (not just technical metadata) and then perform machine learning over this metadata to provide recommendations for integration design and delivery. This capability is typically achieved through the augmented data catalog capabilities of a data fabric. Advanced data fabrics have the capability to assist with graph data modeling capabilities (which is useful to preserve the context of the data along with its complex relationships), and allow the business to enrich the models with agreed upon semantics. Some data fabrics come embedded with capabilities to create knowledge graphs of linked data and use ML algorithms to provide actionable recommendations and insights to developers and consumers of data. Finally, data fabrics provide capabilities to deliver integrated data through flexible data delivery styles such as data virtualization and/or a combination of APIs and microservices (and not just ETL). These are capabilities that together make up a data fabric and will mature over time as more vendors move away from point-to-point and static data integration designs and adopt more dynamic data fabrics.

User Advice: Data and analytics leaders looking to modernize their data management solutions must:

- Invest in augmented data catalogs. These will help you to inventory all types of metadata — along with their associated relationships — in a flexible data model. Enrich the model through semantics and ontologies that make it easier for the business to understand the model and contribute to it.
- Combine different data integration styles to incorporate a portfolio-based approach into the data integration strategy (for example, not just ETL, but a combination of ETL with data virtualization).

- Establish a technology base for the data fabric and identify the core capabilities required before making further purchases. Start by evaluating your current tools (such as data catalogs, data integration, data virtualization, semantic technology and DBMSs) to identify the existing or missing capabilities.
- Invest in data management vendors which exhibit a strong roadmap on augmented capabilities, i.e., embedded ML algorithms that can utilize metadata and provide actionable recommendations to inform and automate parts of data integration design and delivery.

Business Impact: By leveraging the data fabric design, data and analytics leaders can establish a more scalable data integration infrastructure that can provide immediate business impact and enable new use cases, such as:

- Data fabrics provide a much needed productivity boost to data engineering teams that are struggling with tactical, mundane and often redundant tasks of creating data pipelines. Data fabrics once enabled will assist data engineering teams by providing insights on data integration design and will even automate repeatable transforms and tasks so that data engineers can focus on more strategic initiatives.
- Data fabrics also support enhanced metadata analysis to support data contextualization by adding semantic standards for context and meaning (through knowledge graph implementations). This enables business users to be more involved in the data modeling process and allows them to enrich models with agreed upon semantics.
- Over time, the graph develops as more data assets are added and can be accessed by developers and delivered to various applications as needed. This allows organizations to integrate data once and share multiple times thereby improving the productivity of data engineering teams.
- Data fabrics provide improved decisions for when to move data or access it in place. They also provide the much sought-after capability to convert self-service data preparation views into operationalized views that need physical data movement and consolidation for repeatable and optimized access (in a data store such as a data warehouse, for example).

Benefit Rating: Transformational

Market Penetration: 1% to 5% of target audience

Maturity: Emerging

Sample Vendors: Cambridge Semantics; Cinchy; CluedIn; data.world; Denodo; Informatica; Semantic Web Company (PoolParty); Stardog; Talend

Recommended Reading: “Data Fabrics Add Augmented Intelligence to Modernize Your Data Integration”

“Augmented Data Catalogs: Now an Enterprise Must-Have for Data and Analytics Leaders”

“Modern Data and Analytics Requirements Demand a Convergence of Data Management Capabilities”

“Top 10 Data and Analytics Technology Trends That Will Change Your Business”

“Magic Quadrant for Data Integration Tools”

“Critical Capabilities for Data Integration Tools”

Respond Planning

Analysis By: Tim Payne

Definition: Respond planning refers to the ability to trigger short-term planning and/or replanning based on executional events (either demand side or supply side, enterprise or multienterprise, or internally or externally initiated). This capability is essential to ensure plans stay in step with execution and corporate goals as much as possible. Respond planning is essential to support sales and operations execution, and is the R layer of CORE.

Position and Adoption Speed Justification: Most planning vendors have traditionally focused on tactical (optimize) planning and so respond planning is fairly new to them. Most end users have traditionally deployed planning solutions that are tactically focused because this has addressed their biggest planning challenge.

With end users wanting to be more agile and responsive to their operating environments, respond planning has increased in popularity — especially during the first half of 2020 with the global pandemic hitting many supply chains. Hence, it’s positioned at the Peak of Inflated Expectations.

Respond planning recognizes that execution is unlikely to follow the optimal plan and that it needs to respond to these execution events in a way that keeps as close as possible to the corporate goals. Therefore, respond planning inherently has a focus on accuracy to better sense the event and determine an appropriate short-term response (i.e., a revised plan).

Consequently, AI/ML is increasingly being focused into respond planning to help improve prediction accuracy, automate decision making and allow nearer to real-time, granular data to be utilized in planning. The continuing convergence of planning and execution will take place at the interface between respond planning and execution/supply chain visibility. This will force planning systems of record to increasingly have to contain respond planning capabilities, with the associated technical architecture changes required to support it.

User Advice: Respond planning is one of the planning layers in the CORE framework. It is the newest of these and as such is increasing in hype. To improve their planning, organizations need to align planning decisions horizontally and vertically throughout the supply chain. Respond planning is one of these horizontal layers, and as such, acquiring an integrated end-to-end respond planning capability should be a key part of any company’s SCP technology roadmap.

Companies can start experimenting with respond planning in any part of the supply chain. Eventually, the concepts can be taken back and integrated throughout the supply chain and into manufacturing and suppliers for key materials and components for daily replenishment aligned with consumption.

For most SCP vendors, respond planning represents a significant departure from the way they have enabled planning for many years. Several have yet to embrace respond planning fully, while others have limited, but expanding, offerings at this time. Depending on which SCP tools are in place, users may have to use third-party solutions to support their initial pilots. However, if respond planning is identified as a key planning capability for the future, users should ensure it is properly represented in the SCP roadmap.

Respond planning is also evolving from a couple of other perspectives. As it is predicated on execution visibility, several of the supply chain visibility vendors are getting into respond planning. New entrants to the market are coming from providers with big data and predictive analytics capabilities to try to fill the white space left by incumbent SCP vendors. Organizations should take this into consideration when evaluating their SCP technology roadmap.

Business Impact: End-user organizations deploying early versions of respond planning are reporting a range of improvements, including customer service improvements, inventory reductions and lead-time reductions. Additionally, reduction in planning nervousness can help reduce exception messages and gives planners a means to focus on what really needs addressing, due to execution deviations. A key improvement area is in increased responsiveness to events and disruptions.

More mature users of respond planning are looking to automate more of these planning decisions — especially as respond planning gets closer to real-time execution updates. Manufacturing operations can become more stable because the inventory buffers dampen the variability, so they experience fewer unplanned disruptive changes.

The advent of AI/ML into respond planning is helping to drive higher degrees of automation in both the predictive and prescriptive elements of planning decisions.

Benefit Rating: High

Market Penetration: 5% to 20% of target audience

Maturity: Adolescent

Sample Vendors: 4flow; Aera; Blue Yonder; CAMELOT Management Consultants; E2open; IBM Sterling Supply Chain Insights with Watson; Kinaxis; OMP

Recommended Reading: “Getting Ready for the Digital Future: Strengthen Your Supply Chain Planning CORE”

SCP Outsourcing

Analysis By: Amber Salley

Definition: The supply chain planning (SCP) business process outsourcing (BPO) market is composed of third-party service providers that support supply chain planning processes for their clients, which would otherwise be performed internally. BPO providers offer buyers improved business process efficiency and effectiveness. The providers perform activities and may use the

client's technology and defined processes. SCP BPO includes business process as a service (BPaaS) that involves multitenancy often achieved by leveraging cloud services.

Position and Adoption Speed Justification: SCP BPO is emerging as an alternative to in-house planning. It is adopted when companies have constraints in the following areas — SCP talent, technology support, or process maturity. Many SCP BPO providers built their planning outsourcing services to extend their previously existing BPO services lines. Others have a legacy as a SCP software provider and added SCP BPO services to help their end-users quickly scale and reduce the time-to-value of the end-user technology investment.

Broadly speaking, SCP BPO adoption is low. For large BPO providers, SCP BPO is a small part of their outsourcing activity. Interest in SCP BPO is growing, especially in the areas of statistical forecasting, demand management, inventory planning, service parts planning, supply network planning, production planning, and long-term capacity planning. The most interest is coming from North America, Western Europe, and Asia/Pacific.

User Advice: Evaluate the necessity for SCP outsourcing by determining the drivers and objectives for outsourcing for your organization. Cost cutting shouldn't be the end goal of outsourcing. Instead, design a balanced outsourcing strategy by equally valuing and recognizing the importance of overall business benefits, and longevity of relationship.

Be selective in what you choose to outsource by identifying a pain point that can be improved most optimally through outsourcing. Planning is a mission-critical decision-making process for organizations. Organizations should not outsource critical decisions making to an outsourcing partner. Be mindful that some pain points can be solved in-house through process changes or more efficient use of existing technology.

Establish requirements for vendor management that are like those in place for other outsourced functions. Create clear governance model and feedback model with outsourcing vendor by defining mutual roles and responsibilities (RACI), organization structure, processes and handovers, and key metrics.

When engaging with a SCP BPO vendor, assess their ability to support organizations of a similar size and planning scope as yours. Use the discovery process to gauge their knowledge of SCP trends and determine the extent of their experience hosting outsourced SCP activities. Evaluate providers on their methodologies and proprietary tools used to support outsourcing. Treat this relationship the same as any other relationship with a third-party provider.

Business Impact: The objectives for SCP outsourcing vary from more operational cost reductions and improving planning efficiency to more strategical, helping organizations improve planning quality and business performance. SCP activities that are best suited for SCP BPO include statistical forecasting, demand management, inventory planning, service parts planning, supply network planning, production planning, and long-term capacity planning.

Benefit Rating: Moderate

Market Penetration: 1% to 5% of target audience

Maturity: Emerging

Sample Vendors: 4flow; Accenture; Baxter Planning; Bristlecone; Capgemini; Chainalytics; Entercoms; Genpact; Infosys; TCS

Recommended Reading: "Market Guide for Supply Chain Planning BPO or BPaaS"

"How to Evaluate Whether Outsourcing Your SCP Functions or Processes Is Right for Your Organization"

AutoML

Analysis By: Farhan Choudhary; Alexander Linden

Definition: Automated machine learning (autoML) is the capability of automating the process of building, deploying and/or managing machine learning models.

Position and Adoption Speed Justification: AutoML promises a way for traditional and citizen data scientists (developers and business analysts) to quickly build, tune and deploy models using automation and embedded machine learning. AutoML solutions aim to automate some or all steps of the machine learning pipeline processing including:

- Data sourcing and preprocessing
- Feature engineering
- Model training and customization
- Hyperparameter optimization
- Model deployment
- Model serving
- Model management/monitoring
- Model evaluation/update

The hype in autoML was driven by the promise that it can reduce the demand for data scientists or make scarce resources more productive by enabling domain experts to automatically build predictive models with limited knowledge of statistics and ML. However, the hype has slowed down with a reality check that a general purpose end-to-end autoML solution that covers the full ML pipeline — from data acquisition to model deployment and operationalization — doesn't yet exist. Most autoML capabilities available today focus on helping data scientists with a subset of the ML pipeline such as feature engineering, model selection, or tuning and hyperparameter optimization, while working for only supervised ML use cases.

Gartner expects that autoML will rapidly move into the Trough of Disillusionment as end-user organizations run into challenges and experience its limitations. This will primarily be since only a limited percentage of each step associated in the ML workflow can be automated. For instance, we can see a higher degree of automation in tasks such as feature engineering, model training or

hyperparameter optimization. However, the degree of automation in model deployment, model monitoring and model evaluation will stay relatively low. Depending on the level of automation in each step, the remainder will involve human oversight. Hence, Gartner prefers the term, Augmented ML instead of AutoML.

User Advice: Data and analytics leaders responsible for data science teams should:

- Explore the different types of autoML capabilities (open source and commercial) and how they are can be used to help and support different parts of the machine learning pipeline.
- Set the right expectations that autoML is just one of the tools to achieve efficiency through partial automation in some aspects of the data science and machine learning (DSML) workflow. We are yet to reach a stage of complete automation in machine learning workflows.
- Data bias has provided lessons on the limitations of AI. Therefore, it is crucial to understand maximizing value from autoML instead of just haphazardly applying it without expertise and contextualization. The autoML solutions assume that users have the right data as an input for autoML. The choice of training data will directly impact the accuracy and quality of the autoML results.
- Be aware of data science platform vendors overhyping their autoML capabilities. Some vendors market that they can automate end to end machine learning pipelines, but this is limited to very well defined, known use cases.

Business Impact: Today, autoML offers the following benefits:

- Enables domain experts (developers, business analysts) to build ML models with low code.
- Helps data scientists more quickly identify the best features from the available training data.
- Saves time by recommending the best algorithm for a given use case and address algorithmic bias.
- Reduces the time to identify the best data sources, hyperparameter tuning settings.

Benefit Rating: High

Market Penetration: 5% to 20% of target audience

Maturity: Emerging

Sample Vendors: Alteryx; Amazon SageMaker; DataRobot; Google Cloud Platform; H2O.ai; KNIME; MathWorks; RapidMiner; SAS

Recommended Reading: “Magic Quadrant for Data Science and Machine Learning Platforms”

“Critical Capabilities for Data Science and Machine Learning Platforms”

“How Augmented DSML Makes Data Science Projects More Efficient”

"Augmented Analytics Is the Future of Analytics"

"Market Guide for Augmented Analytics Tools"

Digital Supply Chain Planning

Analysis By: Tim Payne

Definition: Digital supply chain planning is defined as the use of digital technologies such as cloud, big data, RPA, AI and/or ML to improve or transform the quality of the planning decision making in the supply chain. How digital the planning has become is characterized through seven dimensions: horizontal alignment, vertical alignment, automation, mix of decision types, data latency, data granularity and degree of bimodal planning.

Position and Adoption Speed Justification: As part of their digital initiatives, more companies have digital supply chain planning initiatives in place. However, digital planning means different things to different organizations. It follows a maturity progression along the lines of the seven dimensions outlined above. Digital planning is not about digital technology per se, but rather the appropriate and effective use of digital technology applied to planning as a company moves forward in its journey.

Digital planning has risen quickly up the Peak of Inflated Expectations over the last 12 months on the back of the hype around all things digital. In some cases, traditional planning, where a "predigital" planning solution is implemented, is being renamed digital planning. Meanwhile, many SCP vendors are adding digital technologies to their solutions (especially cloud and ML). Consequently, digital supply chain planning will slide into the Trough of Disillusionment quickly as companies discover that it is far harder to do well especially at higher stages of maturity.

The journey from the Trough of Disillusionment to the Plateau of Productivity will be slow, as successful digital planning relies on the seven dimensions being progressed in reasonable balance. This is not solely about technology; the people and processes need to be part of the evolution as well.

User Advice: We recommend:

- Leverage a digital planning framework such as Gartner's seven dimensions of digital planning to ensure that the relevant capabilities are part of the company's digital planning roadmap.
- Assess each opportunity to deploy digital technology into SCP by asking which of the seven dimensions of digital planning it positively impacts.
- Start digital planning efforts by focusing on horizontal and vertical alignment of planning decisions early on in a digital planning initiative. This helps to ensure that orphaned digital planning initiatives don't pop up and can't be easily integrated into the rest of the planning.
- Do not strive for autonomous supply chain planning in all planning decisions, but rather focus on how to use digital technologies to drive more decisions (not all) toward simple E2E decisions that can eventually be automated.

- Balance digital planning initiatives by ensuring that, as progress is made, progress is reasonably balanced across the seven dimensions of digital planning.

Business Impact: The benefits from digital planning fall into two main areas.

Initial benefits — Removing the human planning productivity constraint enables a company to do more with less and to do things that couldn't have been done before, such as:

- More accurate master and planning data
- More accurate supply chain model
- The use of more granular data
- The use of fresher data (nearer to real time)
- Faster decision making
- The creation of more plans/options

Subsequent benefits — Using digital planning to support improvements in planning decision quality in areas such as:

- Reducing uncertainty by converting it into understood variability
- Reducing human decision-making bias through decision automation
- Improving prediction accuracy through the use of ML
- Improving prescription relevance and quality
- Data-based, end-to-end planning decisions
- Aligning decision making horizontally and vertically across the supply chain
- Opportunity to deploy new planning paradigms such as resilient planning
- Creating a bimodal planning capability

Benefit Rating: Transformational

Market Penetration: 5% to 20% of target audience

Maturity: Adolescent

Sample Vendors: Aera; Blue Yonder; E2open; Kinaxis; o9 Solutions; ORSOFT

Recommended Reading: "Defining Digital Supply Chain Planning"

"Leverage Gartner's Digital Supply Chain Planning Maturity Model to Improve Planning Quality"

Sliding Into the Trough

RPA

Analysis By: Simon Bailey

Definition: Robotic process automation (RPA) technology uses scripts to guide automation to replicate the user interface path that a human would use, to conduct tasks that involve only structured digital data. This capability can be offered as a stand-alone technology solution or it can come integrated as part of a broader solution. RPA can execute scripted tasks around the clock, faster, with fewer errors and at less cost than manually executing the same process for tasks that are routine, repetitive, rule-based and predictable.

Position and Adoption Speed Justification: There has been a tremendous amount of hype around RPA, with supply chain trailing behind finance and accounting in terms of adoption. Supply chain departments such as procurement and sourcing, and customer fulfillment have seen the highest levels of adoption at over half of those surveyed indicating they have piloted RPA in 2020. However, some companies have found that due to issues with poor governance, poor data or lack of a center of excellence, they have struggled to move from pilot to scale effectively. Without appropriate oversight, UI-level integration leads to further technical debt as companies underestimate the ongoing governance and maintenance of scripts. A rush to RPA can also lead supply chain leaders to neglect addressing the poorly formed/followed processes. They can also seek to bypass IT and, in so doing, overlook more practical, time-tested alternatives such as intelligent business process management suites (iBPMSs).

User Advice: Stand-alone RPA can be an inexpensive, quick fix to reduce manual workload, improve efficiency, speed up processes and eliminate keying errors. To learn more about integrated RPA, supply chain leaders can talk to specific technology vendors to explore the degree of current and future RPA support they can offer or is built into their tools.

To get the right balance of RPA task and other process-level automation, Gartner recommends that supply chain leaders work with their IT counterparts to determine the role of RPA within the broader hyperautomation strategy that includes a portfolio rather than a single technology. This multidisciplinary team can then review which tool to use when using a simple four-step approach to: (1) identify use cases, (2) validate applicability, (3) quantify return on investment, and (4) prioritize projects.

The use cases will be those with the biggest areas of non-value-added activity such as high levels of manual rekeying or high error rates. Confirm these areas are valid in terms of being standardized, repetitive tasks that occur between stable systems using structured, stable data. Then, quantify the potential benefits, and prioritize based on business impact, ease of implementation, lowest risk and best return on investment (ROI). The ROI calculation should include not only cost (e.g., freeing up of resources), but also positive impact on areas like customer experience and potential to drive growth.

To identify more than the most obvious use cases, use process mining tools to accelerate the discovery of automation opportunities for RPA. RPA is not intelligent by itself. However, it is

increasingly paired with artificial intelligence such as content analytics services to expand the types of content/channels with which the RPA tools can interact.

Business Impact: The business case for RPA should look at the total cost to operate a process today and the potential for improved business outcomes. ROI depends on how inefficiently the process is performed today. Even if an organization has been outsourcing or offshoring heavily labor-based data entry work for some time, RPA could still decrease costs further and increase quality. RPA allows organizations to automate manual work and look at new ways to automate work to deliver business outcomes. Potential savings will depend on the total cost of ownership (TCO). TCO is driven by the pricing model of the RPA vendor (typically, annual robot licenses or RPA as a service) or the package for the supply chain tool, and your organization's IT capabilities in terms of script writing and RPA tool maintenance.

Benefit Rating: Moderate

Market Penetration: 20% to 50% of target audience

Maturity: Early mainstream

Sample Vendors: Automation Anywhere; Blue Prism; E2open; Kofax; Kryon; Microsoft Power Automate; NICE; NTT; RELEX; UiPath

Recommended Reading: "Digital Customer Service Part 3 — Update Process Mastery by Selectively Introducing RPA, Chatbots and AI"

"Tips for When to Use RPA in Sourcing and Procurement"

"Magic Quadrant for Robotic Process Automation Software"

"Cross-Functional RPA Use Cases"

"Video: Robotic Process Automation at Dell"

"Predicts 2020: RPA Renaissance Driven by Morphing Offerings and Zeal for Operational Excellence"

Integrated Business Planning

Analysis By: Tim Payne

Definition: Gartner defines integrated business planning (IBP) as the process that considers the long-term planning horizon. It is supported by S&OP (tactical time horizon) and S&OE (short-term horizon). IBP technology consists of a set of technologies that provide a closed-loop performance management environment to support the strategic alignment, supply chain modeling, long-term demand sensing and trade-off capabilities that are required for long-term planning.

Technologywise, IBP aligns with the configure planning layer of the CORE model.

Position and Adoption Speed Justification: The concept of IBP (also known as Stage 4 or Stage 5 S&OP maturity) continues to develop and embrace strategic and deep financial modeling capabilities that leverage the underlying operational planning and S&OP processes, and that link into the organization's financial planning activities. IBP often develops as a distinct capability that sits over the tactical S&OP process. Gartner defines the technology for IBP as an S&OP system of differentiation (SOD).

Over the last few years, there has been a significant increase in the number of companies looking at IBP. For some, this is just a relabeling of tactical S&OP. For others, it is long-term planning vertically aligned with tactical and operational planning. Consequently, most SCP vendors offer solutions for S&OP and very often companies are looking for solutions that incorporate both the operational and tactical planning layers to ensure consistency and closed loop performance management. However, as a company looks to progress further into IBP, some of the S&OP technologies will be lacking in areas, such as supply chain modeling, long-term demand sensing and depth of financial impact analysis, which will hinder the progress toward full IBP.

User Advice: Be clear on your current and future definition of IBP before acquiring technology. Be aware that vendors that have solutions called "IBP" may be using a different definition of IBP than yours:

- If IBP, to you, means integrated tactical/operational planning such as demand, inventory, replenishment and production planning (short- to medium-term horizon), then you need a planning system of record (SCP SOR).
- If IBP, to you, is synonymous with tactical S&OP, then initially consider the S&OP capability of your incumbent SCP vendor. Try as much as possible not to have different vendors providing SCP technology to the different planning layers (operational planning and S&OP) as this inevitably degrades the decision alignment between these two layers. The technology you require sits in the optimize planning layer of the CORE model. Increasingly, Gartner sees non-SCP vendors such as financial planning and analysis (FP&A) providers getting into S&OP. This is a natural evolution for them as they provide the financial view that S&OP needs to reconcile with. However, these vendors tend to have less experience in the detailed planning of the supply chain, which can result in degraded decision alignment from S&OP down into tactical and operational planning.
- If IBP, to you, means all planning integrated horizontally and vertically across the supply chain, then you will require the full capabilities as depicted by the CORE model. There is currently no single vendor in the market that can provide this as a complete solution. You will have to work with multiple vendors. However, try to keep the layers of CORE as homogeneous as possible.
- If your definition of IBP is aligned with Gartner's, then you need an S&OP SOD from a vendor with a strong roadmap/vision for how they will evolve their capability to support mature IBP. Also consider vendors that have not grown up through SCP (such as generic modeling platforms or financial planning solutions), as some of these will have stronger modeling and financial analysis capabilities.

- If IBP, to you, is considered part of a digital planning initiative, then again, you will need a technology roadmap that addresses each layer of CORE with a robust digital supply chain twin at the center to drive decision alignment and automation.

Business Impact: IBP (Gartner's definition) will enable companies to model and align business strategies to operational strategies across supply chains, ensuring significantly improved supply chain and business performance (such as improved profitability, lower working capital, improved cash flow, higher customer service levels and higher probability of successful product launches) through the full implementation of tactics (such as segmented supply chains, demand shaping and capital investments).

Linking IBP, S&OP and S&OE is key to supporting the journey toward more holistic business planning, with connectivity between short-term, tactical and long-term planning. For many companies, it is the missing link that will allow them to drive better decision alignment throughout the supply chain and into other parts of the organization. It is a key pillar of being able to link strategy to execution.

Benefit Rating: Transformational

Market Penetration: 5% to 20% of target audience

Maturity: Adolescent

Sample Vendors: Adexa; AIMMS; Anaplan; Arkieva; Blue Yonder; Kinaxis; Logility; o9 Solutions; OMP; River Logic

Recommended Reading: "Magic Quadrant for Sales and Operations Planning Systems of Differentiation"

Demand Signal Repository

Analysis By: Amber Salley

Definition: Demand signal repository (DSR) is a centralized database that stores, harmonizes and normalizes data attributes, and organizes large volumes of demand data for use by decision support technologies.

Position and Adoption Speed Justification: The use of DSRs by sales, marketing and supply chain teams continues to expand. Thus, DSRs are maturing. Solutions are being sought by leading organizations to differentiate their product and service offerings.

Driving continued interest in DSRs is the need to accelerate revenue growth, better target and reach consumers, and find drivers of cost savings between trading partners. The consumer products industry is actively scaling DSR solutions across the enterprise and throughout the value chain. One of the biggest hurdles DSRs are addressing is the poor quality of retailer data. This is being tackled through investment in demand analytics platforms that are designed to flag suspect data that falls outside of a normal pattern. Machine learning can be used to automate (parts of) this process.

The adoption rate for DSR solutions will continue to increase as the need to manage inventory, cost and service among trading partners becomes even more important and the business case for investment grows.

User Advice: Sales and marketing departments within consumer goods manufacturers, with a specific interest in account-related information and market trends, should focus DSR adoption on the important retail and wholesale accounts, rather than trying to address all corporatewide reporting and analytics requirements. Similarly, supply chain organizations should ensure that their needs, such as improved forecast accuracy, inventory management, customer service, on-shelf availability and retail compliance, are covered in the solution.

Given the many potential solutions in this area, focus on those that provide insightful analytics tied to business strategy and joint value creation among trading partners. Evaluate the scalability of DSR solutions to ensure they can support organic and acquired growth.

Business Impact: DSR analytics capabilities can provide a framework from which to drive the operations of a consumer goods business and drive a wide spectrum of planning and information systems. DSRs are more than just a single version of the truth. They can also be a critical tool to identify new sales opportunities, manage stock more effectively, improve on-shelf availability, drive agile responses, provide a basis for business forecasting and planning, and link suppliers to downstream data.

Benefit Rating: High

Market Penetration: 1% to 5% of target audience

Maturity: Adolescent

Sample Vendors: E2open; Mindtree (Relational Solutions); One Network Enterprises; Oracle; Retail Velocity; RSi; SAP

Recommended Reading: “Achieving E2E Supply Chain Capability Is Much More Than a Good Demand Signal”

“Reference Model for Demand Signal Management System of Differentiation”

“When Will Consumer Products Companies Be Ready to Make a Demand-Sensing Investment?”

“Lessons From Leaders: Collaborating With Customers to Improve Forecast Accuracy and Drive Joint Value”

“Customer Collaboration Is a Conscious Choice of Consumer Products Supply Chain Leaders”

“Use Downstream Data Collaboration as the Supply Chain Differentiator”

Configure Planning

Analysis By: Tim Payne

Definition: Configure planning refers to the technology that supports a company making decisions and plans about the future configuration of its supply chain. The different configuration options are evaluated to see how they might support the company strategy (e.g., new products, new markets, new business models, new channels, new plants, new distribution centers). Configure planning is the C layer in CORE.

Position and Adoption Speed Justification: Components of configure planning, such as network design, have been around for years. But these applications tend to get used for fairly specific use cases (e.g., distribution center modeling) and are typically performed offline from the tactical and operational planning activities (e.g., optimize planning). Configure planning is about performing end-to-end analysis of different supply chain configurations (and increasingly multienterprise E2E). The chosen future configuration is then operationalized through the other planning layers of CORE.

Companies wanting to perform stronger configure planning are pushing their technology providers to span more of the supply chain (e.g., longer-term demand, multienterprise capabilities, integration to source systems and other planning layers, broader analytical approaches). As a result, the vendors are responding with new capabilities.

User Advice: Configure planning is one of the planning layers in the CORE framework. It typically has not had the highest focus out of the three planning layers (C, O and R) as it is traditionally not seen as a planning capability as it should be. However, leading companies are resetting their focus and understanding that they need to focus on all three planning layers. This puts the spotlight back onto configure planning. We recommend:

- Audit existing supply chain modeling capabilities to see how these can be utilized in a configure planning context.
- Examine your incumbent supply chain modeling vendors' existing and roadmap capabilities to identify how these might fit into a configure planning technology landscape with an E2E focus.
- Pay particular attention to how any configure planning capability supports integration to data sources and the optimize planning layer. This helps to drive alignment of decisions vertically in the company.
- Link the configure planning capability to the integrated business planning (IBP) process. Configure planning technology is a key component of enabling a good IBP process.

Business Impact: Configure planning is typically about the longer-term future and the various options that need to be considered. Therefore, the business benefit is centered on risk mitigation primarily, as the level of uncertainty is higher the further out in time you go. However, in times of crisis, configure planning may need to be done in the short term as changes to the configuration of the supply chain are forced onto a company by external events.

The ability to evaluate different scenarios for the supply chain provides the opportunity to build resiliency into the supply chain configurations, support segmentation efforts and make investment decisions based on a more robust analytical approach. The net effect of these is more informed decision making that will drive benefits in terms of the allocation of capital, customer service, and cost and profitability.

Benefit Rating: High

Market Penetration: 1% to 5% of target audience

Maturity: Adolescent

Sample Vendors: 4flow; AIMMS; Arkieva; Blue Yonder; LLamasoft; OMP; River Logic

Recommended Reading: "Getting Ready for the Digital Future: Strengthen Your Supply Chain Planning CORE"

"Magic Quadrant for Sales and Operations Planning Systems of Differentiation"

Machine Learning

Analysis By: Noha Tohamy

Definition: Machine learning is a technical discipline that identifies patterns and generates predictions based on analyzing large sets of data. There are three major subdisciplines that relate to the types of observation provided: supervised learning (where observations contain input/output pairs [also known as "labeled data"]), unsupervised learning (where labels are omitted) and reinforcement learning (where evaluations are given of how good or bad a situation is).

Position and Adoption Speed Justification: Machine learning discipline has been around for a few decades, having been used extensively in areas like voice recognition, e-commerce recommendations and spam management. However, in recent years, interest in machine learning in the supply chain has skyrocketed given its role as an essential enabler to artificial intelligence. While machine learning promises transformational benefits in the supply chain, current expectations of short-term readiness and benefits remain unrealistic. Instances of broad deployments of machine learning in supply chains are still limited.

Interest in machine learning is driven by the surge in data and supply chain complexity, making traditional analytics techniques and manual analysis inadequate. With machine learning, supply chain organizations can take advantage of available data and rely on the algorithms to identify patterns and correlations, and predict outcomes to find the best course of action. Current applications of machine learning in the supply chain are more functional than holistic. Use cases include supplier risk management in sourcing, predictive maintenance and improved product quality in manufacturing and demand sensing in planning.

User Advice: Supply chain strategy leaders responsible for artificial intelligence and analytics strategy should:

- Vet technology providers' claim to offer machine learning capabilities in their solutions. Due to the high level of interest in machine learning capabilities, vendors' marketing positions might sometimes outpace current capabilities.
- Gauge machine learning's incremental benefits, compared to more traditional techniques, such as time series analysis.

- Quantify the technical resources required to develop and deploy machine learning models. This includes data engineers and scientists to acquire and analyze data and build and train machine learning models.
- Dedicate analytics coaches to train supply chain users on using machine learning output to augment and improve their decision-making process.
- Ensure the availability and readiness of the data that will be used by machine learning algorithms. Given that machine learning relies on training datasets to identify patterns and relationships, good contextual, representative data is paramount to the success of these techniques.

Business Impact: Machine learning will have a significant impact on the supply chain as it revolutionizes how a supply chain organization responds to a changing environment. With machine learning, many supply chain decisions that were previously made, based on rudimentary or manual analysis, can now take advantage of massive amounts of text, video, image and sound data to identify patterns, generate insights and predict future outcomes. In addition, machine learning can improve overall productivity, freeing up human resources that used to be dedicated to these analyses, to focus on higher value tasks.

With machine learning, undetected patterns can be identified by conducting analysis with less preconceived user assumptions or relation definition. For example, a machine learning algorithm can identify the most critical drivers for forecasting customer demand without a need for the user to explicitly identify the drivers.

Various supply chain processes can benefit from adopting machine learning. For example, with machine learning, a manufacturer can conduct real-time analytics to determine the likelihood of future component failure, optimize asset utilization, improve speed to market and minimize product recall. Similarly, supply chain organizations can improve customer service levels by detecting changing dynamics in market demand and needs, and recommending the most appropriate course of action to satisfy those needs. Other potential use cases for machine learning include supplier performance management, supply chain risk management, and pricing and product portfolio management.

Benefit Rating: Transformational

Market Penetration: 5% to 20% of target audience

Maturity: Adolescent

Sample Vendors: IBM; Microsoft (Azure Machine Learning); RapidMiner; SAP; SAS

Recommended Reading: “Supply Chain Leaders: Assert Supply Chain’s Central Role in Your Enterprise’s AI Adoption”

“Defining Digital Supply Chain Planning”

“Supply Chain 2029: Disruptions Impacting Future Innovation”

Continuous Planning

Analysis By: Tim Payne

Definition: Continuous planning refers to a capability to continuously run background planning algorithms that match demand and supply as execution changes. It is supported through the utilization of advanced analytics, AI/ML, a unified supply chain data model and a strong end-to-end pegging capability. The algorithms run across the single supply chain model to assess impacts of real-time downstream and upstream signals on a plan and key performance indicators (KPIs). Continuous planning can be a key component of respond planning.

Position and Adoption Speed Justification: As organizations move toward building supply chain environments that are self-adapting and responsive, they leverage algorithms to identify cause-and-effect relationships. Continuous planning currently has strong implications in the respond time horizon (the "R" of CORE). It can aid in autonomous planning (like autonomous replenishment planning) and with full dynamic pegging across the supply chain model.

The key to a true continuous planning capability is the combination of continuously running algorithms (or those automatically triggered by execution events) and the use of a single data model. Software vendors will have algorithms that run continuously for specific activities, like production planning and inventory planning. As more vendors develop their platforms to support continuously running algorithms, continuous planning will become more pervasive in their SCP environments.

However, a downside of continuous planning is often the nervousness that a constantly changing plan introduces into the supply chain. Also, continuous planning challenges traditional planning organizational structures and processes that were designed for a cyclical planning method. Hence, the full value of continuous planning is probably reserved for resilient planning environments.

Driven by the COVID-19 crisis this year, interest in continuous planning has increased.

User Advice: Continuous planning is more relevant to the respond planning layer, which supports the granular, short-term planning decision making. Its main benefit comes from being adopted for multiple tiers in a supply chain and ideally end to end. Users should start to experiment with using continuous planning within their short-term planning horizon.

Companies deploying continuous planning should ensure the solutions have strong pegging capability and a means to alert to thresholds and tolerances so that the degree of nervousness can be somewhat managed and does not overwhelm the physical supply chain.

The adoption of continuous planning will challenge existing planning processes and organizational structures. Traditional planning processes assume a certain planning cadence that directs planners' daily and weekly tasks. Continuous planning implies an always-on planning mentality that needs to be accommodated appropriately. This will drive the requirement for higher levels of planning automation to cope with the more frequent replans, reviews and exceptions. Users need to take these factors into consideration when deploying continuous planning.

Companies should adopt a digital SCP strategy if they are looking to leverage a continuous planning approach. This implies they are working on their data availability and quality, as well as adopting a digital supply chain twin. This will enhance the benefits of continuous planning, since more granular and near-real-time data can be used by the planning algorithms.

Full value from continuous planning is only achievable once a resilient planning approach is in place.

Business Impact: Continuous planning can aid planning teams in being responsive to disruptive events. As companies attempt to improve their E2E decision making with greater data granularity across multiple time horizons, having constantly running algorithms can provide the intelligence needed to make the most appropriate decision. This can reduce the time it takes to make a decision as well as improve the quality of the decision being made.

Benefit Rating: High

Market Penetration: 5% to 20% of target audience

Maturity: Adolescent

Sample Vendors: Adexa; Arkieva; DELMIA Quintiq; E2open; GAINSystems; Kinaxis; Logility; o9 Solutions; OMP

Recommended Reading: "IT Market Clock for Supply Chain Planning Technology, 2019"

"Digital Business Requires Algorithmic Supply Chain Planning"

"Defining Digital Supply Chain Planning"

"Reference Model for S&OP System of Differentiation"

Prescriptive Analytics

Analysis By: Noha Tohamy

Definition: The term "prescriptive analytics" describes a set of analytical capabilities that finds a course of action to meet a predefined objective, such as maximizing revenue or minimizing costs. The most common examples of prescriptive analytics are optimization methods such as linear programming, rule-based decision making and heuristics. Prescriptive analytics differs from descriptive, diagnostic and predictive analytics, in that its output is a recommended action.

Position and Adoption Speed Justification: Although the concepts of optimization, heuristics and decision analytics have existed for decades, their adoption has steadily increased in the supply chain with greater awareness of advanced analytics, better algorithms, cost-effective cloud-based computing power and available data. Increased interest is also driven by executives' desire for more actionable recommendations to support users; fact-based decision making. Prescriptive analytics augments a user's decision making by recommending a course of action to achieve a defined objective. Furthermore, prescriptive analytics is used to fully automate supply chain processes such as replenishment or materials sourcing.

Traditionally, supply chain organizations have used prescriptive analytics to solve functional problems in the strategic or tactical time horizon, such as network design, sourcing strategies or production planning. Today, organizations seek to leverage prescriptive analytics in near-real-time decision making within areas such as replenishment, pricing or rapid planning.

Historically, prescriptive analytics tools operated as black-box engines, with limited visibility into the inner workings of the model and rationale behind its findings. Today, solution providers have improved solution transparency, explaining the drivers or constraints behind a certain recommendation and providing what-if analysis capabilities. With more transparency, there is broader adoption of prescriptive analytics as users become more comfortable with the validity of the solutions.

Just like predictive analytics, over the next three to five years, Gartner expects prescriptive analytics to reach the Trough of Disillusionment as organizations realize that, while critical, prescriptive analytics does not automatically result in better decision making. Reaping the benefits is heavily dependent on the organization's culture and willingness to rely on prescriptive analytics in their decision making across the supply chain. With improvement not only in prescriptive analytics solutions, but in data quality, talent and organizational culture, prescriptive analytics will continue to advance, reaching the Plateau of Productivity in five to 10 years.

User Advice: To take advantage of prescriptive analytics, supply chain leaders responsible for analytics strategy must:

- Identify the prerequisites for success, ranging from organizational buy-in to redesign of current processes.
- Ensure that organizational structure and governance will enable the company to implement and maintain functional as well as cross-functional prescriptive analytics recommendations.
- Ensure the availability, quality and readiness for data required to conduct prescriptive analytics.
- Secure the internal or external skill sets to generate, implement, and consume prescriptive analytics. Identify the supply chain processes that can benefit from prescriptive analytics and clarify how the output will be embedded in the process. This includes identifying the level of process automation and human intervention.

Business Impact: The impact of prescriptive analytics is significant in the supply chain. Prescriptive analytics can improve decision making in functional areas like planning, sourcing and logistics. More importantly, prescriptive analytics can be deployed to improve the end-to-end supply chain performance because it can recommend a course of action that best manages the trade-offs among conflicting functional goals. This has been an elusive goal, given the complexity of the decisions that must sometimes consider hundreds of thousands of constraints and alternatives.

Although traditionally, prescriptive analytics has been relegated to the strategic and tactical time horizon, more advanced capabilities can support real-time or near-real-time decision making. This means, that for processes such as pricing or available to promise, fact-based decision making can be supported or altogether automated with prescriptive analytics.

With prescriptive analytics, many supply chain processes that have heavily relied on human judgment, like inventory positioning, transportation routing or maintenance scheduling, can now be automated. This might have a significant impact on the role definition and job profile that organizations look for in their supply chain talent.

Benefit Rating: High

Market Penetration: 5% to 20% of target audience

Maturity: Adolescent

Sample Vendors: AIMMS; FICO; Gurobi; IBM; River Logic

Recommended Reading: "Market Guide for Supply Chain Analytics Technology"

"Toolkit: Supply Chain Analytics Maturity Assessment"

Stochastic Supply Chain Planning

Analysis By: Tim Payne

Definition: Stochastic supply chain planning (also known as probabilistic planning) refers to the application of probability theory to help construct a supply chain plan (for example, demand plans, replenishment plans, manufacturing orders, and maximum and minimum inventory levels) that takes into account the randomness of data and information in the supply chain when creating the plans and parameters. A stochastic process, given a particular input, will produce a range of different outputs.

Position and Adoption Speed Justification: There are some SCP modules that employ stochastic modeling and try and come up with better, more realistic plans. Multiechelon inventory optimization is one example. Of course, a basic form of probabilistic modeling has long been used in demand-planning systems to come up with demand forecast error. However, there has been little progress in stochastic supply planning (such as replenishment planning or production scheduling) that helps to determine plans that are more representative of variability. This is because there has been a lack of functionality in existing SCP solutions, as well as an incumbent view in many companies that planning should be done by developing a deterministic plan based on a forecast. However, this view is becoming increasingly challenged as more companies understand the true impact of variability on their supply chains and look for ways to better cope with it.

With the progression of the use of ML in SCP in recent years, some vendors are now offering probabilistic forecasting and, to a lesser extent, probabilistic replenishment creating a range of plans that represent the relevant probability functions.

The eventual maturity of resilient planning will supersede current stochastic planning approaches as it will incorporate stochastic SCP along with a stochastic supply chain model.

User Advice: As most supply chain leaders will attest, supply chains are not deterministic, but are impacted by multiple sources of variability. Trying to model a real-world stochastic process with a deterministic model will always lead to a disconnection between the two, with the deterministic model being a poor representation of reality. In an SCP environment, this often manifests itself in the need to repeatedly redo the deterministic plan to try and drive a convergence between the stochastic real world and the deterministic planning model. A feature of this is the nervousness often seen in planning systems, particularly in manufacturing resource planning (MRP) and manufacturing scheduling tools. In the short term, a deterministic plan is created for the system, which is inherently unpredictable, in large part due to the variability in customer orders. This often doesn't follow a normal distribution pattern, particularly for slow-moving products in the long tail.

Look for opportunities to build more stochastic modeling capabilities in SCP as the company moves up in its digital supply chain maturity. Evaluate demand-sensing solutions that can support stronger stochastic analysis of demand patterns as well as supply-planning solutions that utilize stochastic-based algorithms to determine "replenishment tunnels" that provide a range of replenishment quantity. Target investigations initially into short-term planning processes, such as daily-level forecasting, finished-goods replenishment and production scheduling, or what Gartner calls respond-planning capabilities, as this often has the highest impact in coping with variability.

Business Impact: Stochastic SCP can help improve existing planning regimes through the recognition of the impact of variability on a complex system, such as a supply chain.

As supply chains become more complex and their operating environments more unpredictable, the relevance of stochastic supply chain planning will increase — especially as it is a key part of resilient planning. If used in the appropriate circumstances, it should yield value, as it will help to determine more resilient plans and schedules given the stochastic nature of the products and customers being planned but only if it evolves more fully into resilient planning.

Benefit Rating: Moderate

Market Penetration: 1% to 5% of target audience

Maturity: Adolescent

Sample Vendors: Blue Yonder; E2open; Lokad; SAS; ToolsGroup; Vanguard

Recommended Reading: "Digital Business Requires Algorithmic Supply Chain Planning"

"How Existing and New Technology Can Help Drive the Digitization of Supply Chain Planning"

"Mastering Uncertainty: The Rise of Resilient Supply Chain Planning"

"Innovation Insight for Resilient Planning"

Supply Planning

Analysis By: Pia Orup Lund; Amber Salley

Definition: Supply planning translates demand expectations into time-phased and quantified requirements of capacity, materials, labor and services across the supply network. Success is determined by the fulfillment of customer demand while efficiently utilizing capacity and minimizing waste in the consumption of labor, material, freight capacity, inventory and other resources.

Position and Adoption Speed Justification: As manufacturers and suppliers strive to increase the strategic alignment and effectiveness of their decision making through mature S&OP/integrated business planning (IBP), supply planning is central to ensuring that business tactics for maximization of financial results can be converted into feasible operating plans. Midterm supply plan models analyze key constraints to define key network resource requirements (e.g., internal capacity, third-party services and suppliers, product distribution and inventory levels) and inform the development of aligned individual site and functional operating plans.

Many users have been limited in their capability development by a lack of investment in constraint-based modeling functionality. More mature supply planning capabilities, enabled by the right technology solutions, provide optimization modeling and simulation of what-if scenarios to analyze, visualize and socialize performance trade-offs quickly for more effective management of risks, opportunities and events. Increased emphasis on supply agility drives manufacturers to increase the degree of synchronization between midterm supply planning, operational planning and detailed scheduling for postponed decisions that maintain more dynamic supply balancing with demand. This expands the focus from isolated midterm supply planning to multilevel orchestration of a volatile demand signal to an agile supply response. The move toward multienterprise planning between manufacturers and suppliers will necessitate a focus on supply planning across a supply network. As technology providers integrate more capacities for real-time data sharing across partners, this will transition into a mature mainstream capability.

User Advice: Manufacturing, retail, distribution and service companies rely upon supply planning to translate network capabilities into demand fulfillment outcomes. Approach improved supply planning as the path to enable more integrated supply chain decisions for improved overall performance. At the same time, supply planning cannot completely overcome structural disconnects between network capabilities, demand realities and customer expectations. Develop plans or strategies to operate by three principles for supply planning success:

- Align supply planning and inventory strategies, metrics and incentives with network capabilities and outcome objectives.
- Create feasible midterm supply network plans that balance decision agility with modeling precision. Monitor supply plan and production schedule adherence, but emphasize feasibility and fulfillment of performance outcomes.
- Align tactics with demand and product realities by applying the right combination of agile scheduling and optimized supply and inventory planning for each segment of the product portfolio.

Supply planning capabilities go beyond software selection to aligning with solution partners who can assist the configuration of network models that enable decisions to fulfill demand and maximize value. As competition and performance standards increase expectations on decision speed and

precision, supply planning must evolve to orchestration down through execution. This convergence is impacted by a number of factors that will vary based on industry and supply network details.

- Complexity: The number of factories and production units, bills of material structures, product portfolio size, suppliers and market channels served.
- Dependency: Vertical integration, interplant shipments and common suppliers.
- Constraints: Material lead time and availability, processing and storage capacities, labor, and inventory targets.
- Pressure: Short-order lead times and changes, customer-specific product specifications, inventory target policies, and demand profiles.

Business Impact: For product-based supply chains, the following impact areas apply:

- Risk: High — Supply plan models reflect the complex details of product portfolios and supply networks, making master data setup and accuracy critical. Software tool deployment and model testing and user training are critical to success. Change management to migrate from legacy methods such as spreadsheets is imperative.
- Technology intensity: High — Technology solutions translate demand signals into detailed resource requirements expressed in quantities, timing and location. Supply planning complexity is directly related to product portfolio and supply network complexity.
- Organization change: Medium — Supply planning solutions reduce manual planning effort by 20% or more, enabling faster decisions and increasing the scope of analysis across the entire supply network for better alignment with the business.
- Process change: Medium — Supply plans must be converted to individual operating plans for sites, functions and suppliers, requiring clarification of roles, task sequences and information handoffs.
- Competitive value: High — Supply planning aligns operations across the network to deliver outcomes efficiently by ensuring the capacity and resources are available with the right quantity, timing and location. Absence of supply planning may result in manufacturing activities that are misaligned with business objectives or harshly subjected to inefficiencies imparted by the volatility of an unfiltered demand signal.

Benefit Rating: High

Market Penetration: 20% to 50% of target audience

Maturity: Early mainstream

Sample Vendors: Adexa; AspenTech; Asprova; Dassault Systèmes; Infor; Optessa; Oracle; ORSOFT; PlanetTogether; SAP

Recommended Reading: “Make the Business Case for Supply Planning by Answering Five Questions”

"Follow a 5-Step Supply Planning Process to Support Business Objectives and Drive End-to-End Supply Chain Profitability"

"Operationalize Inventory Reduction Targets With Integrated Supply Plan Proposals"

"Optimize Supply Chain Network Capacity Utilization for Manufacturing Competitiveness"

Profitable to Promise

Analysis By: Pia Orup Lund; Tim Payne

Definition: Profitable to promise (PTP) tools combine the capabilities found in available to promise (ATP) and capable to promise (CTP). They then add the consideration of the projected profitability of fulfilling a specific customer order at the time of acceptance and promise, taking into account the opportunity cost of not consuming resources and leaving them for other orders and/or forecast orders. PTP is defined as being part of the respond-planning category.

Position and Adoption Speed Justification: PTP enables organizations to get a clear view of the true profit generated by accepting a specific order (or not accepting one in favor of a forecast order with greater margin). It can also indicate the impact on overall profitability at the customer and organizational levels. Without this capability, organizations are left to accept orders based on available inventory and/or capacity, with a margin assessment based on absorbed costs and average selling prices. Given the prevailing circumstances of the supply chain, this doesn't provide a true view of the real profit generated by taking the order. Therefore, PTP capability can be a key part of providing a profitable supply response to demand signals as part of a demand-driven value network initiative.

Variations of PTP have been around for years, usually in the form of sophisticated CTP systems with additional cost and pricing attributes. The demand for PTP has been low as companies struggle to implement ATP and CTP capabilities for their supply chains. However, with many organizations striving for a closer link to the financial area and asking, "What is a profitable response to demand?," PTP will become more popular, especially because it can be a key capability in helping to execute on a segmented supply chain strategy in the short-term execution time window.

User Advice: Companies will look to PTP to help them make complex decisions in near real time. However, many of them will be disappointed because they won't have sufficient integration across the planning processes of their supply chains. Nor do they have detailed and relevant-enough cost information to drive coherent and meaningful PTP calculations, or the agreed-to business rules on how they want to prioritize orders in line with their business strategy and/or supply chain segmentation initiatives. This can result in aggregate-level or average-level cost information used to derive customer-level profitability analysis limiting the usefulness of the calculations in determining the true impact of customer-level activity on the supply chain.

Users need to be practical in terms of what can be achieved. Get mature integrated planning and ATP and/or CTP up and running before jumping to PTP. ATP and CTP initiatives will quickly highlight issues with system or process integration and supply chain data availability and quality, as well as a lack of clarity on the rules of business engagement for order promising. PTP layers-in other

requirements for integration with customer management and information processes, as well as meaningful and available cost data. Because PTP is hard to bolt on to existing planning systems, carefully consider the right technology to support it upfront, if you consider leveraging this capability in the future.

Business Impact: PTP brings the examination of what drives profitability to the executional and operational level, where it's often missing. How the supply chain is run has a significant impact on a company's profitability, but most detailed analyses of profit are backward looking. Any forward-looking profit analysis is typically high level and can be meaningless to operations. Profit-generating policies can be devised and enacted in operations through the deployment of PTP — for example, executing on a segmented supply chain strategy where tailored supply chain designs have been devised for different customer segments.

Benefit Rating: High

Market Penetration: 1% to 5% of target audience

Maturity: Emerging

Sample Vendors: Blue Yonder; DELMIA Quintiq; E2open; Kinaxis; Logility; o9; OMP; Oracle; SAP

Recommended Reading: "Getting Ready for the Digital Future: Strengthen Your Supply Chain Planning CORE"

"Gartner's Demand-Driven Model for Supply Chain Excellence"

Predictive Analytics

Analysis By: Noha Tohamy

Definition: Predictive analytics is a form of advanced analytics that examines data or content to answer the question, "What is likely to happen?" It includes techniques such as regression analysis, multivariate statistics, pattern matching, predictive modeling and forecasting.

Position and Adoption Speed Justification: Supply chain organizations strive to become more proactive in managing their supply chains. For that, they rely on predictive analytics to anticipate future trends in demand and supply. Broader availability of internal and external data — such as Internet of Things data, dynamic sales data and weather patterns — allow organizations to more effectively leverage predictive analytics. Today, there are many successful examples of organizations that have generated significant return on investments in areas like improving the demand forecasting or predictive maintenance processes

Recently, interest and adoption of predictive analytics has enjoyed a significant increase thanks to corresponding interest in machine learning techniques that are capable of generating more accurate predictions with little human intervention.

Predictive analytics has traditionally targeted problems in the strategic and tactical time horizon. For example, supply chain can use long-range demand forecasting to determine strategic capacity

investment. Tactical demand forecasting, which is based on time series analysis, can be used to determine the expected monthly sales figures. Now, with more advanced techniques, predictive analytics are deployed in real-time or the near-real-time horizon in areas such as dynamic pricing, product quality testing, dynamic replenishment and demand shaping.

Predictive analytics is steadily approaching the Trough of Disillusionment as more organizations realize that, while essential, predictive analytics are not sufficient to make and more proactive, data-driven decisions. Predictive analytics will reach a period of broader adoption and productivity in five to 10 years.

User Advice: To take advantage of predictive analytics, supply chain leaders responsible for analytics strategy must:

- Ensure the availability and readiness for the data required to conduct predictive analytics.
- Build a foundation of descriptive and diagnostic analytics. Without understanding what is going on and what might be the problem, it is unrealistic to accurately predict future outcomes.
- Educate your organizations on new predictive analytics technologies that can handle more dynamic data sources and satisfy requirements for faster response times.
- Secure the internal or external skill sets to create and deploy predictive analytics solutions.
- Identify the supply chain processes that can benefit from predictive analytics and clarify how predictive analytics' output will be embedded in the process and incorporated in users' decision making.

Business Impact: Predictive analytics is undoubtedly a powerful competency that enables companies to be proactive and take advantage of a future opportunity, or mitigate or altogether avoid a future adverse event. Benefits of predictive analysis include better quality, cost savings, uninterrupted customer service or bigger market share.

Predictive analytics can drive supply chain process redesign. Processes that fully relied on human judgment can now be heavily powered with predictive analytics. This might have a significant impact on supply chain talent needs.

Supply chain leaders must realize that predictive analytics, on its own, might not generate sought-after benefits. This is because the benefits are predicated on what the organization does once it identifies the likely future scenarios and are tied to the course of action that the organization takes, based on these predictions. This is where prescriptive capabilities come into play. Prescriptive analytics will build on predictive capabilities by recommending the optimal course of action, given business objectives.

Benefit Rating: High

Market Penetration: 20% to 50% of target audience

Maturity: Early mainstream

Sample Vendors: Blue Yonder; IBM; Logility; SAP; SAS

Recommended Reading: "Market Guide for Supply Chain Analytics Technology"

"Toolkit: Supply Chain Analytics Maturity Assessment"

Internet of Things

Analysis By: Michael Burkett

Definition: The Internet of Things (IoT) is the network of dedicated physical objects that contain embedded technology to communicate and sense or interact with their internal states and/or the external environment. IoT comprises an ecosystem that includes assets and products, communication protocols, applications, and data and analytics. IoT is a core building block for digital business and digital platforms.

Position and Adoption Speed Justification: IoT is entering the trough as we see many companies implementing, but our interactions indicate practitioners are still struggling to define the best opportunities for using its measurement and tracking capabilities. Adoption is growing in select supply chain domains more so than as part of an end-to-end supply chain initiative. Our surveys show solid interest in IoT. According to Gartner's 2019 Digital Business Impact on the Supply Chain Survey, 59% of respondents said they have partially or fully deployed IoT across the entire organization. Another 22% are currently piloting and 15% have not invested yet, but planned to invest in the next two years. We see further potential to grow its use over the next several years. Gartner estimates that installed IoT endpoints for manufacturing and natural resources industries are forecast to grow to 1.9 billion units in 2028. That is five times from 331.5 million units in 2018 (see Gartner's IoT Forecast Tool).

User Advice:

- Work with process subject matter experts to identify supply chain processes that can benefit from IoT, ranging from demand fulfillment and better customer visibility to manufacturing process optimization. The strategist must outline how IoT adoption might require redesign of these processes.
- Partner with IT and OT counterparts to remain engaged in the organization's overall digitalization strategy.
- Potentially offer data collected from IoT-enabled technologies to internal and external supply chain partners. For example, the supply chain group can provide customer usage data to internal partners in the product development and aftermarket services groups. Strategists might also consider offering this data to suppliers for better inventory management and customers for better visibility into their orders.
- Be aware of how IoT external providers may use and possibly monetize captured data.
- Keep up with innovation in and maturity of IoT technologies that will impact the speed of adoption and return on investment.

- Learn from the IoT use cases outside of their industry and in functional areas outside the supply chain, and assess their applicability in the supply chain.

Business Impact: Manufacturing is one area where we see IoT adoption. A food producer applied sensors to capture attributes on one production line. Better understanding of where tolerances would be out of control helped create just under $500,000 savings on the pilot alone.

The IoT could have broad and profound impacts on the supply chain in areas such as:

- Improved asset utilization and higher uptime through remote monitoring and maintenance.
- Improved customer service by better understanding customer behavior and needs, and proactively responding to and shaping customer demand.
- Ability to offer full solutions that include physical products, services and technology. Services can include preventative maintenance and autoreplenishment.
- Ability to create information-based products such as visibility and analytics for better asset usage.
- Improved end-to-end supply chain performance by enabling the right trade-offs and balancing conflicting goals across functional areas.
- Improved supply availability and reliability by better visibility into supplier assets, inventory and risk.

Benefit Rating: Transformational

Market Penetration: 5% to 20% of target audience

Maturity: Adolescent

Sample Vendors: Shopkick; Supermechanical; Thinfilm

Recommended Reading: “Supply Chain 2029: Disruptions Impacting Future Innovation”

“Innovation Insight for Internet of Things in Supply Chain”

“Consumer Products Supply Chainnovator 2019: Anheuser-Busch InBev Wins for Using AI to Boost Beer Quality”

“Prepare for IoT’s Disruption of Customer Fulfillment and Collaboration”

“The 2020 Strategic Supply Chain Technology Trends”

Data Lakes

Analysis By: Nick Heudecker; Henry Cook

Definition: A data lake is a concept constituting a collection of storage instances of various data assets combined with one or more processing capabilities. Data assets are stored in a near-exact, or even exact, copy of the source format and in addition to the originating data stores.

Position and Adoption Speed Justification: Though data lakes have started emerging from the Trough of Disillusionment, a majority of the market still exhibits significant confusion over the data lake concept, how it compares to concepts like data warehouses and data hubs, and how it supports different user groups and service-level agreements. Another portion of the market is embracing packaged data lake offerings from cloud providers and other vendors. These packaged offerings help enterprises conceptualize both what a data lake is and where the data lake fits into their data estate. Adoption of these products has pushed data lakes through the Trough of Disillusionment and toward the Slope of Enlightenment.

This progression has come at a cost. Data lakes have already run their course for many organizations. Some companies struggled to determine the return on investment for their data lake projects, failing to uncover a single meaningful outcome that originated from their lake. Others found some success in their experiments but struggled to evolve those experiments into production for a variety of reasons. Many of these organizations gave up on their data lakes, preferring to use infrastructure that accommodated diverse analytics consumers, rather than solely accommodating data scientists.

Despite progression along the Hype Cycle, data lake success is far from guaranteed. Infrastructure is only one part of the data lake equation. Data and analytics leaders must design and implement a pipeline to move projects into production, ensure high quality, reproducible outcomes, and develop highly skilled individuals that can derive value from datasets with varying levels of context, quality and format.

User Advice:

- The fundamental assumption behind the data lake concept is that everyone accessing a data lake is moderately to highly skilled at data manipulation and analysis. Before implementing a data lake, ensure you have either the necessary skills, such as data science or engineering, or a plan to develop them.
- Recognize that results will likely be difficult to reproduce between analysts. By definition, data stored in data lakes lacks semantic consistency and data governance of any kind. This makes data analysis highly individualized (a consumerization of IT goal) at the expense of an easy comparison or contrast of analytic findings (also indicative of consumerization of IT).
- There are certain SLA expectations that can be served by data lakes. However, most end-user SLAs for analytics rely on repeatability, semantic consistency and optimized delivery. Once data lake efforts confront these SLAs, it is time to explore alternative information management architectures, such as the logical data warehouse, to rationalize how information is stored with how it is used.
- Evaluate a variety of implementation options. Cloud-based data lake offerings are increasingly popular choices and provide a simple pattern for data ingestion and consumption, but no two

data lakes are the same. Your users' needs may require a radically different implementation than prepackaged services. Expect your data lake to be a portfolio of processing capabilities.

- Many organizations think of a data lake to share data within the organization, roughly equivalent to data as a service. This frequently results in multiple copies and lineages of data — exactly what many data lake advocates said wouldn't happen. Alternative architectures, like data hubs, are often better fits for such use cases (see "Use a Data Hub Strategy to Meet Your Data and Analytics Governance and Sharing Requirements").

Business Impact: The data lake concept has the potential to have a high impact on organizations, but its effect is only moderate at present. To get full value from a data lake, its users must possess all the skills of a system analyst, data analyst *and* programmer. They should also have significant mathematical and business process engineering skills — otherwise it will still have a significant impact, but a highly undesirable one.

Depending on the method of implementation, a data lake can be a low-cost option for massive data storage and processing. Processed results can be moved to an optimized data storage and access platform, based on business requirements and tool availability. However, the potentially high impact of this will be diluted by vendors seeking to use the term "data lake" merely as a means of gaining entry to the highly mature analytics and data management markets. This presents the potential for some very real lost opportunities and large sunk costs, as a balanced warehouse/services/lake architectural approach would be the better solution.

Benefit Rating: Moderate

Market Penetration: 5% to 20% of target audience

Maturity: Adolescent

Sample Vendors: Amazon Web Services; Cambridge Semantics; Cazena; Google Cloud Platform; IBM; Informatica; Microsoft; Oracle; Zaloni

Recommended Reading: "How to Avoid Data Lake Failures"

"Solve Your Data Challenges With the Data Management Infrastructure Model"

"Efficiently Evolving Data From the Data Lake to the Data Warehouse"

"Data Hubs, Data Lakes and Data Warehouses: How They Are Different and Why They Are Better Together"

"Building Data Lakes Successfully"

"Metadata Is the Fish Finder in Data Lakes"

CORE

Analysis By: Tim Payne

Definition: The CORE framework categorizes SCP technology under three major headings — configure, optimize or respond — with a strong connection to execution visibility. Configure planning determines the right configuration of the supply chain. Optimize planning produces a plan that best uses the constrained resources with the current configuration. Respond planning recognizes that execution is unlikely to follow the optimal plan, and that a response is required to these execution events in a way that keeps a company as close as possible to corporate goals.

Position and Adoption Speed Justification: The CORE model resonates with SCP professionals as a good way to explain the different planning capabilities that are required. It helps to explain how the horizontal planning layers can be integrated vertically through an organization.

However, there are no SCP vendors in the market that can cover all the planning layers in CORE, which means that a company needs to mix together technologies from different vendors in their technology landscape. That will likely change over the next few years as SCP vendors build out their planning capabilities in line with CORE. They are seeing more pull from the market that end users want the type of capabilities that are described by the CORE model in a unified solution.

The advent of more digital planning will accelerate the move toward CORE becoming more of a reality for companies.

User Advice: Companies developing an SCP technology roadmap, and especially one that has a strong digital element, should ensure that the three key planning layers are adequately utilizing a framework such as CORE. Also, CORE is a fundamental requirement for a switch from traditional "accuracy-focused, deterministic" planning to resilient planning and resiliency.

Audit existing SCP technology assets to better understand what coverage is currently in each of the CORE layers. Compare the current SCP technology landscape with key SCP initiatives (especially any digital planning requirements) and identify the gaps.

Create a high-level SCP technology roadmap that highlights which CORE technologies are or will be required to support the future-state SCP business capability maturity levels.

Link the evolution of the planning CORE to any digital planning goals by matching with the degree of horizontal and vertical decision-making alignment called for in your digital SCP roadmap.

Business Impact: Having a strong CORE is key to helping a company move along its digital planning maturity journey. If a company's technology matches with the CORE framework, this ensures that the horizontal and vertical alignment of planning decisions is happening. It ensures that a company reduces the level of chaotic planning decisions it makes through this alignment, linked to "execution visibility" of the E layer and across the other CORE layers. The E layer further helps with reducing the latency of the data used by planning. The R layer helps to ensure that the right planning analytics are available to take the E layer data and run with it — creating scenarios that provide the best decisions for how to respond to significant execution events. The E layer also allows for the ingestion of granular data from, for example, business networks and IoT sensors. This data is then available to the R, O and C layers for appropriate planning decisions.

Benefit Rating: High

Market Penetration: 5% to 20% of target audience

Maturity: Adolescent

Sample Vendors: 4flow; AIMMS; LLamasoft

Recommended Reading: "Getting Ready for the Digital Future: Strengthen Your Supply Chain Planning CORE"

Optimize Planning

Analysis By: Tim Payne

Definition: Optimize planning refers to the ability to create an optimal plan given the current resources and configuration of the supply chain. It is focused on creating optimal demand and supply plans, taking account of any constrained resources to best achieve the goals of the company. It is the O layer in the CORE model.

Position and Adoption Speed Justification: Optimize planning is typically more centered on the tactical time frame. It is the area of planning that most SCP vendors grew up in, hence it is well-represented in the market. Most companies have some form of optimize planning in their SCP technology landscape.

Optimize planning traditionally covers the domains of demand, inventory and supply planning. It is currently being expanded to also cover other resource types/assets that should be considered when developing a feasible tactical plan (e.g., workforce, transportation, finance).

Over the last few years, companies have been progressively trying to deploy their optimize planning capability end to end to support a balanced integrated plan across at least the enterprise supply chain. With the evolution of cloud-based SCP solutions, in-memory computing and single data models (eventually becoming digital supply chain twins), this integration of functional planning is becoming easier to achieve.

User Advice: Optimize planning is one of the planning layers in the CORE framework. It is the most evolved of all. To improve their planning, organizations need to align planning decisions horizontally and vertically throughout the supply chain. Optimize planning is one of these horizontal layers, and as such, acquiring an integrated end-to-end optimize planning capability should be a key part of any company's SCP technology roadmap.

It is likely a company already has some commercial SCP software in place and should therefore determine whether the incumbent SCP vendor can support integrated E2E optimize planning. Acquiring the right optimize planning capability is a key consideration for a planning system of record, as getting a feasible, balanced tactical plan is the starting point for most companies.

Ensure that the solution chosen for optimize planning has the appropriate predictive and prescriptive analytics for the target supply chain (such as heuristics, optimization and/or ML).

If there is a need to co-plan with suppliers and/or customers, ensure that the optimize planning capability is cloud-based and scalable so that it can be stretched out to key trading partners.

Business Impact: Optimize planning is targeted on producing a balanced feasible plan leveraging a company's key resources to best achieve specific supply chain goals such as service, cost and profitability. Optimize planning is a key capability to support a strong S&OP process — both Stage 3 and Stage 4 S&OP maturity (aka IBP).

At Stage 3 maturity, the benefits of optimize planning focus on improving internal measures such as inventory turns, customer service and cost. At Stage 4 maturity, the focus switches to improving external measures such as profitability and market share.

Benefit Rating: High

Market Penetration: 20% to 50% of target audience

Maturity: Early mainstream

Sample Vendors: 4flow; Adexa; Arkieva; Kinaxis; o9 Solutions; OMP; ORSOFT

Recommended Reading: "Getting Ready for the Digital Future: Strengthen Your Supply Chain Planning CORE"

"Magic Quadrant for Supply Chain Planning System of Record"

Climbing the Slope

Supply Chain Planning System of Record

Analysis By: Tim Payne

Definition: A supply chain planning system of record (SOR) is a platform that enables a company to create, manage, link, align, collaborate on and share its supply chain plans across a supply chain. It spans from demand creation to detailed supply-side response, and from operational to tactical-level planning. A planning SOR is the single version of the truth for the end-to-end supply chain plan. It will typically cover most of the optimize and respond planning layers of the CORE model.

Position and Adoption Speed Justification: A capable SCP SOR is a prerequisite for Stage 3 planning process maturity. Key factors driving companies toward standardized and integrated SCP include:

- Increasing globalization of supply chains, which drive larger planning models
- The need for a single version of the truth to help align key resources to fulfill the demand signals, supported by end-to-end integrated planning
- Increasing SCP process maturity and associated best practices to support improved supply chain performance

- The increasing need to support sales and operations planning (S&OP) processes to help govern the supply chain and provide a decision-making forum to connect to the business strategy
- More complex and uncertain operating environments
- The increasing need to support more granular planning

Increasingly, users will require planning SORs that can cover their extended multienterprise supply chains as well as their internal enterprise plans. This has pushed SCP vendors to move to software as a service/cloud technology and fast-planning capabilities (e.g., in-memory data models) as a means to support these large, extended planning models.

Companies trying to use their legacy SCP solutions are often hitting scale and integration issues, and lack of usability and future-proofing.

User Advice: To support maturing SCP processes, consider a planning SOR deployment, especially if you are:

- Looking to standardize on a particular SCP technology to leverage skills, integration and best practices across the organization.
- Looking to improve S&OP processes. The need for an integrated operational planning capability is foundational to a strong S&OP process that is linked back to operations and execution, as well as across other planning domains in the company (for example, financial, labor, new product and suppliers).
- Looking to get better data and process integration along the supply chain, supported by a single version of the truth, improved plan visibility and strong internal collaboration to ensure alignment and consensus for the resulting plans.
- Looking to mature planning processes through the acquisition of additional planning functionality, but within the context of an integrated operational planning environment so as not to create islands of process, data, optimization or ERP integration.

In some cases, an SCP solution that is locally deployed could be expanded to become a planning SOR. In other cases, companies will need to replace existing SCP technology with an appropriate SCP SOR solution. Carefully evaluate SCP vendors to see whether they are able to support a planning SOR. This will mean more than just the functional breadth and depth of the solution/modules. It is paramount that the architecture of the SCP solution is appropriate for an SCP SOR role in that a single model of the supply chain is leveraged by the different planning analytics (demand, inventory, production, etc.).

Business Impact: SCP SORs enable enterprises to make better use of resources by coordinating supply and demand, and by using analytics to help identify anomalies in demand and supply conditions across a complete supply chain. They will support the move to more global and extended supply chains, allowing for a strong foundation from which to build higher-maturity planning processes, process standardization and an environment in which it is easier to propagate best practices.

Business value is determined by process maturity and, incrementally, by increasing maturity, which requires a layering up of appropriate SCP technology starting with the SCP SOR. Although the impact of an initial SCP SOR deployment is capped at what Stage 3 planning processes can deliver, Stage 4 planning maturity can only be fully realized with relevant SCP systems of differentiation layered on top of a suitable SCP SOR. Ideally these SCP SODs should come from the incumbent SCP SOR vendor.

Typical justification for an SCP SOR include inventory and cost reductions, customer service improvement and planner productivity increases. Most SCP vendors have added some ML to their solutions to help enable some nascent digital planning capabilities for their customers, especially in the realm of demand forecasting and decision automation.

Benefit Rating: High

Market Penetration: 20% to 50% of target audience

Maturity: Early mainstream

Sample Vendors: Arkieva; Blue Yonder; Dassault Systèmes; E2open; Kinaxis; Logility; OMP; Oracle; ORSOFT; ToolsGroup

Recommended Reading: "Reference Model for SCP System of Record"

"Best Practices for Developing a Pace-Layered Application Strategy for Supply Chain Planning"

"Magic Quadrant for Supply Chain Planning System of Record"

SC Segmentation

Analysis By: Jennifer Loveland

Definition: Segmentation defines a menu of outcomes and optimizes the relevant processes to deliver them. Supply chain uses can be end to end (E2E), focused on distinct customer experiences from order through services, or targeted to a role, function or process. Each use has:

- Distinct operational outcomes with two-to-five standard operating procedures.
- Different targets for relevant financial and operational metrics.
- Defined flows through the physical and digital supply chains.
- Required behavior changes across and outside supply-chain-owned activities.

Position and Adoption Speed Justification: All supply chains balancing growth, efficiency and increasing supply chain complexity benefit from segmentation techniques. It can also enable a shift to an outside-in value focus required of maturity levels 4 and 5. Historically, application of segmentation in supply chain has been ad hoc, preventing a tie to metric targets and performance. Successful implementations have a repeatable, standardized playbook and ongoing segmented governance. The Hype Cycle position represents an average of varying adoption profiles across the extremes of the segmentation complexity.

Over the past two to five years, about half of large, leading supply chains in all industries have successfully implemented E2E segmentation. Supply chain maturity of stage 3 and above is critical for successfully sustaining implementation. Lower-maturity and smaller organizations will continue to adopt E2E segmentation as they mature. Successful E2E segmentation implementation examples show highly complex changes taking two to three years to implement. More companies have begun design of E2E segmentation, moving it closer to the productivity plateau. However, It will be five to 10 years before it is mainstream for companies to operate differentiated E2E supply chain models globally as many of the first few implementation attempts will fail due to lack of maturity based pre-requisites.

Smaller-scope targeted segmentations (categorizing suppliers, ABC inventory categories, targeted customer collaboration, etc.) are formally documented in about half of all supply chains, with almost all having ad hoc targeted supply chain segmentation in place. Successful implementation examples can take days, weeks or months in organizations of maturity level 2 and above. There are identified use cases for each supply chain function. We expect it will be two to five years for a consensus formal segmentation approach to be documented that will enable full mainstream adoption with explicit ties to financial and operational metrics.

User Advice: Chief supply chain officers (CSCOs) should create a standard segmentation playbook to allow the process of segmenting to improve continuously.

Create an E2E segmentation aspiration to move from a one-size-fits-all execution model to a standard menu of E2E operating models aligned to customer needs. This helps to efficiently support CEO growth priorities often enabled by product, market and channel expansions that add to supply chain complexity. It provides a tangible goal to plan change roadmaps and help shift the cultural focus toward customer and business value. Successful E2E segmentations require a multiyear roadmap, advanced maturity of Stage 3 or above, cost-to-serve analysis, common metrics and collaborative decision making.

Supply chains realize near-term value through smaller-scale targeted segmentations within specific supply chain functions. Examples include new product introduction, procurement, planning, manufacturing, inventory management, logistics and customer service. CSCOs appoint specific leaders in continuous improvement teams, centers of excellence and strategy organizations to own the standardization, application and refinement of segmentation across the supply chain.

Both E2E and targeted forms must ensure that the complexity introduced by segmentation has business value by identifying:

- **Relevant:** Significant, quantifiable impact to financial and operational measures that warrants added complexity and behavior change.
- **Behavior changes:** Specify changes from current approach and justify when, why and how resources choose between ways of completing a task.
- **Sustainable:** Ability to deploy, operate, maintain, govern and refine multiple approaches to a single process over time.

Supply chain segmentation allows you to effectively handle complexity. Each collection of targeted or E2E supply chain segments must be repeatedly refined as the business and customer needs change. This should be done as part of annual strategy planning, as well as during specific events such as new product launches, new routes to market or mergers and acquisitions.

Business Impact: A segmentation capability has value in any supply chain or process serving heterogeneous needs. Applying a one-size-fits-all approach to fulfill a set of diverse needs causes the process to overserve or underserve various needs. Creating a portfolio of two to five approaches — each tailored to a specific set of needs — reduces waste from overserving and underserving.

Each application of segmentation will yield unique benefits to the business based on the process scope impacted, the current process performance, and the different outcomes and approaches defined. Companies successfully completing E2E segmentation have reported cost savings of over 30%, customer satisfaction improvement of over 50% and significant lead-time reductions in specific segments. Organizations successfully completing targeted segmentation have reported cost savings and productivity improvements of well over 10%.

Benefit Rating: High

Market Penetration: 20% to 50% of target audience

Maturity: Early mainstream

Recommended Reading: "Segmentation 101: Apply Supply Chain Segmentation to Serve Diverse Needs and Reduce Waste"

"How to Choose the Right Type of Supply Chain Segmentation for Your Objectives"

"Use End-to-End Supply Chain Segmentation to Support Growth, Operational Excellence and Increasing Complexity"

"Supply Chain Brief: Achieve Transformative Benefits From End-to-End Supply Chain Segmentation"

"Five Phases for Successful Supply Chain Segmentation"

Short-Term Demand Sensing

Analysis By: Amber Salley

Definition: Demand sensing provides real-time visibility and predictive insights into channel demand, and is enabled by advanced technologies that incorporate channel data into a set of strong foundation planning, modeling and analysis practices. Pattern recognition, performance analytics, simulation and optimization, and scenario management support short-term and midterm demand and account management.

Position and Adoption Speed Justification: The integration of a demand-sensing capability is growing as organizations seek methods to differentiate their demand management approach and to get a more accurate signal for supply planning. Demand-sensing technology has been in use since the early 2000s and the technologies are maturing to include the use of simulation and optimization. This capability has been used primarily in B2C environments with a focus on near-term forecast enhancement, and efforts are being made to extend demand sensing to midterm planning horizons. The integration of unstructured data into demand management activities incorporates consumer sentiments from social networking websites.

Demand sensing within industrial B2B models has relevance since manufacturers attempt to gain visibility to demand through indirect wholesale and distribution channels. While the technology for enablement is available, alignment of incentives to foster collaboration with indirect channel partners remains a challenge. Vendor-managed inventory (VMI) is one form of collaboration with direct customers that can offer the potential for increased demand visibility which can then be used by demand sensing algorithms to more accurately predict demand.

User Advice: The mastery of demand-forecasting and demand-planning capabilities is essential to effectively support demand sensing. This mastery includes having a mature demand-planning process with appropriate governance and accountability frameworks in place. The value of demand sensing comes from having infrastructure in place to collect and cleanse data, and having good analytics to translate data into better demand forecasting inputs.

Different elements within the Internet of Things (IoT) can prove to be very valuable input to the demand-sensing algorithms. Organizations must therefore be aware of possible IoT initiatives that can enrich the demand-sensing capability.

Demand-sensing tools are part of a structured supply chain planning (SCP) technology platform. For demand sensing to improve supply chain responsiveness, there must be an adequate supply response capability built into the technology environment.

Business Impact: Companies invest in demand sensing to reduce forecast error and improve inventory management. Other benefits include more frequent statistical forecast generation and reduced lag periods. Demand sensing enables value chain partners to be more responsive to consumers' changing needs and preferences. This capability has been used in B2C environments. Combined with demand-shaping activities like trade promotion management, demand sensing is an effective tool in understanding sell-through activities and the impact to product mix and customer mix for margin and profit enhancement as well as support inventory and service objectives.

The integration of causal data and unstructured data into demand management activities incorporates consumer sentiments from social networking websites. The impact to supply planning and scheduling is that real-time sensing can replace rule-based consumption of demand forecasts.

Benefit Rating: High

Market Penetration: 5% to 20% of target audience

Maturity: Early mainstream

Sample Vendors: Arkieva; E2open; Kinaxis; Logility; Lokad; Oracle; SAP; SAS; ToolsGroup; Vekia

Recommended Reading: "Market Guide for Demand Signal Management Vendors"

"Reference Model for Demand Signal Management System of Differentiation"

"When Will Consumer Products Companies Be Ready to Make a Demand-Sensing Investment?"

"Three Basic Actions to Start in Order to Use Artificial Intelligence in Demand Planning"

Network Design

Analysis By: Kamala Raman

Definition: Gartner describes network design as the creation of a supply chain model to optimize the network for chosen strategic objectives. Objectives may include creating an agile network that is highly responsive to changing customer needs, cost efficient, flexible to handle demand variability, rationalized after an acquisition, or one that is resilient.

Position and Adoption Speed Justification: In volatile business environments, companies using an analytics driven approach to designing their supply chain can better assess trade-offs between conflicting priorities. This has been proven through the last few years of global trade turbulence and in this year battling a pandemic as companies navigate an environment where network configurations of the past are being questioned. Examples of use cases include aligning footprints with business model changes, balancing efficiency against resilience, supporting multichannel fulfillment, optimizing capacity and responding to trade policy fluctuations. Scenario analysis can help with placing considered strategic bets amid uncertainty. Creating a suitable design early in a product life cycle before functional constraints are in place allows for better optimization of the total costs. Periodically testing fulfillment options and policy settings can ensure a physical configuration that enables appropriate trade-offs between inventory, cost and service-level requirements.

Cloud-based platforms offer scalable and collaborative solutions that can cut the solution time for large and complex models. This complexity presents a need for dedicated analytical resources and the learning curve for technology limits mainstream adoption of software tools. Software vendors are offering configurable applications to tackle focused problems and service providers are responding with delivery models that range from one-off network analysis to ongoing model management. 3PLs and contract manufacturing partners also offer design services for their customers and prospects.

User Advice: Make network design a mainstay of analytics initiatives within supply chain, with input from manufacturing, sourcing, logistics and trade compliance. Prioritize the ability for scenario planning to be conducted more frequently to improve decision making ability. Balance objectives around cost efficiency and customer experience with network resilience when configuring the network structure. Shortlist alternate scenarios with stakeholders, identify constraints on the network, create the baseline and to-be network models, and provide trade-off analysis for the selected scenarios.

To optimize the manufacturing or distribution footprint, select the to-be design on its expected performance to the chosen objectives but also on qualitative criteria. To optimize tactical capacity and product flows, review policy settings periodically to ensure the network can flexibly meet changing business needs

Network design inputs include long term customer demand, service-level requirements, costs, and constraints. Costs include the labor, facility and inventory cost structures of factories and warehouses, and transportation and handling costs for product flow through these locations. Constraints could be by site (capacity, contractual need to stay open), capability (production technologies or the need for a cold chain), resiliency (dual sourcing or diversifying manufacturing), sustainability (lowering carbon footprint) or regulatory/tax needs. “Soft” or qualitative criteria can include complexity of implementation, market perception of social and environmental impact or sourcing locations and brand value of the ability to mitigate or avoid disruptions.

Business Impact: Consider the following impact areas:

- **Risk: Medium —** Implementation risk can be reduced by evaluating design scenarios on monetary benefits, strategic objectives, network impact and implementation complexity.
- **Technology intensity: High —** Automation of data collection and model building is becoming critical to boost the quality of decision making in fast paced business environments.
- **Strategic policy change: High —** This will impact supplier, manufacturing and distribution locations and policy settings that are translated into execution.
- **Organization change: Medium —** The availability of skilled data scientists and supply chain experts is essential for a successful analytics team. The implementation of a new network design may have a significant impact on the objectives, metrics and business processes used across manufacturing, planning, sourcing, distribution and customer service.
- **Competitive value: High —** An analytical approach to trade-offs across multiple network objectives can enable better decision making in high uncertainty environments, thereby providing a first mover advantage over the competition

Benefit Rating: High

Market Penetration: 20% to 50% of target audience

Maturity: Early mainstream

Sample Vendors:

Recommended Reading: “A Simple Framework to Understanding Supply Chain Network Design”

“Top Reasons Supply Chain Design Initiatives Fail and What to Do About It”

“Evaluate These Factors in a Global Manufacturing Site Selection Activity”

“Design Resilience Into Your Supply Chain With Scenario Planning to Weather the Unexpected”

“Market Guide for Supply Chain Strategy and Operations Consulting”

“Toolkit: Prioritize Highest Net Impact Risks During Scenario Planning”

“Presenting Your Strategy for Navigating Tariff Uncertainty to the C-Suite”

Multiechelon Inventory Optimization

Analysis By: Pia Orup Lund; Tim Payne

Definition: MEIO helps users improve response management across a multilevel supply chain by enabling them to determine appropriate inventory and postponement protocols taking all echelons in the supply chain into account in the optimization. It also increasingly helps users look beyond inventory optimization and toward broader facets of the supply chain (for example, sourcing, pooling and replenishment strategies) so that they can support segmented response strategies for different customers, categories and channels.

Position and Adoption Speed Justification: Gartner defines multiechelon inventory optimization (MEIO) as a supply chain planning (SCP) system of differentiation that supports Stage 4 inventory planning. Most MEIO products use optimization-based technologies with some business intelligence and analytics capabilities. Over time, they’re adopting event-based and discrete-event simulation, as well as stochastic algorithms, to enable companies to model uncertainty factors. Long-term business what-if evaluations and scenario planning will eventually be commonplace to support any number of strategies and tactical possibilities. However, users will need frameworks to support the allocation of products to specific supply chain response models. Two main factors are driving the progression of MEIO:

- MEIO tools are required for Stage 4 maturity inventory planning processes.
- MEIO is one of the more popular processes for companies to develop as they look to improve supply chain (particularly service and inventory) performance.

User Advice: Complex, distribution-intensive industries (such as consumer products, retail, aerospace and defense, utilities, and telecommunications) should use MEIO and SCP tools (implemented in support of Stage 3 SCP maturity where end-to-end planning is initiated) to extract the greatest value from inventory and supply chain assets. The more complex your supply chain network is — the production network as well as the distribution network — the higher potential benefits can be achieved through MEIO. Exploiting this value, however, requires careful management of user skills and competencies. Otherwise, results can be disappointing. MEIO tools support more mature inventory optimization processes and, therefore, are defined as planning systems of differentiation. As such, a robust planning system of record with a strong model of the supply chain is required to get the full benefit from MEIO.

Fewer independent MEIO vendors remain in the market, because SCP and ERP vendors have developed or acquired the capability to offer MEIO as part of their application suites. However, a small group of specialist vendors aims to offer MEIO for spare parts planning. In the longer term, it’s likely that the operational and tactical inventory optimization capability will be absorbed into the SCP suites to support integrated inventory policy optimization as part of the end-to-end planning

capabilities. More specialized modeling tools — for example, the ones supporting segmented supply chain design and postponement strategies — will likely merge and/or integrate with integrated business planning/Stage 4 S&OP planning tools to support more strategic supply chain analysis and design.

Business Impact: MEIO solutions enable enterprises to use supply chain assets — people, equipment, inventory, money, suppliers, routes, locations and promises — more effectively, while realigning or segmenting the use of these assets across multiple customer, product and channel categories.

Benefit Rating: High

Market Penetration: 5% to 20% of target audience

Maturity: Early mainstream

Sample Vendors: Arkieva; Blue Yonder; Coupa (LLamasoft); E2open; GAINSystems; Kinaxis; Logility; Oracle; SAP; ToolsGroup

Recommended Reading: "Don't Invest in Multiechelon Inventory Optimization Until You're Ready"

"Apply 4 Principles for Integrated Supply and Inventory Planning Capability"

"Operationalize Inventory Reduction Targets With Integrated Supply Plan Proposals"

"Make the Business Case for Supply Planning by Answering Five Questions"

"Key Principles for Implementing MEIO to Cope With Supply Chain Variability"

S&OP

Analysis By: Pia Orup Lund; Tim Payne

Definition: S&OP is mainly focused on operational and tactical reconciliation, typically focused on balancing demand and supply. Technology needs to support the aggregation and harmonization of operational and tactical plans. However, the most prevalent technology for S&OP is still the spreadsheet, albeit supported by ERP and SCP system of record data. At higher maturity levels, S&OP is accompanied by integrated business planning (IBP).

Position and Adoption Speed Justification: Successful adoption of S&OP has been limited by organizational issues and by the inability of technology to support a truly cross-functional process with integrated what-if scenario planning and execution capabilities. Today, however, the organizational aspect is more limiting than the technology aspect due to rapid development within cloud solutions to support supply chain planning. ERP vendors are still focusing on providing basic S&OP capabilities, while SCP vendors are expanding their capabilities in general to include S&OP capabilities along with a closer link to the operational planning layer to secure plans are executable. Specific S&OP technology, as opposed to using SCP applications, is also maturing, with some

vendors adding more capability in order to bring a stronger financial analysis dimension to the process.

Interest in S&OP from end users is strong. Many are reexamining their processes and trying to determine how to make them more effective and deliver value in achieving both the business strategy and financial objectives. Interest is driven by the need for better visibility and scenario management in the supply chain to help evaluate different potential outcomes and effects arising from increased uncertainty on the supply and demand sides.

User Advice: To support early-stage S&OP process initiatives, evaluate the different tools in the market. Pay attention to how they support the business processes of S&OP and, specifically, the different stages of S&OP maturity — not just the data aggregation and representation requirements. Understand that the demand planning, sales pipeline planning, or product and distribution planning solutions that have been extended with S&OP screens and reports will help with all stages of S&OP. However, these won't necessarily support all the process requirements and financial impact analyses of S&OP. Vendors for S&OP include SCP applications, ERP suites, business intelligence suites and best-of-breed applications.

Do not look at S&OP as a stand-alone decision process, but evaluate the different S&OP tools keeping in mind the connection to other planning layers, such as respond and configure.

If the business has a roadmap to get to a higher maturity of S&OP, then consider SCP solutions that can support a mature S&OP process with the additional capability to support IBP when the business is ready. At a mature S&OP stage, it should be an active decision-making process, and the integration down to operational planning and execution is key.

Business Impact: S&OP technology can help companies make better use of resources by balancing supply with demand. It can also deliver improved collaboration throughout the organization, as well as what-if simulations and scenario management capabilities. This can help in the evaluation of alternative operational options and some reconciliation of operational plans to financial plans and budgets. S&OP tends to have a tactical timeline focused on achieving better results within the constraints of the current operating model and resources.

Business impact will be higher if the organization moves to IBP, where plans and scenarios will have a strong financial-impact dimension to them and stronger alignment to long-term strategic plans.

Benefit Rating: Moderate

Market Penetration: 20% to 50% of target audience

Maturity: Early mainstream

Sample Vendors: Arkieva; Blue Yonder; Demand Solutions; GIB; John Galt Solutions; Kinaxis; OMP; Oracle; ORSOFT; SAP

Recommended Reading: "Magic Quadrant for Sales and Operations Planning Systems of Differentiation"

"Quantify the Value of S&OP to Engage Cross-Functional Leaders"

Entering the Plateau

Diagnostic Analytics

Analysis By: Noha Tohamy

Definition: Diagnostic analytics are techniques to identify the possible drivers or reasons behind an event, outcome or a trend. Techniques include root cause analysis, statistical modeling, ad hoc query, online analytical processing (OLAP) and data visualization.

Position and Adoption Speed Justification: The goal of diagnostic analytics is to explain the reasons behind an event. Events can range from a late delivery to high supply chain costs. Many organizations have embraced diagnostic techniques in areas such as sales and operations planning (S&OP) or customer fulfillment. For diagnostic analytics needs, supply chain organizations use various technologies ranging from Microsoft Excel, data visualization and embedded analytics in supply chain applications to BI tools.

The adoption of diagnostic analytics has lagged that of descriptive analytics because diagnostic analytics require clear understanding of the intertwined relationships among supply chain variables, to explain the drivers behind observed performance. This is changing with more data availability and more adoption of machine learning. machine learning can identify patterns in data and uncover interdependencies among different variables. This will improve users' ability to diagnose events and pinpoint their root causes.

Wider adoption of diagnostic analytics is also driven by descriptive analytics and BI vendors embedding diagnostic capabilities in their solutions. Adoption will also expand as analytics solutions continue to offer more self-service capabilities that allow the user to independently investigate and diagnose performance and metrics.

User Advice: Supply chain leaders responsible for analytics strategy should:

- Realize that, as with descriptive analytics, availability and quality of data are critical to success.
- Augment diagnostic analytics with playbooks that offer the user a recommended approach to investigating and resolving problems.
- Investigate the role of machine learning in supporting diagnostic analytics to better identify new patterns and interdependencies through data discovery and analysis.
- Deploy cross-functional and multienterprise diagnostic analytics; siloed diagnostic analytics can only offer an incomplete picture behind an observed variable or event.
- Choose solutions that support self-service, to empower the users to consistently rely on diagnostic analytics in their decision-making process.

- Investigate the role of natural language generation for a more intuitive, interactive approach to support the users in understanding the root causes and driving factors while diagnosing an event or a metric.

Business Impact: Diagnostic analytics presents the next milestone after descriptive analytics in an organization's analytics adoption journey. It helps supply chain users uncover the true drivers behind observed supply chain performance. Once known, the user can focus on the root causes behind an event or a variable. Users can then devise plans to mitigate a problem or take advantage of a potential opportunity.

But the impact of diagnostic analytics on the business is moderate. Unlike predictive analytics, diagnostic analytics is not forward looking, and still leaves it to the user to predict future events. Also, unlike prescriptive analytics, diagnostic analytics is passive, leaving the user with the responsibility of finding and executing the best course of action.

Benefit Rating: Moderate

Market Penetration: More than 50% of target audience

Maturity: Mature mainstream

Sample Vendors: Microsoft Power BI; Qlik; SAP; Tableau

Recommended Reading: "IT Market Clock for Supply Chain End-to-End Technology, 2019"

"Toolkit: Supply Chain Analytics Maturity Assessment"

Descriptive Analytics

Analysis By: Noha Tohamy

Definition: Descriptive analytics is the application of logic, pattern detection, discovery and business rules to data, to understand what is currently happening or has happened. Capabilities span reporting, dashboards, supply chain visibility, visualization and alerts.

Position and Adoption Speed Justification: A foundational capability, descriptive analytics is viewed as a natural starting point for organizations looking to understand supply chain performance. Descriptive analytics spans a wide variety of formats from static reports, interactive dashboards, or data visualization. Supporting technologies range from the most basic Microsoft Excel to machine learning platforms.

Descriptive analytics can be deployed both internally, within the enterprise, or for multienterprise visibility across the extended supply chain.

Increasingly, supply chain users are asking for self-service descriptive analytics capabilities where the user can independently conduct data discovery and visualization, and build flexible reports, dashboards and alerts that satisfy their role and focus.

Organizations can use embedded functionality within core supply chain applications or general purpose BI and data science platforms to meet their descriptive analytics needs.

Today, technology providers are incorporating machine learning techniques to improve their descriptive analytics offerings. Machine learning can analyze large sets of data to continuously uncover new patterns. This can minimize the users' need to predefine reports based on their understanding of critical variables and interdependencies. For example, a manufacturer might have previously created a late deliveries report that shows perceived factors in late delivery, such as shortage in inventory or inaccurate customer forecasts. Machine learning can analyze data and uncover an unrecognized correlation between late deliveries and a tier 2 supplier. Generating this insight based on ongoing data analysis will ultimately make descriptive analytics more dynamic and more accurate, encouraging broader adoption.

User Advice: Supply chain leaders responsible for analytics strategy should:

- Realize that quality and accessibility of data are critical to success. It is not uncommon for an organization to have dozens of back-end and ERP systems where the data resides. The ability to harmonize this data, creating a single version of the truth that becomes the foundation for descriptive analytics, is an ongoing battle.
- Establish common metrics definitions. For example, make sure that a metric like the perfect order is calculated consistently across the organization. With this consistency, descriptive analytics can become the common language used to communicate supply chain performance.
- Augment descriptive analytics with playbooks that offer the user a recommended approach to investigating and resolving problems.
- Adopt machine learning in descriptive analytics to better identify new patterns and interdependencies through data discovery and analysis.
- Investigate the role of natural language generation for a more intuitive, interactive approach to support the users in understanding patterns and variable interdependencies.
- Choose solutions that support self-service, to empower the users to consistently rely on descriptive analytics in their decision-making process.

Business Impact: With descriptive analytics, an organization can establish visibility into its supply chain performance in the strategic, tactical and operational time horizon. Reports and dashboards can cater to the varying needs of business users, ranging from high-level understanding of the overall health of the supply chain to detailed operational information. As it matures, descriptive analytics also can enable management by exception, which can significantly reduce the need for extensive user intervention. Generally, strong descriptive analytics capabilities are a prerequisite foundation for successful diagnostic, predictive and prescriptive analytics adoption.

As it is the least actionable analytics capability, the business impact of descriptive analytics is moderate. Once the question of what is happening is answered, it falls on the user to assess why the event has happened and predict and mitigate similar future events.

Benefit Rating: Moderate

Market Penetration: More than 50% of target audience

Maturity: Mature mainstream

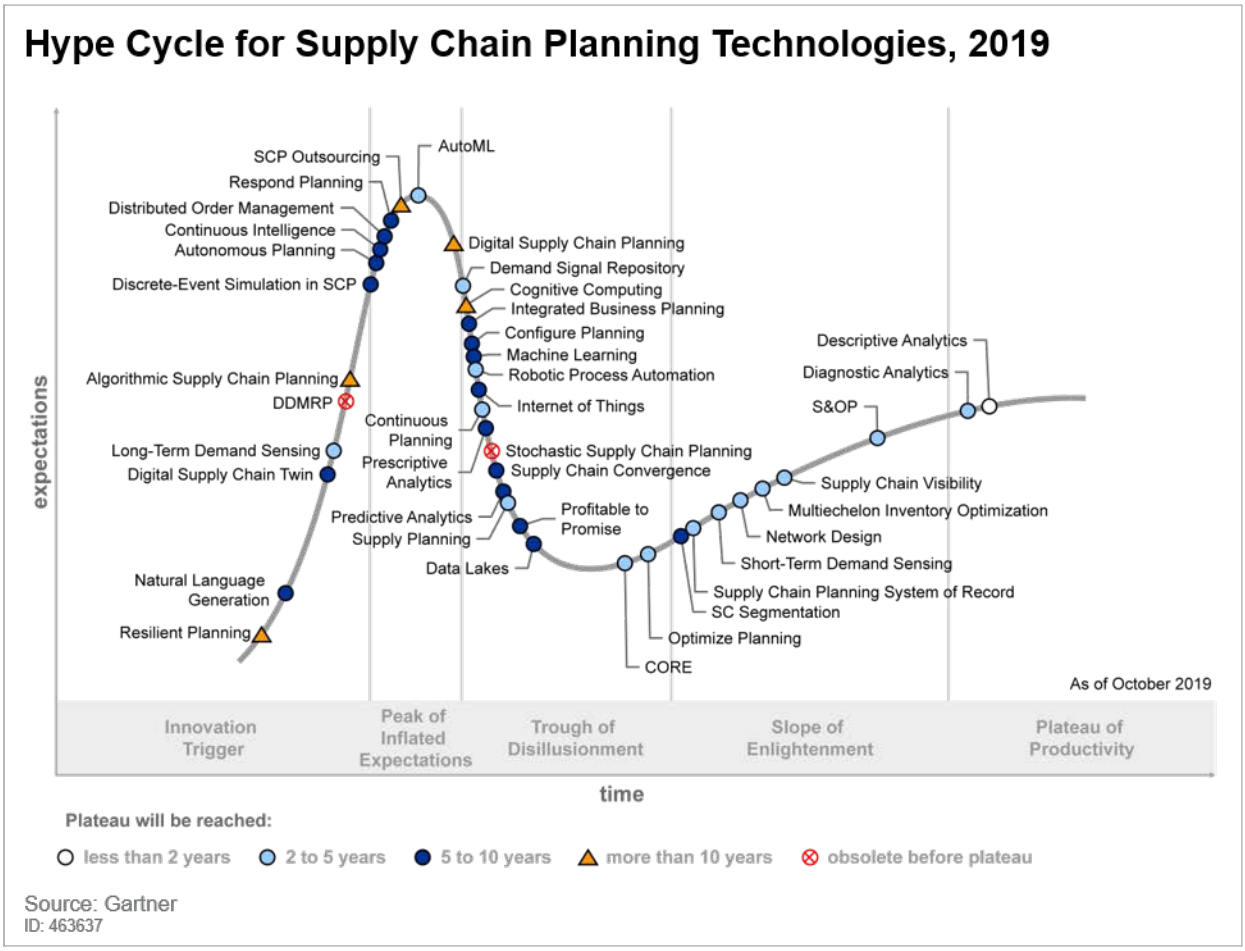
Sample Vendors: Microsoft Power BI; Oracle; Qlik; SAP; Tableau; TIBCO Software

Recommended Reading: "Market Guide for Supply Chain Analytics Technology"

"Toolkit: Supply Chain Analytics Maturity Assessment"

Appendixes

Figure 3. Hype Cycle for Supply Chain Planning Technologies, 2019



Source: Gartner
ID: 463637

Hype Cycle Phases, Benefit Ratings and Maturity Levels

Table 1. Hype Cycle Phases

Innovation Trigger	A breakthrough, public demonstration, product launch or other event generates significant press and industry interest.
Peak of Inflated Expectations	During this phase of overenthusiasm and unrealistic projections, a flurry of well-publicized activity by technology leaders results in some successes, but more failures, as the technology is pushed to its limits. The only enterprises making money are conference organizers and magazine publishers.
Trough of Disillusionment	Because the technology does not live up to its overinflated expectations, it rapidly becomes unfashionable. Media interest wanes, except for a few cautionary tales.
Slope of Enlightenment	Focused experimentation and solid hard work by an increasingly diverse range of organizations lead to a true understanding of the technology's applicability, risks and benefits. Commercial off-the-shelf methodologies and tools ease the development process.
Plateau of Productivity	The real-world benefits of the technology are demonstrated and accepted. Tools and methodologies are increasingly stable as they enter their second and third generations. Growing numbers of organizations feel comfortable with the reduced level of risk; the rapid growth phase of adoption begins. Approximately 20% of the technology's target audience has adopted or is adopting the technology as it enters this phase.
Years to Mainstream Adoption	The time required for the technology to reach the Plateau of Productivity.

Source: Gartner (November 2020)

Table 2. Benefit Ratings

Benefit Rating	Definition
Transformational	Enables new ways of doing business across industries that will result in major shifts in industry dynamics
High	Enables new ways of performing horizontal or vertical processes that will result in significantly increased revenue or cost savings for an enterprise
Moderate	Provides incremental improvements to established processes that will result in increased revenue or cost savings for an enterprise
Low	Slightly improves processes (for example, improved user experience) that will be difficult to translate into increased revenue or cost savings

Source: Gartner (November 2020)

Table 3. Maturity Levels

Maturity Level	Status	Products/Vendors
Embryonic	■ In labs	■ None
Emerging	■ Commercialization by vendors ■ Pilots and deployments by industry leaders	■ First generation ■ High price ■ Much customization
Adolescent	■ Maturing technology capabilities and process understanding ■ Uptake beyond early adopters	■ Second generation ■ Less customization
Early mainstream	■ Proven technology ■ Vendors, technology and adoption rapidly evolving	■ Third generation ■ More out-of-box methodologies
Mature mainstream	■ Robust technology ■ Not much evolution in vendors or technology	■ Several dominant vendors
Legacy	■ Not appropriate for new developments ■ Cost of migration constrains replacement	■ Maintenance revenue focus
Obsolete	■ Rarely used	■ Used/resale market only

Source: Gartner (November 2020)

Gartner Recommended Reading

Some documents may not be available as part of your current Gartner subscription.

Understanding Gartner's Hype Cycles

Digital Supply Chain Planning: The Art of the Possible Should Focus on Reducing the Four Evils of Planning

Defining Digital Supply Chain Planning

Leverage Gartner's Digital Supply Chain Planning Maturity Model to Improve Planning Quality

Digital Business Requires Algorithmic Supply Chain Planning

Magic Quadrant for Supply Chain Planning System of Record

Technology Reference Model for Stage 5 Maturity Supply Chain Planning

Mastering Uncertainty: The Rise of Resilient Planning

Innovation Insight for Resilient Planning

Innovation Insight for Digital Supply Chain Twin

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Hype Cycle for Supply Chain Planning Technologies, 2020

Published: 12 November 2020 **ID:** G00464742

Analyst(s): Tim Payne, Amber Salley, Pia Orup Lund

Supply chain technology leaders can use this Hype Cycle to help transform their supply chain planning. It gives guidance into the maturity and viability of various capabilities and underlying technologies that will be used to transform the way planning decisions will be made in the future.

Hype Cycle for Manufacturing Operations