



# IO TECHNOLOGY VALUE MATRIX 2017

ANALYST

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## THE BOTTOM LINE

**Inventory optimization (IO) solutions are a key lever which can enable companies to streamline operations while maintaining service levels and freeing up working capital.** In the 2017 edition of the IO Value Matrix, Nucleus found that leading vendors are delivering capabilities that help organizations determine the optimal safety stock to hold at the lowest price with greater automation and more accurate forecasts. Customers are getting value from solutions that deliver a continuous data model and provide users with tools to help them visualize and adopt recommended changes.

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## MARKET OVERVIEW

In the 2017 edition of the Inventory Optimization (IO) Value Matrix, Nucleus analyzed solutions from 17 vendors based on the usability and functionality, with the leading solutions delivering value to customers with better visualizations, greater automation and machine learning capabilities, and more accurate forecasts (Nucleus Research, *R59 – Understanding the Value Matrix*, April 2017). Many companies have realized that inventory optimization tools are vital to both keeping inventory levels in check and maintaining service levels for their customers. At its core, inventory optimization reflects the ultimate goal of supply chain management: having the right amount of stock at the right location at the right time at the lowest cost.

Although they can be used to minimize inventory and as a result free up working capital, IO solutions provide flexibility to allow companies to decide what Key

Performance Indicators (KPIs) to constrain. Vendors are delivering solutions that can account for inventory held across multiple echelons (MEIO) and optimize on metrics such as safety stock, service level, budgetary constraints, profit margin, and holding capacity.

Though often inaccurately conflated, IO differs significantly from inventory management, which is concerned primarily with control and movement of existing inventory. Management implies the efficient oversight of stock keeping units (SKUs) and production components, which means inventory management is disconnected with the levels and costs of the inventory being held. On the other hand, IO solutions are designed to link a company's level of inventory and where it is being held to how well it can service customer needs and what the financial cost is to the organization. While some vendors offer both inventory management and optimization solutions, this Value Matrix considers only the IO capabilities and how customers are achieving value with them.

Though inventory optimization solutions have traditionally catered to large enterprises with extensive supply chains, the increasingly complex supply chains for mid-sized companies means vendors are moving their IO capabilities down market. Additionally, as companies of every size are expected to deliver products through multiple channels, leading vendors have made MEIO a standard functional capability of their offerings. By improving ease of use and delivering solutions in the cloud, vendors are improving the value proposition of their products and can better service the needs of mid-sized companies.

For companies with new product launches or seasonal demand, vendors are developing and delivering machine learning capabilities that generate more accurate demand forecasts. Machine learning is also being used to automatically adjust which optimization model a solution utilizes for a given SKU based on historical performance and changes demand patterns. As demand-driven supply chain become more standard, the power and quality of advanced machine learning capabilities will become a differentiator for companies that deploy them. The leading vendors in the 2017 IO Value Matrix are already leveraging machine learning techniques to account for variability in actual demand across the supply chain.

Nucleus found that many customers are getting value from their IO solutions when they are used in conjunction with other supply chain capabilities, such as demand sensing, replenishment planning, and sales and operations planning (S&OP). However, the Value Matrix also features vendors who offer best-of-breed capabilities as a stand-alone offering, are able to deliver value and are competitive in a marketplace which typically highlights end-to-end solutions. For vendors that

deliver a more holistic solution set, those that utilize a continuous data model across all their supply chain components help customers achieve better value. With a single data model, users can immediately see the effect of a proposed change on every part of the supply chain and relevant KPIs.

In terms of usability, many vendors have realized that a plan is only as good as its ability to be implemented. As a result, vendors are focused on helping customers with visualizing and communicating how the optimization engines are generating their recommendations. Stakeholder engagement and buy-in are crucial parts of solutions, as they help companies actualize a supply plan that might require significant organizational change. Removing the “black box” that surrounds the optimization engine and increasing the transparency of calculations, though often complex, helps users understand why a change is being recommended and chart a path of how to achieve the new optimum. Robust “what-if” scenario engines should come baked-in, allowing supply chain planner to run simulations to determine the effect of changes in inventory policies. Though some customers may rely on internal champions to effectively utilize IO tools, vendors are making it easier for users to visualize their inventory on hand and help firms translate the plan into action.



NUCLEUS RESEARCH

### IO TECHNOLOGY VALUE MATRIX 2017



## LEADERS

Leaders in the 2017 Inventory Optimization Value Matrix include Ezopen, GAINSystems, JDA Software, Kinaxis, LLamasoft, Logility, Manhattan Associates, SAP, and ToolsGroup.

### E2OPEN

Ezopen is a new entrant to the IO Value Matrix, having taken over Terra Technology's position in the Leader quadrant after acquiring the company last year (Nucleus Research, *Q41 – Ezopen Acquires Terra Technology*, March 2016). Since the acquisition, Ezopen has been delivering Terra's cloud-based IO capabilities as part of its multi-enterprise network solutions, describing the application as multi-enterprise inventory optimization (MIO) rather than MEIO.

The application allows companies to optimize inventory across multiple tiers of their supply chain, from the store location to distribution and plant sites. Two unique differentiators are the use of specific error over the lead time for each SKU and respecting the location interdependencies at each stocking node. This overcomes the traditional mathematical scaling approximations and pooling assumptions required by conventional MEIO and leads to more accurate inventory recommendations. In addition, the solution is tightly coupled to Ezopen's demand sensing which cuts volatility and allows customers to further reduce safety stock.

Since the last IO Value Matrix, Ezopen has been focusing on consolidating Terra Technology's capabilities into its demand-driven, multi-enterprise supply chain solutions. To that end, a significant update on the user experience (UX) for all Ezopen's products is expected later this year, which will ensure a consistent look and feel for customers who have deployed multiple tools from the vendor. Nucleus expects the UX update to help the vendor's usability, complementing the IO solution's functionality, which includes tools to develop statistical maximum inventory targets based on a SKU's perishability or obsolescence as well as a simulation tool to run scenario analyses.

Ezopen caters to enterprise customers with complex, multi-tiered supply chains. It delivers a highly scalable solution with some of the best demand sensing capabilities on the market, translating to better forecasts and more accurate supply plans which can mean significant financial benefits to enterprise customers.

### GAINSYSTEMS

GAINSystems is a Leader in the 2017 IO Value Matrix, delivering best-of-breed capabilities in its MEIO tool as part of its supply chain solution which includes demand planning and forecasting, replenishment/production optimization, and

sales, inventory and operations planning (SI&OP). GAINS stands for General Adaptive Inventory Solution takes the approach that its models and algorithms can be effectively applied across industries such as manufacturing, distribution, and maintenance, repair, and operations (MRO).

Customers have the ability to optimize on a number of parameters such as minimizing total annual cost relative to optimum service level. Users are given visibility of current stock levels and the associated costs of a stock out for any item at the SKU-location level. The solution also reports comprehensive error that incorporates demand and supply variability. GAINSystems gives users tools to determine the best sourcing for items with visualizations that chart input hierarchies that allow recommendations to be analyzed. Unique to the solution, GAINSystems provides users with disservice probabilities which demonstrate the costs of a lost sale or expedited shipments relative to the cost of holding more safety stock.

To accelerate user adoption, GAINSystems uses three approaches. The first is a glass box approach wherein users can see how the optimization engine produced the recommendation it did. The second is tracking the actual actions taken versus the recommended actions and the difference in terms of KPIs. The third approach leverages GAINSystems' single data model giving users simulation and visualization tools to rapidly see how key inputs would change and the relative sensitivity of key inputs based on the targeted optimization.

GAINSystems has invested in improving its product usability, with a new user interface (UI) built in HTML5 that offers completely configurable dashboards and data displays, and works across any platform or device. The vendor has deployed machine learning methods to adjust future inventory plans based on planner action or inaction. It is exploring how to apply machine learning capabilities more broadly in its solution to improve automation when the system encounters a situation that resembles one it has encountered in the past. Overall, the vendor delivers a robust product to a board range of companies, offering speed of deployment, a next-generation UI, and competitive return on investment.

### JDA SOFTWARE

In the 2017 IO Value Matrix, JDA Software continues as a Leader with the IO capabilities it delivers as part of its Manufacturing Planning solution, which offers a comprehensive suite of supply chain components. With its origins in complex manufacturing and with the ability to optimize across thousands of SKU-locations, JDA's inventory planning product delivers scalability to accommodate the needs of large end-retail customers, with the ability to deploy on-premises or to the cloud.



The MEIO application allows organizations to optimize on several KPIs including service level, customer wait time, and cost. The solution enables users to segment inventory based on any number of attributes and define a target group of items that can have different demand variability, inventory turns, or lead time. The planner can define a group service level target or budget and the IO solution can optimize levels for each SKU based on the parameters and attributes of each item. The tool can also optimize for replenishment interval to ensure stock levels are maintained.

Users experience a consistent UI with dashboards that present KPIs and exceptions that need the user's attention. Users can drill down for more granular information, including details about the root cause of errors or exceptions. Users are given information about the financial and logistical implications of any exception at the item-location level, with the subsequent downstream impact charted out.

With the scenario planning and what-if tools included in the IO solution, users can set an inventory budget target and then classify items based on several factors such as services level or item importance. The IO engine will determine how far the budget will go to satisfying the customer's defined needs, and where they will fall short. JDA is investing in additional capabilities that help customers contend with irregular inventory issues, such as non-stochastic demand patterns and the lumpiness of product demand. The company is also investing in machine learning and integrating third-party data into its modeling abilities, with greater automation capabilities on the roadmap. The vendor will continue to deliver value through its IO tool, catering to organizations of any size or complexity, with a full suite of supply chain tools.

## KINAXIS

Kinaxis moves into the Leader quadrant in the 2017 edition of the IO Value Matrix, delivering consistent benefits to customers who leverage its solution. Kinaxis' inventory optimization is part of its RapidResponse supply chain planning solution suite, which consists of 13 different applications. Customers derive more value from using the solutions in concert rather than isolation, however, the MEIO application can be delivered as a stand-alone software-as-a-service cloud offering. Based on the mantra "know quicker, act faster", Kinaxis' algorithms are demand driven, with the IO tool integrated to balance all of the competing constraints, drawing on multiple data sources in near real time. RapidResponse also provides a what-if scenario analysis tool that planners can use to see how relevant KPIs and service levels would be affected by changes in the supply chain.

Kinaxis is currently targeting usability enhancements that cater to digital natives who are more accustomed to simple, boiled-down application interfaces.

Additionally, Kinaxis is developing enhanced reporting capabilities that help the collaborative process necessary to set optimum inventory levels. Users will be able to identify how safety stock has changed and where there are risks demanding based on the changes being recommended. Users can chart out a plan to achieve a more optimum level of inventory that can be used collaboratively with stakeholders.

Another area of focus for Kinaxis in the inventory planning and optimization space is building users trust with the engine despite heterogeneous skills and adoptions techniques. The ability to model non-normal distributions for demand and lead time variability is unhelpful unless the users can understand the results. Kinaxis' approach to change management increases its overall usability and helps users create buy-in to the recommended changes. The vendor appeals to customers who are looking for an end-to-end planning and execution solution, with MEIO capabilities that can meet a broad range of customer needs.

### LLAMASOFT

LLamasoft moves into the Leader Quadrant in the 2017 edition of the IO Value Matrix. LLamasoft delivers an IO solution as part of Supply Chain Guru, its flagship product. The IO capabilities are tightly coupled with other parts of their supply chain capabilities including production optimization, supply chain simulation, distribution, and network optimization. The solution takes a holistic view of inventory in the supply chain from safety stock to pre-build and in-transit. LLamasoft has made its name in supply chain network design which translates to using IO as both a strategic and tactical tool running inventory simulations to test the performance of recommended inventory policies.

The MEIO capabilities start at optimizing safety stock holding costs and use linear and dynamic programming to analyze demand. LLamasoft has up to 10 classes of demand to which it applies a number of probability functions, with the tool determining which probability function has the best fit. The IO tool propagates demand through the rest of the supply chain upstream, against which users can test inventory scenarios to determine the financial impact.

LLamasoft's simulation tools help users determine whether inventory policies will meet the required service levels across every echelon. The supply chain modeling helps users adopt the IO recommendations with interactive visualization tools that present the optimization as more of a "sandbox" rather than a "black box". LLamasoft currently uses machine learning capabilities to improve its demand modeling and is currently offering Supply Chain Guru as an on-premises or cloud deployment. LLamasoft is continuing to invest in its IO capabilities, helping

companies to better visualize how to optimize and what the impact of inventory policies changes on the company bottom line or its service level.

## LOGILITY

Logility continues as a Leader in this year's IO Value Matrix with its Voyager Inventory Optimization product which delivers a scalable, MEIO solution. Available in the cloud or on-premises, Logility offers a full suite of supply chain capabilities within Logility Voyager Solutions, with tools to optimize demand and supply with replenishment and manufacturing planning, to optimize retail with merchandise planning and assortment and allocation, and transportation optimization for shipments and pooling opportunities. Logility also offers an integrated business planning solution that fulfills customer's S&OP needs as well as built-in collaborative planning, forecasting, and replenishment (CPFR) through a multi-enterprise business network.

Voyager Inventory Optimization gives users visibility into inventory inputs and tools to make adjustments. Users can customize dashboards to track KPIs and manage by exception with alert collections. Voyager Inventory Optimization also publishes the math behind a recommendation so it is available to the user. As a result, users can quickly gain additional insight and establish trust in the solution, rather than relying on a black box approach. The high configurability, allowing users to customize not just what they see, but set parameters that drive inventory policies down to managing inventory targets on a SKU-location level, gives Logility a notably high degree of usability.

In addition to optimizing inventory based on location, distribution, and multiple tiers of suppliers, Logility has been busy on the functionality front, delivering automation capabilities. For example, Voyager includes machine learning technology that automatically switches the applied optimization model if the system determines there is a better model available. Additionally, Logility is delivering improved inventory modeling that analyzes multiple scenarios in order to support a customer's monthly sales, inventory, and operations planning (SIOP).

Logility is continuing to add to Voyager Solutions suite including adding "fat-finger" interfaces that allow for easier navigation on mobile devices. Logility is also looking to leverage third-party and unstructured data sources to help accelerate demand sensing efforts. Nucleus expects the forthcoming enhancements to deliver additional end-customer value. As it currently stands, Logility delivers one of the most user-friendly solutions on the market and with MEIO capabilities that can meet the needs of most customers.



## MANHATTAN ASSOCIATES

Manhattan Associates is once again a Leader in the 2017 IO Value Matrix, delivering a suite of inventory solutions including advanced planning, demand forecasting, replenishment, and an S&OP module. All its IO customers utilize the forecasting and replenishment tools which are delivered in the cloud or on-premises.

Manhattan Associates uses a proprietary algorithm for its demand forecasting called Unified Forecasting Method (UFM), which blends multiple forecasting models. The UFM self-adjusts to changing forecast parameters and adjusts the forecast methodology to deliver granular demand detail leading to better demand and order projections. The system is designed to handle a number of use cases with limited user involvement and is more effective in scenarios with greater complexity and diversity of the demand signals.

On the replenishment side, Manhattan Associates is architected for multi-echelon, multi-channel networks. Taking a holistic view of an organization's value chain, Manhattan is designed to optimize across multiple tiers to reduce total network inventory while maintaining service level targets. Manhattan's omni-inventory optimization considers the variability of forecasts across channels and allows users to optimize service level targets by selling channel to optimize overall buying. Manhattan is also deploying self-learning algorithms that help tune inventory strategies, finding and correcting ill-fitting inventory profiles.

To help users visualize adjustments, Manhattan includes embedded simulation tools so users can compare scenarios. Customers can also generate dashboards and portlets that display relevant KPIs. As part of its inventory optimization tools, Manhattan includes a number of standard reporting templates as well as allowing users to leverage IBM Cognos out of the box to develop custom visualizations.

With the recent release of its S&OP tool, Manhattan helps organizations translate planning into operations, with additional what-if simulation capabilities. The continued investment in cross-cutting stakeholder engagement helps organizations better optimize inventory strategies across the entire enterprise. Manhattan Associates delivers a flexible MEIO solution, which, in combination with the other parts of its solution suite, can meet the needs of almost any customer.

## SAP

SAP is a Leader in the 2017 version of the IO Value Matrix with one of the most functionally rich offerings in the market. SAP's IO capabilities come as part of SAP Integrated Business Planning (IBP), which has four supply chain applications in addition to inventory optimization: S&OP, control tower, demand analytics and sensing, and supply planning and response. IBP's inventory capabilities leverage

SAP's acquisition of SmartOps in 2013, and SAP has continued to build on what was a market-leading best-of-breed solution when it was acquired. SAP IBP is a cloud-based running on the HANA platform, which utilizes in-memory processing to deliver responsive performance and reliability.

SAP IBP calculates optimal, time-phased inventory targets at the SKU-location level using stochastic models for risk, variability, and uncertainty. The system considers customer service levels and profitability objectives when developing an optimized plan for inventory holdings and service levels. Users can build what-if scenarios using the simulation engine and are presented with dashboards and analytics to gain visibility into the drivers of change in the supply chain. IBP also presents users with the drivers of inventory to remove the black box around an optimal recommendation.

The latest release of the product, SAP IBP 1702, was released in March 2017 and included enhancements such as the Supply Chain Network Visualization application, which gives users the ability to visualize the entire supply chain network based on key relevant data through heat maps and interactive graphical representations. SAP IBP applications can run on the SAP HANA platform in the cloud, leveraging the SAP Fiori user interface, allowing users to access the software from any web or mobile platform. Customers are able to use the in-memory database when performing scenario analysis and simulations of the entire inventory model in real-time.

SAP continues to invest in its MEIO capabilities, with growing momentum in its cloud solution, helping customers to go-live more quickly and start achieving value. Like other vendors featured in this Value Matrix, SAP can deliver its IO application as a stand-alone offering but has seen customers realize better value when implementing more of the IBP applications that work in concert to deliver better plans. Additionally, SAP IBP integrates with any cloud-based or on-premises enterprise resource planning system, regardless of vendor, giving users flexible deployment options. The improvements SAP continues to make on with its IBP solution set are designed to help enterprise customers get better control of their inventory levels and supply chain overall.

## TOOLSGROUP

ToolsGroup sets the industry standard in the 2017 Inventory Optimization Value Matrix, delivering usability and functionality that helps customers achieve value through one of the most autonomous inventory optimization and supply chain planning solutions on the market. As with many other solutions featured in the Value Matrix, ToolsGroup's IO solution can be sold as a standalone solution but is overwhelmingly packaged as part of a more holistic supply chain solution. The IO

application can be deployed on-premises or in the cloud and is part of ToolsGroup's Service Optimizer 99+ (SO99+) platform. SO99+ also includes solutions for demand forecasting, demand sensing, supply and demand collaboration, production planning, and promotion optimization.

ToolsGroup delivers a single data model across its platform, thereby accurately translating the effect of a change in one area to the rest of the operation. The MEIO tool gives users the ability to optimize across multiple echelons based on the service level for each stock keeping unit (SKU) by location. Users can also assign an aggregate service level target for a group of items, which the optimization engine then translates into an appropriate individual target for each item in the mix, based on item parameters such as anticipated demand, lead time, margin, seasonality, and historical sales data. ToolsGroup calls this "Service Level Optimization". Users are updated on the financial implication of any change in target service level or inventory policy.

To address usability, ToolsGroup delivers visualizations on its dashboards that can display core analytics or exception management. In addition, the solution includes a report builder and modeling tool to help users quickly understand the situation and determine what steps to take.

ToolsGroup has also deployed machine learning capabilities to help improve forecasting and demand planning. Customers can leverage historical data to determine stocking levels for new product launches or seasonal products, with the optimization engine determining what attributes were significant in matching the actual demand with anticipated demand.

ToolsGroup is also delivering capabilities that help companies with products that have lumpy, non-normal demand curves or require a holding inventory to account for "long tail" demand. Looking forward, the vendor is looking to leverage more social sensing data, such as to help planners set inventory targets for new product launches with better demand sensing. These solutions are designed to reduce the burden on planners by making the inventory optimization and supply planning process more autonomous. Nucleus sees the enhancements as value drivers for customers with complex inventory holdings looking for a best-of-breed solution that can close the loop from long-term sales and operations planning (S&OP) to demand modeling to inventory optimization to replenishment.

## EXPERTS

Experts in the 2017 Inventory Optimization Value Matrix include: Infor.

## INFOR

Infor moves into the Expert quadrant in the 2017 IO Value Matrix. Infor's IO capabilities fall under its Supply Chain Planning product set which includes capabilities for demand planning, S&OP, supply chain planning, scheduling, and supplier management. Infor is in the process of delivering its products to cloud such as Integrated Business Planning (IBP), which that was announced in November 2016 and is currently offered as a single tenant cloud solution.

With IBP, Infor has built the framework for a board suite of supply chain applications such as S&OP, demand planning, and supply planning. Infor optimization capabilities are based on demand planning, taking all constraining factors into account. The IBP framework includes master data management on which prescriptive and predictive analytic capabilities sit.

As Infor brings more of its capabilities to the cloud, it will continue to lever the social collaboration tools via Ming.le and the UI/UX deliver by its creative lab, Hook & Loop, giving Infor the foundational elements to build a robust cloud solution. Add to that the capabilities of two Infor acquisitions, Predictix and GTNexus, which deliver demand analytics and extended supply chain visibility, respectively (Nucleus Research, *Infor Purchases Predictix for Demand Analytics*, June 2016; Nucleus Research, *Infor to Acquire GT Nexus*, August 2015). With Predictix, which is designed to provide insights into unstructured data, Infor can deploy a tool that helps omnichannel retailers better understand demand and make more accurate demand plans as part of their MEIO process. As a result of the continued investment and push to the cloud, Nucleus expects the value Infor delivers to its customers to steadily increase.

## FACILITATORS

Facilitators in the 2017 Inventory Optimization Value Matrix include: One Network, Oracle, and Vanguard Software.

### ONE NETWORK

One Network is a Facilitator in the 2017 IO Value Matrix. One Network delivers inventory optimization capabilities as part of its Real Time Value Network (RTVN) of which Version 16.0 was released in the middle of last year (Nucleus Research, *Q149 – One Network Releases RTVN Version 16.0*, July 2016). One Network delivers a multi-company supply chain network platform that connects trading partners, suppliers, and distributors, giving organizations better visibility and coordination capabilities than the traditional outside-in approach to the enterprise.

As part of its Inventory Management service, One Network's RTVN captures inventory data such as lead times, order policies, batch size, and production frequency across multiple parties on the network to determine the optimum inventory target. The system also factors in demand signals from downstream sources in generating forecasts. The optimum inventory level considers multiple tiers of trading partners matching the demand forecast against inventory held within the network.

Over the last year, One Network has been deploying intelligent bots within the network which are designed to automate many of the more menial tasks of managing inventory levels, helping users focus on more strategic initiatives. By setting inventory policies the bots can make automatic adjustments to maintain the desired service levels or minimize costs. The latest release of RTVN delivers dashboards to help users visualize data as well as collaboration tools to help users work with other members of the network more seamlessly.

Although One Network is primarily a control tower, those who have deployed it can leverage the IO capabilities within the solution. By delivering a demand-driven supply chain solution, One Network helps its users optimize inventory levels across the network rather than just within the enterprise's four walls.

#### **ORACLE**

Oracle is a Facilitator in the 2017 edition of the IO Value Matrix. Historically, Oracle has delivered an inventory management solution but has been focusing on inventory optimization as part of their supply chain planning or integrated business planning solutions. Oracle is also in the process of bringing its IO capabilities to its Maintenance and Service Parts Cloud, which is planned for release later this year. Oracle can deliver its IO capabilities as a module of its value chain suite, which it is moving to cloud, with the core pieces such as demand management, demand variability, safety stock planning, and S&OP currently available in the cloud or on-premises, with plans to deliver inventory planning and policy planning to the cloud within the next year.

Oracle's IO solution uses stochastic, probabilistic models for discrete industries as well as multi-echelon capabilities. Supply chain planners are able to optimize around minimum inventory as well as service level targets, cycle stock, and capacity constraints. Users can also look to optimize service contracts due to payer capabilities, routing constraints, and sourcing. Oracle delivers capabilities that help users define an aggregate service level target for an inventory segment, optimizing each item based on demand, variability, and availability.



Users get a consistent UI regardless of whether they have deployed on-premises or in the cloud. Planners can leverage scenario analysis that looks at all elements of the enterprise, allowing users to test multiple service level strategies based on inventory levels and constraints. As with other vendors, Oracle views its IO tool not as a standalone product, but rather capabilities that are vital to supply chain planning and risk management. With more supply chain tools being delivered via the Oracle Cloud, Nucleus expects customers to achieve better value moving forward, with flexible deployment options and easier technology management, especially for smaller enterprises who might not have previously considered Oracle.

### VANGUARD SOFTWARE

Vanguard Software has developed a MEIO solution to complement its flagship forecasting product within its supply planning modules. In addition to MEIO, Vanguard has solutions to address sales forecasting, demand planning, financial forecasting, and S&OP. The vendor has invested in delivering extensive analytic capabilities that cut across industries, with customers leveraging the solution as an integrated business planning solution or on a module by module basis.

Built on the philosophy that inventory is impossible to optimize in isolation, Vanguard customers typically add IO to the demand planning for forecasting and replenishment planning. Moreover, customers get the greatest value when the forecasting capabilities are used in conjunction with the MEIO. Vanguard delivers over 28 statistical forecasting models with a machine intelligence-based engine that optimizes the forecast. Using Monte Carlo simulations, customers can calculate safety stock, order quantities, or reorder triggers, leveraging the in-memory capabilities to run multiple scenarios, with dynamic recalibration of KPIs for each calculation.

Vanguard's MEIO solution has the scalability to address four million SKUs per minute, with a malleable workflow to cater to customer requirements. The solution is browser-based with customizable dashboards, charts, and tables to help customers better visualize key data. Vanguard's focus since the last Value Matrix on linking the IO and Monte Carlo simulations around lead time and forecasts. It is also in the process of developing a production planning solution to accompany its purchase order and replenishment planning, and linking it into the financials of the customer. The capabilities the solution has today deliver value to customers looking for inventory optimization that is linked to forecasting and replenishment and provides analytic models that address nearly every business circumstance. Nucleus expects Vanguard's continued investment to push it into the Leader Quadrant in the future.

## CORE PROVIDERS

The Core Providers in the 2017 IO Value Matrix include: 4R Systems, Blue Ridge, Slimstock, Smart Software.

### 4R SYSTEMS

4R Systems provides a cloud-based inventory solution for retailers. Its supply chain suite is characterized as profit optimization solutions and includes forecasting, replenishment, assortment optimization, seasonal allocation, and vendor order optimization. The solution is designed to maximize profit for each item and uses prescriptive analysis and machine learning in its forecasting solution taking into consideration constraints such as seasonality, promotions, and pricing to develop a demand signal.

Within its replenishment solutions, 4R Systems provides omni-channel profit optimization to help retailers find the right balance of inventory. For customers with seasonal products, 4R Systems has solutions to manage buying, allocation, and markdown. 4R Systems also has capabilities that can optimize an assortment and send alerts when customers should make adjustments. Like all 4R Systems' offerings, the engine selects an assortment designed to maximize profits.

As a Core Provider, 4R Systems delivers a solution that is narrowly focused and is valuable for the right customer. For omni-channel retailers that are struggling to maintain profitability, 4R Systems provides the analytics and automation that help customers achieve value.

### BLUE RIDGE

Blue Ridge is an Expert in the 2017 Value Matrix, delivering a MEIO solution as part of its cloud-based supply chain planning suite. In addition to IO, Blue Ridge offers demand forecasting and planning, replenishment optimization, forecasting, supply planning, allocation, S&OP, and supply chain analytics. The MEIO uses a holistic view to analyze the entire supply chain network, calculating inventory levels based on demand sensing and supply chain configuration.

Blue Ridge's modeling takes into account supply chain constraints such as supplier capacity, buying maximums or minimums, and lead times. The MEIO tool accounts for drivers of demand and supply along the entire supply chain, helping retailers and distributors by allowing them to consider different demand types when modeling their forecasts.

With a focus on retail and distribution customers, Blue Ridge's solution isn't suited for every supply chain situation. However, the solution delivers significant value to

its customers, offering a cloud solution with capabilities that make it competitive in its market verticals.

### SLIMSTOCK

Slimstock offers a supply chain solution called Slim4 which includes demand profiling, forecasting and demand planning, IO, S&OP execution, replenishment, and multi-echelon planning. The inventory optimization comes within the inventory management modules and determines the correct inventory level at each item-location. Safety stock and reorder level are determined dynamically based on organizational inventory policies. The system adjusts to changes in policy such as a change in desired service level and can manage across diverse types of stock.

Slimstock provides optimal order-level when the inventory module is integrated with forecasting and planning. As a result, customers can ensure that stock and order levels are balancing working capital and service levels.

Though primarily based in Europe, Slimstock has been making in-roads in the North American market, delivering a revamped UI and adding modules that cater to specific industry verticals. Customers should consider Slimstock if they are unsure about the benefits they could garner from an IO solution since the vendor will only sell the software if it believes the customers will have a payback period of under one year.

### SMART SOFTWARE

Smart Software is a Core Provider in the 2017 IO Value Matrix offering two MEIO solutions that help customers make better inventory policy decisions:

SmartForecasts and Smart Inventory Optimization (SIO). Both solutions can be integrated on the vendor's Smart Platform, which delivers native web-based applications.

SmartForecasts is the vendor's demand planning, forecasting, and inventory forecasting solution, delivered via a hosted service or installed on-premises. Customers can set service level targets based on future demand predictions and stocking parameters. Its usability is enhanced by workbenches that allow users to share and override forecasts based on events, promotions, and other intervening factors.

SIO is designed to allow users to optimize inventory taking into account parameters such as current safety stock, order quantities, and reorder points. Inventory levels are linked back to KPIs and a variety of inventory costs. Smart Software gives users tools to modify policies and build consensus, creating what-if scenarios. The solution

promotes management by exception so users get alerts to modifications so they can be tracked and implemented.

Smart Software provides users with tools to visualize their plans with graphical representations of forecasts. The vendor delivers value to cost-conscious customers that are looking for help optimizing inventory and forecasting when faced with intermittent demand.

