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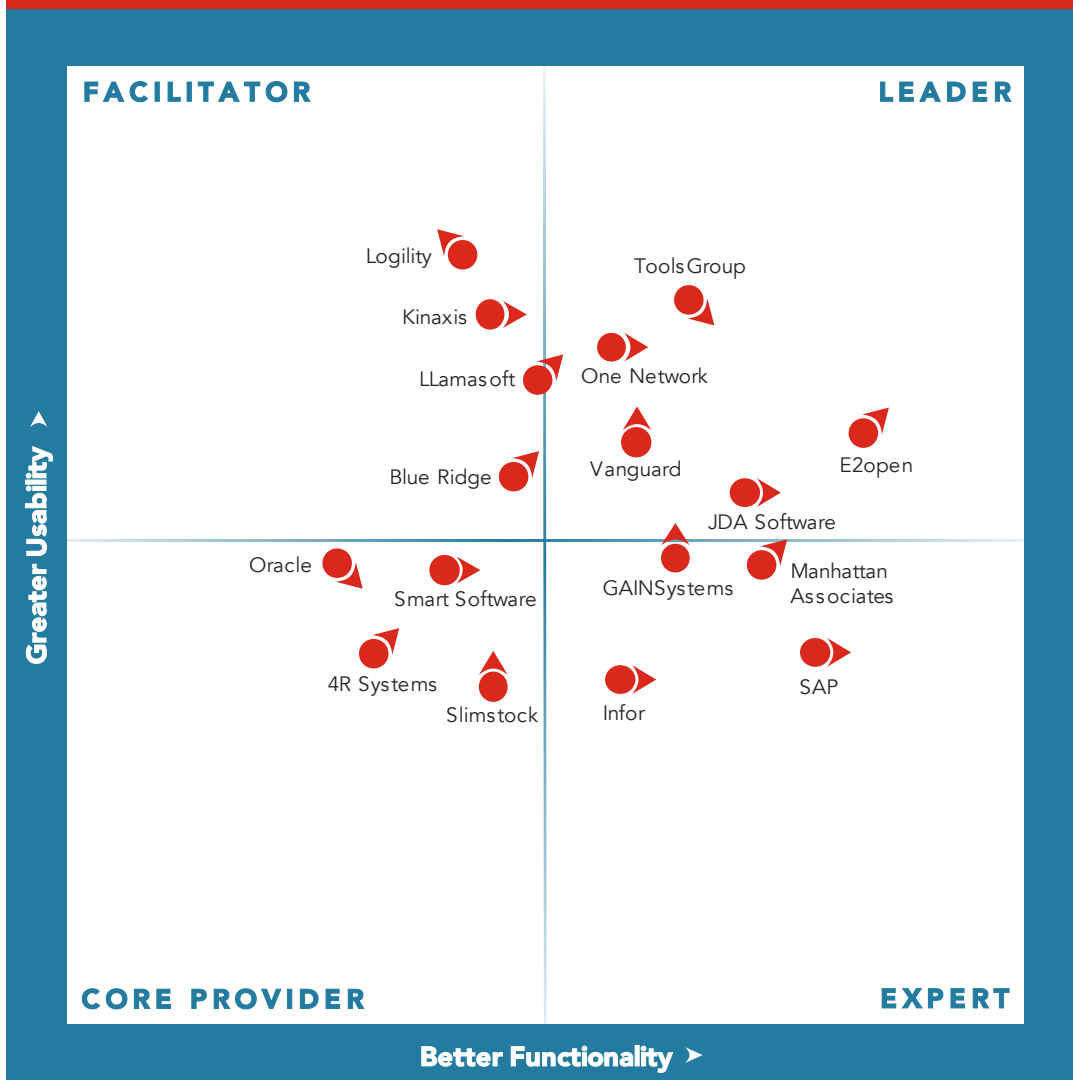
IO TECHNOLOGY VALUE MATRIX 2019

ANALYST

Seth Lippincott


THE BOTTOM LINE

Many organizations are under increasing competitive pressure to improve their supply chain efficiency and operation. As they look to refresh their supply chain management processes, the software tools available have come a long way to help answer the challenges of modern enterprises. Planning systems are providing visibility within and without a company's four walls, facilitating a holistic approach to inventory and the ability to optimize across multiple echelons of trading partners and suppliers. Inventory optimization (IO) solutions remain a critical area of focus for supply chain planners as they are being asked to drive better results with fewer resources. Leading vendors are providing capabilities that speed customer time to value and bring additional flexibility to planners.



MARKET OVERVIEW

In this Technology Value Matrix, Nucleus evaluates several solutions that help organizations find the right balance between inventory and service levels while minimizing costs. The Matrix positions vendors in the market based on their delivery of value to customers through the functionality and usability of the software (Nucleus Research *s142 – Understanding the Value Matrix*, September 2018). With a focus on inventory optimization (IO), the solutions



featured in this Matrix help organizations move from day-to-day management of inventory to optimization around several key performance indicators (KPIs).

The demand for solutions that enable organizations to plan around balancing service delivery with stocking levels is becoming more pronounced as the competitive landscape and shifts in consumer behavior present new challenges. Historically, many organizations answered the challenges they faced by carrying more inventory to cover risks and uncertainty. However, IO solutions are enabling organizations to find a better balance between stocking levels, service, and cost. For many vendors, IO is part of their suite of planning tools; including demand sensing and planning, supply planning, replenishment planning, and sales and operations planning (S&OP). Nucleus found that many customers achieve greater benefit when their IO capabilities are used in conjunction with other planning tools offered by the same vendor, eliminating the silos that are created by operating on a plethora of point solutions.

The goal for vendors is to provide a holistic view of an enterprise's inventory picture, allowing planning to be integrated across different parts of the business and extended value chain. Instead of managing inventory at each distribution center (DC) separate from each retail location, IO solutions must cut across echelons of the extended supply chain. Leading solutions allow for organizations to expand their planning and optimization into multiple tiers of trading partners and suppliers. As organizations improve their sophistication and capabilities along the Nucleus Research Supply Chain Management Maturity Model, their ability to extract value and transform their associated business processes can undergo significant change, and thereby necessitate a new suite of tools (Nucleus Research's 175 – *Assessing Supply Chain Management Maturity*, November 2018).

This report also focuses on ways in which vendors are bringing automation and intelligence to their software tools. The use of machine learning (ML) and simple artificial intelligence (AI) to several areas of planning is becoming a reality for more customers. Though often reserved for identifying patterns and outliers in large datasets, these technologies are gaining traction and are ideally suited for use cases within supply chain planning and optimization. For example, a table stake for the market is ML-informed forecast modeling selection, where the optimization engine identifies the demand model best fitting the demand signals that are captured.

In terms of usability, ensuring user adoption and trust in the tool is an area of differentiation for vendors. With the inherent difficulty in change management that inventory optimization implementations typically experience, the ability of vendors to help users stick with the tool—rather than reverting to their old processes—is often the difference between implementation success and failure. Additionally, by removing the “black box” in which many optimization engines sit, vendors more easily generate buy-in within organizations where planners are historically conservative.

LEADERS

The following vendors are Leaders in the 2019 IO Value Matrix: E2open, JDA Software, One Network, ToolsGroup, and Vanguard.

E2OPEN

E2open remains a leader in the 2019 edition of the IO Value Matrix, having continued to make moves to address enterprise supply chain needs from end-to-end. With a total of 10 acquisitions over the last 36 months, E2open looks to create a digital twin to the extended supply chain that includes suppliers, manufacturers, third-party logistics providers, warehouses, transportation, resellers, and retailers. Underpinned by its multi-enterprise network, the vendor facilitates customer coordination with trading partners both upstream and downstream, and provides visibility over inventory levels beyond the four walls of the customer's enterprise.

E2open's solution tackles MEIO across its multi-enterprise network, propagating demand captured from the vendor's demand sensing capabilities to upstream operations and trading partners. As a result, customers gain additional value when the solution is used in conjunction with other parts of the E2open software suite; most frequently leveraging demand sensing, demand planning, and analytics. The vendor is applying ML techniques to customers' historical data to identify anomalies and bring them to users' attention.

To help consolidate its new acquisitions, E2open has released a new user experience called Harmony. Since the solution is delivered through a SaaS model, E2open customers receive a consistent cadence of updates and improvements to their software. Based on its success in the CPG industry, E2open has focused on enabling customers to run weekly inventory rebalancing, however, the MEIO capabilities can be applied to any of the industries E2open serves. Looking forward, E2open is continuing to invest in its MEIO solution with plans to further improve the usability with capabilities such as data validation automation and better root cause analysis. As the vendor consolidates its recent acquisitions, customers should expect E2open to strengthen its ability to answer their inventory optimization needs in conjunction with their end-to-end supply chain management requirements.

TOOLSGROUP

ToolsGroup is a Leader in the 2019 edition of the Inventory Optimization Technology Value Matrix. Specializing in industries such as CPG, retail, food and beverage, and automotive, ToolsGroup's flagship product, SO99+, generates a stock-to-service model for each SKU-location to achieve the required service level at the minimum cost. In addition to inventory

optimization, SO99+ can cover demand planning and sensing, production planning, promotions planning, S&OP, and allocation and replenishment for customers.

Unlike other vendors that deliver a suite of demand curve models out of the box, ToolsGroup SO99+ uses one self-learning algorithm to forecast demand distribution. The technology can digest as little as six months of historical actuals to start forecasting accurately. The software assists customers in building an understanding of the probability of demand that is propagated at each node of the supply chain. SO99+ also accounts for re-supply parameters to generate the supply curve for each SKU-location.

ToolsGroup has made strides to help customers better manage long-tail demand, using probabilistic demand (also called stochastic demand) rather than deterministic demand in its forecasting engine. The vendor has also been focusing on developing capabilities to improve new product introductions. The system breaks down a product into a set of parameters and analyzes historical data of like-products for the demand drivers that are significant to the parameters of the new product. ToolsGroup has demonstrated success expanding in existing accounts as well as acquiring new logos and continues to focus on delivering end-customer value. Further investments in shortening the distance between planning and operations will help the vendor keep pace with competitors that cover both within their solution suites.

JDA SOFTWARE

JDA Software is a Leader in the 2019 edition of the IO Value Matrix. JDA has been making investments in an effort to move toward its vision of an autonomous supply chain. JDA delivers MEIO as part of its planning solution suite, which includes demand planning, S&OP, category management, network design, factory scheduling, distribution planning, and master planning. JDA also connects planning with execution, providing solutions that cover warehouse management, transportation, order promising, and workforce management.

To bolster its ML/AI capabilities as it strives to build an autonomous supply chain, JDA acquired Blue Yonder, a vendor focused on ML and AI solutions primarily for retail organizations. Users can develop probabilistic forecasts for each item-location, with Blue Yonder's technology integrated into JDA's demand planning solution. For example, JDA is augmenting its deterministic forecasting with Blue Yonder's probabilistic forecasting for SKUs with long-tail demand. The vendor has plans to continue to invest in its planning suite and further integrate Blue Yonder's capabilities into its offerings.

Seeking to answer the inventory challenges organizations, JDA's MEIO technology can be applied to strategic and tactical planning and review processes, allowing customers to perform annual, monthly, or weekly cycle analysis. Customers can also audit the results of their policies with root cause and scenario comparisons. Looking forward, JDA is planning

on bringing functionality and usability improvements to its MEIO technology, such as segmentation based on self-clustering algorithms and improvements to JDA's integrations with customers' systems of record. As one of the few vendors that can bring the end-to-end supply chain management under a single umbrella, JDA has the ability to bring disparate data into its planning and optimization engine. As its library of customer use cases that demonstrate the benefits of its AI and ML investments increases, Nucleus expects the vendor to be better able to deliver value through automation and machine intelligence.

ONE NETWORK

One Network is a Leader in the 2019 IO Technology Value Matrix. The vendor delivers a multi-party network connecting its customers with upstream and downstream trading partners and suppliers. With a suite of application modules delivered on the platform, customers can answer their end-to-end supply chain needs including supply planning, demand planning, sales and operations planning, global logistics management, outbound fulfillment, and inbound logistics management. One Network customers can onboard their trading partners, giving two-way visibility to inventory levels, ability to serve, and forecasts. The network has over 75,000 participating organizations, allowing customers to find partners and collaborate around their plans. The vendor supports customers across several industries in CPG, retail, restaurant and food service, healthcare and pharmaceuticals, high-tech, aerospace, defense, and government, automotive, and logistics service providers.

One Network has taken several steps with its planning applications to increase automation and usability for its customers through AI and Machine Learning technology. One primary driver is the use of artificial intelligence agent technology within the software to perform a host of functions such as forecasting, replenishment, sourcing, and transportation optimization. By allowing the intelligent agent technology to analyze current performance relative to historic data, customers can use the software to autonomously determine the optimal replenishment order. Trading partners can see the forecast that the system publishes, enabling them to better prepare for fulfilling the upcoming order. The agents scan inventory levels and incoming demand signals periodically to optimize the next replenishment cycle.

While many vendors are talking about bringing automation to their supply chain planning and inventory optimization software, One Network has customers that are live—using the capabilities and extracting value from the technology. By providing an integrated platform on which customers can run their supply chains end-to-end, the vendor is shortening the distance between planning and execution, providing a holistic view of inventory and the ability to optimize stocking levels. Nucleus expects the value One Network delivers to continue to improve as more customers adopt its automation and intelligent capabilities.

VANGUARD

Vanguard Software remains a Leader in the 2019 IO Value Matrix, providing a suite of applications for supply chain planners including sales forecasting, demand planning, MEIO, S&OP, financial planning and analysis (FP&A), and integrated business planning (IBP). The vendor's MEIO application encompasses sales forecasting, supply planning, and demand planning capabilities. The planning tools are underpinned by the philosophy that strives to automate routine tasks and assists users with finding solutions to exceptions. To improve usability, Vanguard delivers a web-based interface for its applications and provides an object-based database. Rather than relational tables, Vanguard stores data in objects, increasing cloud performance and enabling customers to operate on a single data model across their applications.

An area of investment for Vanguard has been its cloud infrastructure, which is paying dividends to customers. The vendor has built a global mesh network of datacenters, making each datacenter redundant to the others and ensuring 100 percent uptime globally. Vanguard also brings extensive modeling and simulation capabilities to its planning software. Customers can run scenarios based on Monte Carlo methods to calculate the possible range and likelihood of impacts on KPIs to identify plan risk.

Vanguard is bringing collaboration capabilities to its applications in several ways. The infrastructure allows for customers to establish a multi-enterprise network, integrating trading partners and suppliers in planning cycles. The user experience allows planners to tag information and specific views to other users, providing the contextual information to facilitate easier communication and alerting users to issues that need their attention. As Vanguard continues its investment in delivering holistic planning and inventory optimization, Nucleus expects its value proposition to further improve.

EXPERTS

Experts in the 2019 Inventory Optimization Technology Value Matrix include GAINSystems, Infor, Manhattan Associates, and SAP.

GAINSYSTEMS

GAINSystems is an Expert in the 2019 edition of the IO Value Matrix. The vendor's MEIO solution is part of its planning suite that includes forecasting and demand planning, sales, inventory, and operations planning (SI&OP), and replenishment and production optimization. Although some of its customers are still using an on-premises version of its software, GAINSystems has had good momentum in its cloud offering over the last year.

Additionally, customers can leverage several out-of-the-box process automation capabilities such as replenishment planning. For additional usability the vendor has shifted its software from Java to HTML5, allowing for codeless configuration by users.

GAINSystems' software delivers the scalability to handle customers of any size and complexity, handling SKU-location datasets with tens of millions of entries. The multi-echelon capabilities allow companies to leverage upstream and downstream data such as supply variability, inventory positions, and point-of-sales, tied together on the vendor's supply chain optimization data network. In terms of usability, GAINSystems provides feedback and information to users so they can better understand why the system made a particular recommendation. The systems also provides performance data to track what happened since the last planning cycle. With powerful in-memory capabilities and more successes in shifting customers to cloud delivery of its inventory optimization software, GAINSystems is well positioned to continue to deliver value to its customers moving forward.


INFOR

Infor is an Expert in the 2019 edition of the IO Value Matrix. The vendor provides a suite of planning modules along with inventory optimization, including S&OP, production planning, demand planning, scheduling, and supply planning. Infor allows customers to optimize around relevant KPIs, and delivers a multi-enterprise network to provide visibility to a customer's extended value chain off the back of its 2015 acquisition of GT Nexus.

In March 2019, Infor rebranded GT Nexus to Infor Nexus and charted a path toward an autonomous supply chain when combined with the capabilities of Infor Coleman AI and the internet of things (IoT). The movement towards a more autonomous supply chain is both ambitious and encouraging, considering that the vast majority of Infor's software is focused on ERP solutions. Nucleus expects that as Infor further connects its planning solutions with its operational execution products, customers should be better equipped to extract additional value from the optimization capabilities.

MANHATTAN ASSOCIATES

Manhattan Associates is an Expert in the 2019 IO Value Matrix, with a heavy focus on omnichannel inventory optimization (OIO) particularly geared toward retail and wholesale customers. The vendor has a suite of solutions related to its inventory capabilities, including demand forecasting, replenishment, sales and operations planning, MEIO, and vendor managed inventory. With OIO, Manhattan Associates helps customers align inventory to omnichannel demand across their entire network of stores and DCs, enabling in-store fulfillment of online demand. Combined with capabilities from the S&OP solution,



Manhattan Associates users can develop a holistic inventory strategy centered around customer demand down to the SKU-location-fulfillment strategy level.

Promotions are another area of continued focus for the vendor. Manhattan Associates has deployed machine learning capabilities to analyze the drivers of promotional lift, allowing customers to have a better understanding of promotion performance. By integrating the anticipated effects of promotions into the planning and forecasting process, Manhattan users can ensure service levels are maintained during a promotion as well as improving the organization's bottom line.

Although Manhattan Associates has made progress with its cloud offerings gaining traction, the vendor has not outpaced the overall shift in the market away from on-premises deployments toward applications delivered in the cloud. As more customer make the move to cloud, drastically reducing the administrative burden on their IT departments and accelerating their time to value, Nucleus expects Manhattan Associates' relative position in future editions of the Value Matrix to improve.

SAP

SAP is an Expert in the 2019 edition of the IO Value Matrix. SAP delivers IO capabilities as part of its Integrated Business Planning (IBP) solution, which covers five planning modules: S&OP, inventory, demand analytics and sensing, control tower, and supply planning and response. Available on the HANA cloud platform, SAP IBP is focused on end-to-end supply chain management, with customers realizing greater benefits when they have more than just the inventory optimization module and can feed forecasts and demand sensing data into the optimization engine.

Since the last edition of the Value Matrix, SAP has focused on moving away from build-to-forecast toward build-to-order models. This has been led by demand-driven Material Requirements Planning (MRP) theories. As part of SAP's 1802 launch, the organization is now integrating with partners to offer complete end-to-end, demand-driven MRP. SAP has continued to invest in its MRP vision and is moving to offer full end-to-end service within its solution.

FACILITATORS

Facilitators in the 2019 IO Value Matrix include Blue Ridge, Kinaxis, LLamasoft, and Logility.

BLUE RIDGE

Blue Ridge is a Facilitator in this year's IO Value Matrix. The vendor scores highly in delivering usability to customers with a focus on the software doing the heavy lifting, quick implementation and on-boarding, monthly updates, and cloud-native software. With a focus primarily on retail and wholesale distribution, Blue Ridge doesn't try to answer the inventory optimization needs of every industry vertical; instead it specializes on where its technology is best utilized. In September 2018, the vendor added an integrated business planning application to its planning software suite, helping customers gain a more holistic and comprehensive approach to inventory planning and optimization.

Recently, Blue Ridge announced a partnership with the enterprise resource planning vendor, NetSuite. The partnership will deliver Blue Ridge's planning capabilities configured to match NetSuite's industry-specific applications. Blue Ridge has also invested in its advanced analytics technology, leveraging AI to continuously learn and adjust the optimal combinations of forecast and inventory policies. The system can incorporate external data sources that can impact optimization efforts such as weather and demand exceptions. As Blue Ridge expands its use cases of automation and analytics, its position in the Value Matrix should continue to improve.

KINAXIS

Kinaxis is a Facilitator in the 2019 edition of the IO Technology Value Matrix, delivering its suite of concurrent planning capabilities via its flagship product, RapidResponse. The vendor offers a single cloud-based SaaS platform delivering sales and operations planning, and supply chain planning capabilities, including inventory planning and optimization (IPO). Able to bring continuity to large enterprises, Kinaxis helps planners move from fragmented measures and metrics to standardization on a common platform, providing a clear picture of the inventory situation and enabling easier decision making.

Customers point to the vendor's superior usability as a primary differentiator, allowing users to build workbooks to answer their unique business conditions as well as powerful scenario analysis capabilities. The flexibility of RapidResponse enables customers to perform nearly any planning activity with the software. This is further aided by Kinaxis' connectivity with systems of record that Kinaxis has out-of-the-box, providing users with the data they need.

An ongoing area of focus for Kinaxis is realizing The Self-Healing Supply Chain. The vendor has invested in capabilities that automatically perform tasks such as deviation detection, analysis of predicted values, and corrective actions. Kinaxis has started this process focusing on lead time, including time-phased lead time, with plans to expand the use cases to continually challenge and heal the key inputs that control a supply chain's digital twin. Additionally, customers can take advantage of regression forecasting that draws on external

events and data sources to build a more effective inventory plan. As Kinaxis brings additional practical applications of ML technology to its solution, customers should expect to derive additional value from the self-healing functionality.

LLAMASOFT

LLamasoft is a Facilitator in this year's IO Value Matrix, with its MEIO capabilities delivered as part of its supply chain network design software. While supply chain design is suited for answering large strategic and tactical questions, LLamasoft's solutions can perform operational optimization for a wide variety of customer verticals, including healthcare, chemicals, retail, CPG, manufacturing, and wholesale distribution. Because LLamasoft models a customer's extended supply chain from end to end for the purposes of design analysis, applying the model to analyze inventory and service optimization is possible. Typically operating in a Center of Excellence within an enterprise, LLamasoft's technology can scale to answer the needs of some of the largest companies in the world.

The vendor delivers three modules on its integrated cloud platform: Visualizer, Modeler, and App Builder. All of the modules sit on LLamasoft's algorithm library and data hubs, which are the foundational elements of the cloud platform. The vendor has continued to push innovation with its investments in disposable built-for-purpose applications. The application building capabilities are designed to assist users with decisions and complement existing enterprise systems. The apps are tailorable to the users' specific needs with easy configuration and connectivity to the Data Hub, ensuring that the user is drawing from a unified data repository. Based on its platform construction and increasing ability to deliver value to customer by informing better decision making, LLamasoft offers a unique approach to inventory optimization, and the results customers realize typically are well worth the investment.

LOGILITY

Logility is a Facilitator in the 2019 IO Value Matrix, delivering the market standard for usability. The vendor delivers a platform that enables companies to integrate with suppliers, collaborate with their customers, and leverage analytics that draw on data from outside the enterprise, including social sensing and unstructured information. Logility has product capabilities that span supply and demand optimization, replenishment planning, manufacturing planning, assortment and allocation planning, and transportation and shipping optimization through its Voyager Solutions.

In March the vendor launched Logility Voyager Pulse Wise, an autonomous engine that senses, analyzes and updates demand planning parameters in real-time. Artificial intelligence (AI) analyzes future demand signals and actual performance to proactively react

to changes that may impact forecast accuracy. In addition to offering out-of-the-box templates for connecting with ERP systems and reducing data lags between systems, the integration allows for multi-enterprise collaboration. The vendor also spent the past year focusing on its integration of Halo Business Intelligence. The vendor also helps customers with master data management using capabilities delivered by Voyager AdapLink, which it deploys as the integration layer between the supply chain and the enterprise's data.

This year the vendor launched Logility University, an education program that delivers a product-specific curriculum to customers and partners. This program extends Logility's training series to provide in-person training at one of Logility's education centers in India, New Zealand, United Kingdom, or the United States as well as online through an on-demand course program. The vendor also continued its investment in its machine learning and AI capabilities as well as functionality within the Logility Voyager Solutions Retail Optimization platform.

CORE PROVIDERS

Core Providers in the 2019 Inventory Optimization Value Matrix include 4R Systems, Oracle, Slimstock, and Smart Software.

4R SYSTEMS

4R Systems is a Core Provider in the 2019 edition of the IO Value Matrix. The vendor focuses exclusively on retail customers, providing a suite of planning tools in addition to its inventory optimization capabilities including assortment optimization, vendor order optimization, forecasting, and seasonal allocation planning. 4R Systems has functionality that is specialized but remains flexible as the needs of customers change. The vendor strives to deploy its software in only a few months with a goal of maximizing profitability for its customers, resulting in payback periods that typically span months rather than years. Nucleus found that 4R Systems' ability to deliver value is on par with its expertise in the retail segment of the value chain.

Machine learning has been a major area of focus for 4R Systems, using the technology to match consumer behavior with the goal-seeking model the system builds. The software automatically evaluates the data coming from the systems to which 4R Systems is connected, looking for trends and outliers. As the vendor continues to push the boundaries of retail optimization and brings more automation capabilities to its customers, 4R Systems will further differentiate itself as the "go-to" solution for its market segment.

ORACLE

Oracle is a Core Provider in the 2019 edition of the IO Value Matrix, offering a suite of value chain planning tools. Oracle continues to make significant investments to build its Supply Chain Planning (SCP) Cloud solution from the ground up. Though it is predominately installed on premises, Oracle leverages its cloud user's best practices to increase usability in its on-premises products. Within SCP Cloud, the users see only the functionality they need rather than switching between modules. Offering its capabilities as cloud-based services rather than individual applications, Oracle is focusing on ensuring that its capabilities are fit-for-purpose to increase the value customers realize.

Since the last Value Matrix, Oracle has invested in its SCP Cloud solution, recently adding Field Service Logistics—a new solution that enables organizations to resolve customer issues by connecting customer service teams and field service teams. Oracle also released a feature to facilitate billing upon fulfillment by integrating and automating the tracking of project attributes and related costs from a sales order. The vendor also deployed a new vendor-managed inventory capability that assists with replenishment that allowing users to securely share on-hand quantities with selected suppliers. Further adoption of its cloud software by customers should improve Oracle's position in future editions of the Value Matrix.

SLIMSTOCK

Slimstock is a Core Provider in the 2019 IO Value Matrix, offering its Slim4 product which includes demand profiling, forecasting, demand planning, S&OP, replenishment planning, and MEIO planning. Slimstock services the needs of customers from many industries including automotive, retail, wholesale, manufacturing, spare parts, industrial, consumer packaged goods, construction, and healthcare. The vendor also offers a plug-and-play connector with ERP systems. Operating as a knowledge partner with its customers, Slimstock offers fixed-fee implementations and customers generally go live in three to four months.

Since the last Value Matrix, Slimstock has moved to a web-based user interface for its new applications, helping the solution's usability along with its subscription to management by exception as a foundational principle. Supporting customers in 40 countries and operating out of 18 offices, Slimstock has a global presence and ambitious plans for further growth. As more organizations adopt the most recent version of its software and realize the additional value it has to offer, Nucleus expects Slimstock's position in future editions of the Value Matrix to improve.

SMART SOFTWARE

Smart Software is a Core Provider in the 2019 edition of the IO Value Matrix, having made significant strides with its next-generation Smart Inventory Planning & Optimization (IP&O) solution suite. The solution is delivered on a multi-tenant, web-based platform hosted by Amazon Web Services and is built natively for the cloud. The vendor has also extended its partnership ecosystem, integrating ERP systems such as Epicor, Microsoft Business Central, and NetSuite.

As part of IP&O, Smart Software delivers three modules covering inventory optimization, demand planning, and operational analytics. For organizations that have operated with spreadsheets and operational silos, the solution helps to codify inventory stocking policies and improve forecasting. Smart Software provides the foundation to move supply chain operations from reactive to proactive, as organizations mature their processes. Additionally, the company has developed analytic models to address intermittent demand, which is key for customers that manage service parts. As more customers shift to and deploy the new IP&O solution, Nucleus expects Smart Software's ability to deliver value to further improve.