Supply chain software basics: Supply chain

By Lorie King Rogers, Associate Editor

Anyone will tell you, use the right tool for the right job. When it comes to supply chain execution software—the applications that direct manufacturing operations, oversee distribution processes like receiving and order fulfillment, and ship products—there are more tools, and more robust tools, available than ever before.

In the past, these were stand-alone applications, explains Tom Kozenski, RedPrairie's vice president of product marketing. Not anymore. Software applications are working together and using common data to synchronize and optimize the operations necessary to get an order to a customer.

This equipment report focuses on supply chain execution (SCE) solutions. Like foot soldiers, supply chain execution solutions carry out the plan created by the planning systems. Here's a look at how these software applications are being used to manage the information of product moving through today's complex operations.

Workers interfacing with a WMS can track product and ensure that the right amount of inventory is where it's supposed to be and when.

Warehouse management systems

Accurate inventory management directly impacts an operation's bottom line. "Too much product sitting means too much money sitting. Too little product means stocks and that's money lost," says RedPrairie's Kozenski.

A warehouse management system (WMS) is the starting point for inventory management. It ensures that the right amount of inventory is where it's supposed to be when it's supposed to be there, whether that's in the manufacturing facility, the warehouse or the distribution center, Kozenski explains.

A basic WMS package supports the everyday functions that are central to warehousing: receiving, directed putaway, order fulfillment planning, picking and packing, and shipping the order.

An advanced WMS may also support:

- **Replenishment:** The WMS constantly updates inventory and calls for the movement of material from storage to the active pick area so order pickers don't run out of inventory or sends notification to re-order.
- **Returns:** With increased catalog and online shopping at the consumer level, the WMS system has the capacity to handle a large quantity of returns to maximize the value of the merchandise coming back.
- **Cycle counting:** Typically this is a process to systematically count inventory according to a plan, and a support for the usual inventory accounting process.
- **Productivity:** The WMS communicates with workers on handheld RF devices and voice technology. The communication data also provides a way to track and report productivity.

Enhancements to WMS

In today's warehouses and DCs, a WMS is a foundational application. As these solutions have

execution

Today's supply chain execution software applications are evolving, adding functionality and enabling operations to function more effectively.

evolved, so has a suite of applications that enhance and extend the WMS functionality. While there are a number of different applications available, the three most commonly used are slotting, yard management and labor management.

Slotting

Slotting software tools map the warehouse and the velocity of orders and order mixes to calculate the fastest moving items. This information is used to determine where individual products should be stored to create the most efficient picking operation. For example, fast movers should be located closest to the shipping area; slow movers can be located further away in reserve storage; similar items should be separated to reduce picking errors; and heavy items should be positioned at chest height to avoid worker injury and improve ergonomics.

Slotting data can also be used to reconfigure and optimize the layout of products in a facility as business requirements change.

Yard management systems

The yard management system (YMS) extends the view of the WMS. "Visibility is the big issue," says Richard Kirker, SAP's SCM solution management and solution owner for warehousing. "Knowing what's in the con-

tainers in the yard is important, especially when the container is an extension of the freezer."

The YMS also serves as the bridge between the WMS and transportation. It controls yard activities and schedules arrivals at the dock doors, reducing bottlenecks and waiting time.

On the outbound side, a YMS creates a delivery schedule and can coordinate picking activities around the trailers that are available to be loaded. Information collected by the YMS can also be used to analyze a carrier's delivery performance.

Labor management systems

The WMS directs activities, but the labor management system (LMS) determines how many workers are needed and where they're needed to do the job efficiently. It can also plan, manage, measure and report on the performance of warehouse personnel by comparing the work against a set of engineered labor standards.

Additionally, the LMS can monitor work during a shift, provide real-time feedback to supervisors and associates, and use business intelligence tools to proactively address personnel situations before they become customer service problems.

Warehouse control systems

A warehouse control system (WCS) is a layer of software that sits between a host system—either an ERP or WMS—and automated materials handling equipment. It controls and synchronizes the automated storage, picking and transportation solutions.

The WCS determines the best way to route materials through the automated systems and provides real-time control to re-optimize orders as business conditions change. It also updates the host system, providing transparency into warehouse activities.

If something goes wrong, the WCS can reroute the product or send an error message to the WMS in sub-second response time, explains Chad Collins, vice president of marketing and strategy for HighJump.

Manufacturing execution systems

The manufacturing execution system (MES) manages processes on a shop floor. It tracks products and orders, manages the work, and collects transactions for reporting to ERP systems. The MES also electronically dispatches orders to personnel and allows the schedule to change quickly in response to unexpected demand or to recover from equipment or material problems.

Today's integrated MES tools also manage the challenge of maintaining master records about the components of a product. Tracking and tracing capabilities are increasingly important in the global supply chain, especially in the food and pharmaceutical sectors, so maintaining one copy of data regarding the product is crucial, says SAP's Kirker.

"As regulations become more stringent, having one version of the truth is very important. You don't want a separate set of data for all areas, you want complete transparency," Kirker adds.

Transportation management systems

The transportaion management system (TMS) receives orders, confirms shipping dates, checks rates, assigns carriers and establishes pick-up and delivery schedules before releasing orders to the WMS for processing. Once the orders have been picked, packed and shipped, it manages tracking, freight payments and carrier performance metrics.

Basic TMS functions include mode, carrier and route selection. The TMS can also handle load building, which optimizes orders by combining LTL shipments into full loads, and aggregates parcel shipments to geographic regions. This is increasingly important as transportation is a vital

Supply chain software suppliers

Company	Web site	ERP	SCP	WMS	MES	TMS
Aldata	aldata-solution.com	x	x	x		x
Apriso	apriso.com			x	x	
Descartes Systems Group	descartes.com					x
e2open	e2open.com		x	x		x
Epicor	epicor.com	x	x	x		x
HighJump	highjumpsoftware.com		x	x		x
IBS	ibs-us.com				x	
IFS	ifsworld.com/us	x	x		x	
Infor	infor.com	x	x	x		x
JDA Software	jda.com		x			x
Kewill	kewill.com			x		x
Lawson	lawson.com	x	x	x	x	x
Logility	logility.com		x	x		x
Manhattan Associates	manh.com		x	x		x
Oracle	oracle.com	x	x	x		x
QAD	qad.com	x	x	x	x	x
RedPrairie	redprairie.com			x		x
Reddwerks	reddwerks.com			x		
Retailix	retailix.com	x	x	x		x
SAP	sap.com	x	x	x	x	x
Sterling Commerce	sterlingcommerce.com			x		x

This table represents a sampling of leading supply chain software suppliers.

but costly part of the supply chain that can erode profit margins if not handled effectively.

Supply chain event management and visibility

Once stand-alone applications, event management and visibility solutions are increasingly integrated into other applications, including WMS, WCS, MES and TMS. These systems are like watchdogs monitoring processes inside the four walls of a facility or across the supply chain for unexpected events that are out of tolerance for the plan—like the shortage of parts on an assembly line or the breakdown of equipment in a DC. In case of an event, the system sends an alert to a decision-maker by fax, e-mail, pager or on a PDA so immediate action can be taken.

By building in work flow rules, the system can offer suggestions that allow a decision-maker to implement the best alternative in terms of cost, time and customer service requirements.

Computing in the cloud

Software-as-a-service (SaaS), or on-demand software, is an increasingly popular delivery mode that makes virtually all software applications available to operations of any size. Software applications, which are hosted by the supplier, are accessed by the end user over the Internet. Also called computing in the cloud, this format enables clients to use software solutions without having to own, repair, upgrade and maintain their own IT systems and equipment.

There are a variety of drivers for cloud adoption. For some it's cost savings, others want to be more agile. For others, computing in the cloud keeps the focus on the value-added activities of their core business, says HighJump's Collins.

In addition to off loading the IT burden, end users can keep systems current because vendors can push out changes and updates as available, behind the scenes, even without notification. □

Supply chain software basics:

The enterprise level

Enterprise-level supply chain software solutions give an operation the tools to create and test effective business strategies and plan ahead by incorporating commands for necessary preemptive strikes.

By Lorie King Rogers, Associate Editor

Today's supply chain software solutions are enhancing every link in the supply chain, enabling real-time communication and effective management between an operation's internal departments and its global trading partners. As the technology evolves, so does the seamless sharing of information.

Software applications are moving away from stand-alone applications to systems that are working together and using common data to effectively plan across the broad enterprise. Today's software provides an end-to-end process, says Richard Kirker, SAP's SCM solution management and solution owner for warehousing.

From the end users' perspective, as technology evolves and becomes more affordable, organizations that didn't think they could afford it are taking advantage of the optimization offered by the common data and architecture that today's solutions offer.

From the suppliers' perspective, the goal is to keep up with end users' demands and market-driven changes. "As businesses look to refresh their offerings, software has to keep up," says Jennifer Sherman, senior director of logistics product strategy for Oracle. As a result, software applications at all levels have an increased depth of capacity.

Software can be organized into two basic categories:

- applications that plan and manage processes and operations across an enterprise, also known as supply chain management applications, and
- solutions that execute those plans inside the four walls of a facility, or supply chain execution solutions.

This equipment report looks at supply chain management (SCM) software and how these applications are being used in today's supply chain operations.

ENTERPRISE-LEVEL APPLICATIONS

Enterprise resource planning

A packaged enterprise resource planning (ERP) system is a business software application that resides at the corporate level and serves as the information backbone, or the system of record, of the supply chain. It allows a company to:

- automate and integrate its business processes,
- share common data across the entire enterprise, and
- produce and access real-time information.

Typically, the core business functions managed by the ERP involve the manufacturing, distribution and financial needs of a company, including cost accounting, inventory at a high level, purchasing, customer orders, invoicing, vendor invoices and payments, customer receipt processing, general ledger and shop floor features.

The data created by those processes is maintained in a common file and in a common language that is understood by all the other systems in an enterprise, whether those systems are part of an integrated supply chain suite or linked together through interfaces.

In the past, no one single vendor had all the parts to manage the entire supply chain. The software market has matured and has become a platform in itself. While there is still a gap between the robust functionality provided by best-of-breed applications, ERP suppliers have closed the gap in many applications. As a result, many customers can go to a single vendor for a set of products that work together to run all areas of their business. That is especially true for customers running relatively straight-forward operations.

Order management system

Filling an order begins with capturing order information from the customer. The order management system (OMS) may receive orders by fax, phone, EDI (electronic data interchange) or on the Web.

Because there are a number of order and delivery scenarios, the OMS has to be heterogeneous with the functionality to deal with multi-channel capture and multi-channel fulfillment channels. Multi-enterprise OMS sits above the ERP and presents one face to the customer: Place an order and the OMS will parse out the different line items of an order to the right division, the right manufacturing plant, the right third-party distributor or the right warehouse.

SUPPLY CHAIN PLANNING

Supply chain planning

Supply chain planning (SCP) software, which also resides at the corporate level, is an umbrella technology that enables an operation to perform advanced planning and scheduling. It may also be used to handle information about orders collected by the systems of record and generate plans to accomplish the work.

One of the core functions performed by the ERP includes overseeing the manufacturing needs of a company.

SCP applications can be configured any which way. During the programming process, an operation's business rules are entered into the system. While there can be literally thousands of variables incorporated, these business rules are what optimize the process.

The SCP system usually resides at the corporate level, where it has a broad view of the orders to be manufactured, picked and shipped. It also sees constraints or limitations on the availability of capacity, materials, equipment and personnel. With this information, it determines the ideal way to schedule an order and plan for the future. In planning, SCP software may even determine that an order cannot be filled profitably and therefore should not be scheduled at all.

While there are many planning components, most SCP systems approach a problem from one of three angles:

- Strategic planning looks at capital asset allocation as well as market and resourcing decisions like a warehouse location that best serves a particular market.
- Tactical planning looks at an operation's resources and customer demands to determine what will produce the most profit for the company.
- Operational planning looks at the supply chain plan developed by the strategic and tactical planning programs and creates an operational path to execute those plans. For example, the operational plan might outline a weekly production schedule then go a step further and break down the schedule by the day, hour, minute or the second.

Multi-echelon planning

Multi-echelon planning is an application used to optimize the amount and

positioning of inventory across the supply chain. These planning solutions have matured and can add significant value to an operation, says Karin Bursa, vice president of marketing for Logility.

The multi-echelon solution evaluates the entire network and helps make decisions about the best quantity of product to keep at the most desirable location, explains Bursa. "Instead of spreading inventory like peanut butter, the multi-echelon solution enables you to spread inventory with precision across the network and better align with customer service goals."

For example, this solution can simultaneously consider inventory at a number of DCs, supplier warehouses or inventory in route from a manufacturer or distributor. It can also consider product still in the manufacturing phase, evaluate your work-in-process materials and develop a postponement strategy for the operation, if necessary.

Today's OMS have the ability to handle multi-channel order capture and fulfillment channels.

A postponement strategy, which can be as simple as packaging decisions for different customers, allows a company to bring working capital down significantly and accelerate total inventory turns, Bursa adds.

Supply chain collaboration

Supply chain collaboration systems go hand-in-hand with planning. In a global supply chain, where every participant has its own planning and execution systems, a collaboration platform enables all players outside the enterprise to communicate as if they were part of it. Collaboration is especially useful for companies with complex contract manufacturing and distribution requirements.

Inside the enterprise, these systems provide tools to share a common view, says Scott Fenwick, senior director of product strategy for Manhattan Associates. "Internally focused, collaborative tools bring together all sectors of the supply chain. "The idea is to collaborate and work against the same plan. All points have the information to effectively plan and execute the sales and operations planning (S&OP) sharing projected needs and plans internally to ensure that all departments are aligned and no one area is making decisions that are sub-optimal."

During the business process, key stake holders can connect to review the plan and reevaluate the strategy. Once a plan has been created to fill an order, and the resources needed to execute that plan have been identified, the requirements are made available across the supply chain through the collaboration platform. Each supplier is asked to commit to providing the parts needed within the established timeframe. If a supplier cannot commit, that information can be fed back into a planning system to create an alternative.

As the plan unfolds, the collaboration system can monitor the progress using event management and serve as a repository of performance data for future analysis.

Supply chain execution solutions manage activity inside the four walls of a facility.

Supply chain optimization and network design

Supply chain optimization and network design planning solutions are like having a window into the future. These tools can model and simulate complex supply chains so that decision-makers can decide the optimal way to source materials, locate manufacturing plants and distribution centers, and set up transportation lanes.

Once the network design is in place, the system can run what-if scenarios to determine how the supply chain will perform when business changes occur. It then looks for opportunities to optimize the current network.

Every step in the enterprise has the same goals–low cost, high quality and visibility, says SAP's Kirker. Success is achieved when the final goals in each step are met, and software enables that achievement. ☐