Supply Chain Management Market and Vendor Guide, 2010

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Analyst(s): C. Dwight Klappich, Greg Aimi, Tim Payne, William McNeill, Tim Zimmerman, Chad Eschinger

The poor global economic climate is exerting pressure on supply chain management (SCM) professionals to focus efforts and investments on initiatives aimed at reducing — or, ideally, optimizing — costs and improving customer service. The SCM applications covered in this research remain a source of needed investment.

Key Findings

- The SCM application market remains diverse, with large-scale suite providers offering portfolios of solutions, niche providers specializing in particular areas and innovative companies bringing new, value-added capabilities to market.
- Although mature in some areas, the SCM application market remains a source of innovation. New capabilities continue emerging to solve new problems or provide more sources of business value.
- Gartner finds an emerging trend toward convergence of traditional application functional silos, so that users can better support end-to-end business processes.
- New deployment models — most notably, software as a service (SaaS) and cloud — are gaining traction, fueled primarily by the poor economic climate, which makes large capital expenditures difficult for many organizations.

Recommendations

- Consider new sourcing options, such as SaaS or managed services, to gain the benefits of incrementally improved capabilities without the traditionally large upfront costs of on-premises applications.
- Explore buyer-favorable financing options that will likely be coming from software vendors in response to the economic climate.
- Focus as much attention on a vendor’s ability to help your company exploit a given application through the vendor’s functional expertise, services and support.
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Analysis

This document was revised on 25 March 2011. For more information, see the Corrections page on gartner.com.

SCM Market Overview

SCM User Priorities
The SCM vendor landscape remains diverse with user needs and vendor offerings. It wasn’t immune to the recessionary environment that began in 3Q08, either. Supply chain software
contracted slightly 0.7%, representing $6.2 billion in 2009. Despite a drop in annual growth, specialized vendors, primarily through subscription models, collectively outperformed suite vendors by a four-to-one ratio, indicating strong opportunities. During 1H10, many vendors showed increased revenue, which is reflective of stronger demand from businesses. Gartner estimates 2010 annual growth of 4.9%, fueled by supply chain organizations focusing investments in areas of high business value — most notably, applications that help reduce costs, drive business growth, improve customer service and improve efficiency (see "Forecast: Enterprise Software Markets, Worldwide, 2009-2014, 2Q10 Update").

In our 2010 SCM User Wants and Needs survey (see "User Survey Analysis: Understanding Supply Chain Management Software Buyers, North America, 2010"), we surveyed SCM professionals to better understand how the global economic crisis is affecting their organizations, the business pressures they face, their priorities for supply chain investment, the actions they're taking and planning to take in response to the difficult operating environment, and how these conditions will influence their SCM technology choices. Some of the findings from the study follow.

**SCM Application Market Definition**

The SCM application market breaks down into two broad application categories: supply chain execution (SCE) and supply chain planning (SCP). SCP tools create the plans for the enterprise supply chain, while SCE tools help the enterprise execute against those plans.

SCE applications are the tools used to carry out the day-to-day tasks and activities needed to fulfill orders, manage inventories and move or deliver products. The SCE category comprises several large-scale application categories, such as warehouse management, transportation management and global trade management (GTM), as well as niche solutions that complement broader products, such as routing and scheduling in transportation or workforce management and slotting in warehouse management systems (WMS). Furthermore, SCE applications are now offered in multiple deployment methods, including on premises and SaaS. Different solutions might fit different types of business environments best (e.g., WMS specifically aimed at small and midsize businesses or transportation management focused only on freight carriers).

SCP is the category for analytical applications used to improve decision making related to SCM. It’s the layer on top of transactional or execution applications, providing the planning, optimization analysis and what-if scenario capabilities used to make decisions about which products need to be where, in what quantities and when to meet customer demands — all while balancing the costs of producing, moving and holding inventories. SCP handles various levels of decision support, from strategic to tactical to operational decisions. It can be provided as a broad suite or specialized component. It can also include under its umbrella capabilities such as strategic network design, capacity planning, demand and event planning, manufacturing planning and scheduling, distribution or supply planning, deployment planning, inventory optimization and sales and operations planning (S&OP).

**How to Use the Vendor Guide**

In this research, Gartner breaks down the SCM market into the broad market segments of SCE and SCP. Within each section, we further break out the various applications into market subsegments...
that make up the larger segments, considering suites and the specialized components that either complement them or are stand-alone applications that support a specific need. For example, under SCE, we highlight transportation management system (TMS) suites and specialized solutions for parcel management, routing and scheduling, or international logistics. In some cases, suite vendors — whether they're ERP providers or SCM specialists — appear in the major category and specialty areas, while some niche vendors might specialize in one area only.

Not all markets are completely independent, since there's some overlap of capabilities across markets. For example, the TMS suite market contains components of stand-alone markets, such as parcel management. However, different users purchase this capability differently, so we include the dominant forms of purchase (which define markets) in this guide.

Gartner provides a description for each application type, including what the application comprises. We also list key vendors that offer solutions for the application type. In each area, we list all vendors we're aware of at the time of publication. We'll periodically revise this vendor guide with new vendors, changes in ownership, or a vendor or offerings exiting a market. Where vendors offer multiple solutions, we note each offering separately.

**SCE**

SCE is an SCM subset that focuses on transactional activities in the areas of logistics, fulfillment, transportation and warehousing. SCE applications include WMS, TMS, GTM systems and other execution applications within the enterprise and throughout the extended supply chain, such as real-time, decision-support systems (e.g., dynamic routing and dynamic sourcing systems) and supply chain visibility systems.

Sometimes order management systems are included in SCE, but Gartner generally doesn't include it in our definition. Order management truly consists of a "front-office" component, which is tied more to sales and product lines (i.e., an order is a sales transaction), and a "back-office" component, which is the fulfillment of the order. It's generally this back-office component of order management that lives firmly in the SCE products, such as WMS and TMS. Also, SCE processes and technologies can also be involved in the movement and storage of materials and components used to feed manufacturing lines — that is, manufacturing materials also must be shipped and stored and delivered to production lines. SCE systems can be used for these purposes as well.

**Warehouse Management**

**WMS Market Dynamics Overview**

The WMS market is mature in North America and Western Europe. It's less mature, with market penetration significantly lower, in emerging markets, such as Eastern Europe, Latin America and parts of the Asia/Pacific region. Growth in net-new WMS deals will increasingly come from other parts of the world.

The focus of leading vendors has been on the high end of the WMS market, where they have increasingly added functionality to broaden and deepen their WMS functionality. With fewer
complex, large deals across the market, there's potential for high levels of growth in small or midsize business (SMB) markets, most notably in emerging markets, where depth and breadth of functionality is often less important. Across industries and geographies, however, we find the need for business agility/adaptability is placing a higher priority on WMS technical architectures. Specifically, there's a focus on the ability of an application to adapt to change without code modifications, using service-oriented architecture (SOA) and model-driven architectures to adapt the WMS to business needs. We find that functionality and vendor expertise remain highly ranked evaluation criteria. However, even though architecture doesn't supersede functionality, we do find adaptability is now a critical objective for new WMS purchases. Therefore, architecture is approaching parity, with depth and breadth of functionality as decision criteria in new deals. This can be especially true for third-party logistics (3PL) firms that want to standardize on commercial WMS software, but have the variability of needing to implement different scenarios for each client.

The breadth of leading WMS solutions has expanded. Many vendors now generate a growing percentage of their revenue by selling add-on components, such as labor or yard management and services to existing WMS implementations.

ERP vendors (SAP, Oracle and Infor) are now players in the WMS market, especially for small to moderately complex facilities. Although ERP vendors offer improved WMS solutions, replacement of specialized systems will be slow, since few companies are ready to replace a rich legacy WMS for the sole purpose of ERP integration. However, we do find an emerging hybrid strategy: Some enterprises use specialized WMSs in the largest, most complex facilities and increasingly consider using their ERP vendor's WMS or even an SMB-focused WMS in less complex or satellite facilities.

Not All Warehouses or WMSs Are Alike

Although they share many characteristics, there are distinct differences across the strata of WMSs. We believe these can be broken down into five levels of warehouse environments/systems, from the simplest to the most sophisticated and automated (see "Stratifying WMS: A Multilevel View"):

- **Level 1: store room** — These are rudimentary, bin-tracking systems that support basic WMS and inventory management functions, such as perpetual inventory, receiving, picking and shipping, but the overall depth of these capabilities are limited. Because of the single storage location nature of these systems, they're appropriate in places such as stock rooms, sales offices, retail stores and simple manufacturing environments, where the storage location is predefined and typically fixed.

- **Level 2: rudimentary locator** — This is the first level where multilocation inventory tracking is introduced, supported by a rudimentary stock locator capability that facilitates put-away and picking, but the options are limited. Again, core functions such as receiving, storage, picking and shipping are supported, but the breadth of coverage is limited to a few simple options (e.g., order pick, palette movement and put-away zones). These are often paper based, with limited work verifications (e.g., pick verify, ship verify). Level 2 systems are appropriate for minimally complex facilities that need some but not extensive WMS capabilities, such as remote satellite warehouses and simple manufacturing environments.
- **Level 3: advanced locator** — At this level, increasingly sophisticated features are introduced, focusing on improving physical warehouse processes, while also introducing more options and greater levels of inherent flexibility. Level 3 systems are more robust, with rule-based locators providing more options "out of the box." In more sophisticated locators, however, they provide customization through rules definition (not coding). Although some processes might remain paper based, a key addition at this level is support for radio frequency (RF) devices for work issuance and verifications. Depth of feature/function is greater, with more options and sophistication in processes (e.g., cross-docking, multiple pick and put-away methodologies, serial/lot control, palette/case license plating, packing and cycle counts).

- **Level 4: intelligent** — At this level, the emphasis shifts from just improving physical work processes to putting more emphasis on value-added capabilities (e.g., task, labor and yard management; slotting) and managerial support (e.g., visibility and event management). Figure 1 highlights the extended WMS capabilities that would be introduced at this level. Level 4 operations are typically more complex and sophisticated, with higher volumes of work. The goals driving new system evaluations are often to improve performance and throughput, while adding more decision-support capabilities.

- **Level 5: automated** — The previous levels focus on people-driven processes; at this level, the emphasis shifts to automation. Level 5 operations are the most sophisticated, and, in extreme cases, entire facilities are engineered to support highly automated operations (e.g., conveyorization, automated storage retrieval and pick to light). ERP WMSs will rarely be applicable at this level. In fact, in many cases, specialized solutions will fall short as well. Typically, the design of these types of operations is driven by engineering firms that either have their own WMSs or partner with a specific, specialized vendor. Customers considering this level should first make the engineering company decision. Once this decision is made, determine the best approach to the WMS business application.
### Table 1. WMS Stratification Model

<table>
<thead>
<tr>
<th>WMS</th>
<th>Level 1</th>
<th>Level 2</th>
<th>Level 3</th>
<th>Level 4</th>
<th>Level 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Impact</td>
<td>Store Room</td>
<td>Rudimentary Locator</td>
<td>Advanced Locator</td>
<td>Added Intelligence</td>
<td>Automated</td>
</tr>
<tr>
<td>People</td>
<td>Inventory management and control are secondary processes for users in store-room-type environments, which is typical of this level.</td>
<td>Limited WMS user knowledge and skills still focus on day-to-day execution of receiving and put-away.</td>
<td>Increased WMS user knowledge and skills, but still primarily focused on process execution. Increased demand and use of RF for operators.</td>
<td>Advanced WMS user knowledge and skills with operators, support personnel and warehouse management. Focus moves more to warehouse productivity/efficiency/throughput, resource/asset utilization and optimizing warehouse activities. More demand, need for decision support and extended WMS capabilities.</td>
<td>Emphasize shift from primarily user knowledge and skills focused to designing and managing the warehouse around automation.</td>
</tr>
<tr>
<td>Process</td>
<td>Primarily manual processes with minimal use of technology (ERP). Very low complexity. Inventory typically stored in single location in support of some other function, such as sales or customer service and support.</td>
<td>Minimal complexity, with typically rudimentary needs for product locating for put-away and picking. Pallet storage with minimal split pallet picking. Focus on simple storage and retrieval.</td>
<td>Increasing warehouse complexity, with more receiving/put-away, pick/pack/ship and inventory management options and requirements. Focus on improving warehouse task execution performance.</td>
<td>Tend to be larger physical facilities, with more employees both in operational and back-office roles. There are more products and transactions as well as more complex processes, such as light assembly or complex picking or kitting operations. High-level complexity, labor and transaction volume requires more robust decision support to optimize operations.</td>
<td>At this level, warehouse and automation design are often done in concert with the building designed to support the needed warehouse automation processes and capabilities. Although limited automation can be used in previous levels, these types of facilities are highly automated, with the automation intrinsically woven into the warehouse processes.</td>
</tr>
<tr>
<td>Technology</td>
<td>Use whatever capabilities provided by ERP, or perform manually.</td>
<td>Need a real WMS with basic product-locating capabilities, but minimally use core WMS capabilities. Even with reduced cost for RF activities, often paper based. Most</td>
<td>Need for richer locator capabilities. Greater feature depth across core WMS capabilities, with a need for more feature options and configuration, particularly in pick/pack/ship. More functionally deep</td>
<td>Need for strong core-WMS capabilities remains, but emphasis shifts to extended WMS capabilities that aid in operating complex warehouses more effectively. Capabilities, such as task interleaving, labor management, dock scheduling and yard management, are often required. Having an adaptable application architecture is increasingly important at this level.</td>
<td>Highly automated facilities are often designed and built by engineering or material-handling firms that specialize in automated warehouses. The emphasis in WMS is less on the core-WMS features, but more on the integration with automation. With highly automated facilities,</td>
</tr>
<tr>
<td>WMS</td>
<td>Level 1</td>
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<td>Level 3</td>
<td>Level 4</td>
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<td></td>
<td>ERP offer acceptable WMS capabilities.</td>
<td>core-WMS supported by some, but not all, ERP WMS and all best-of-breed WMSs.</td>
<td>to allow the WMS to adapt to process changes during and after implementation. Some but not all ERP systems are approaching this level and have some extended capabilities, but this level remains primarily the domain of best-of-breed WMS vendors.</td>
<td>addressing WMS application needs is often easier because there's less WMS task and decision control, since it's engineered and controlled by the PLCs in the automation layer.</td>
<td></td>
</tr>
</tbody>
</table>

Source: Gartner (December 2010)
Comprehensive WMS Suites

WMS suites are software applications that manage the various operations, tasks and activities of moderate to complex warehouse or distribution centers (DCs) (see Figure 1). These applications are normally targeted at Level 2 or above warehouses.

**Figure 1. WMS Ecosystem**

Application functionality includes receiving, put-away, inventory management, cycle counting, task interleaving, wave planning, order allocation, order picking, replenishment, packing, shipping, labor management and automated material-handling equipment interfaces. The use of RF technology in conjunction with bar codes provides the foundation of a WMS, delivering accurate information in real time (see "Magic Quadrant for Warehouse Management Systems").

**WMS Suite Vendors:**

- Accellos — [www.accellos.com](http://www.accellos.com)
- Aldata — [www.aldata-solution.com](http://www.aldata-solution.com)
- Apriso — [www.apriso.com](http://www.apriso.com)
- CDC Software — [www.cdcsoftware.com](http://www.cdcsoftware.com)
- Consafe Logistics — [www.consafelogistics.com](http://www.consafelogistics.com)
- Generix Group — [www.generixgroup.com](http://www.generixgroup.com)
SMB WMS

A subsegment of the WMS market, SMB WMS applications manage core warehouse management operations, tasks and activities of less complex warehouse or distribution operations. These solutions are aimed at SMBs, less complex operations of large companies or, increasingly, warehouse operations in nontraditional warehouse environments in organizations such as universities, healthcare organizations or government agencies. These applications are normally targeted specifically at Level 1 and Level 2 warehouses. Although they specifically target less complex operations, many of the comprehensive WMS solutions are often used in less complex
facilities, especially satellite operations, where the comprehensive WMS solution is running the main warehouse operations.

SMB-focused WMS solutions are normally less functionally broad than comprehensive WMS suites, but these applications adequately cover core WMS application functionality, including receiving, put-away, inventory management, cycle counting, picking, replenishment, packing, and shipping for Level 1 and Level 2 operations, with some support for Level 3 warehouses. These systems will normally support some use of RF technology in conjunction with bar codes.

Not included in the list below are the ERP suites oriented to product-centric businesses (e.g., distribution, manufacturing and retail) that are sold into midsize businesses, such as Epicor, Infor, Lawson, Microsoft, Oracle (JD Edwards EnterpriseOne), QAD and Sage. Users of these systems with Level 1 or Level 2 WMS needs should consider their ERP vendors as well as the ones listed below (see "Magic Quadrant for Midmarket and Tier 2-Oriented ERP for Product-Centric Companies").

**SMB WMS Vendors:**

- Accellos — [www.accellos.com](http://www.accellos.com)
- AdvanceWare Technologies — [www.advanceware.net](http://www.advanceware.net)
- Aptricity — [www.aptricity.com](http://www.aptricity.com)
- Deposco — [www.deposco.com](http://www.deposco.com)
- eBizNET — [www.ebizscm.com](http://www.ebizscm.com)
- Fascor — [www.fascor.com](http://www.fascor.com)
- Foxfire — [www.foxfiresoftware.com](http://www.foxfiresoftware.com)
- Made4Net — [www.made4net.com](http://www.made4net.com)
- Manhattan Associates — [www.manh.com](http://www.manh.com)
  - SCALE (Previously WM for Windows)
- PathGuide Technologies — [www.pathguide.com](http://www.pathguide.com)
- Savant Software — [www.savantwms.com](http://www.savantwms.com)
- SmartTurn — [www.smartturn.com](http://www.smartturn.com) (RedPrairie acquired SmartTurn in 2010)
- Synergy Logistics — [www.snapfulfill.com](http://www.snapfulfill.com)
- Tecsys — [www.tecsys.com](http://www.tecsys.com)

**Cloud/SaaS WMS**

Gartner defines cloud computing as "a style of computing where massively scalable IT-enabled capabilities are delivered 'as a service' to external customers using Internet technologies." Our use
of the term "customers" is made to emphasize the fact that cloud-computing services may be
delivered to either internal or external consumers, and that the customer is acting as a consumer of
the target service. Public cloud computing refers to the delivery of cloud services by a third-party
provider to external customers. In private cloud computing, the IT organization acts as the provider
of services to internal customers. Hybrid cloud computing refers to the combination of public cloud-
computing services with internal IT services (e.g., private cloud services or traditional IT services).

WMS deployments remain largely on-premises, single-tenant applications implemented to support
a single company, although multiple facilities are often supported from a single instance of the
WMS. During the last several years, however, the underlying architectures of leading WMSs have
evolved where they can now support multitenant environments, and the potential exists to evolve
further to "cloud-based" solutions.

Two very different cloud deployment models are emerging: cloud and SaaS. It's analogous to
"every square is a rectangle, but not every rectangle is a square" — all SaaS WMSs are cloud, but
not all cloud WMSs are SaaS.

Here are the key characteristics of a SaaS WMS:

- Hosted off premises
- Multitenant application with a single code base that's maintained across all user organizations
- Web-based/native architecture
- Subscription/transaction-based pricing model
- Vendor provides outsourced access to the application as well as maintenance and upgrade
  services

Although all cloud-type applications share many of these characteristics, what distinguishes a SaaS
WMS is multiple companies share a single copy of the software, which is operated and maintained
by the vendor. However, a WMS provided through a cloud service might be a single instance
supported for a single customer, with many other characteristics similar to SaaS.

The SaaS-versus-cloud debate in WMS is heating up. However, there's likely less impact on users
for the various deployment options compared to TMS. A distinguishing characteristic of true SaaS
TMS is the notion of a network of carriers, where the SaaS TMS vendor onboards carriers to the
TMS platform, then makes these potentially available to all its TMS users.

SaaS is a relatively new offering within the WMS market. For companies that want to access their
WMS software over the Internet and pay for it with a subscription or transactional fee instead of the
license fee plus annual maintenance, SaaS WMS may be the way to go. As with other SaaS
software, system maintenance and management are included, thus relieving the customer of some
of the IT management burden. Also, SaaS systems are "always on," so initial implementation can be
sped up, compared to traditional implementations.
Because of the relative newness to the market, the functionality of these offerings varies widely. Customers should be careful to match necessary warehousing requirements with a system’s functional capabilities during selection. Note that a pure SaaS offering is usually one instance of software that all customers use (i.e., multitenancy). This has the benefit of currency (e.g., automatic upgrades), preconnected suppliers and other trading partners across the network, and better leveraged vendor development resources, since they don’t have to support multiple older releases of the software.

Several vendors are now offering their traditionally on-premises WMS as a cloud offering. The number of true SaaS WMS is small (see vendors noted with an "(S)" below). Currently, most of the SaaS WMS solutions are targeted at smaller, less complex warehouse environments, with the depth of WMS functionality significantly less than Tier 1 WMS. Furthermore, questions remain about how well a true SaaS, multitenant environment will accommodate customization, which is more prevalent at the high end of the WMS market.

SaaS WMS solutions today primarily only support core WMS, largely because of their SMB focuses. The addition of extended WMS capabilities is unclear at this time.

**SaaS/Cloud WMS Suite Vendors:**

- 3PL Central (S) — [www.3plcentral.com](http://www.3plcentral.com)
- Apptricity (S) — [www.apptricity.com](http://www.apptricity.com)
- Deposco (S) — [www.deposco.com](http://www.deposco.com)
- Generix Group (S) — [www.generixgroup.com](http://www.generixgroup.com)
- HighJump Software — [www.highjumpsoftware.com](http://www.highjumpsoftware.com)
- RedPrairie — [www.redprairie.com](http://www.redprairie.com)
- SmartTurn (S) — [www.smartturn.com](http://www.smartturn.com) (RedPrairie acquired SmartTurn in 2010)
  - SmartTurn Warehouse Management System (WMS)
- Softeon — [www.softeon.com](http://www.softeon.com)
- Tecsys — [www.tecsys.com](http://www.tecsys.com)

**Slotting (Inventory)**

Inventory "slotting" refers to tools that provide a set of methods used to determine the most efficient locations for each item in a DC, considering a facility’s unique product, demand, movement and storage characteristics. The optimal profile minimizes travel time and allows workers to put away and pick items more efficiently.

**Slotting Vendors:**

- Aldata — [www.aldata-solution.com](http://www.aldata-solution.com)
Yard Management

Yard management includes a set of capabilities, normally closely associated with warehouse management, that deal with the management and process execution activities related to or impacting a company’s shipping yard and dock doors, taking into consideration equipment/facility/employee constraints and activity demand. In its most simple form, yard management can automate
the tracking of assets (e.g., trailers or containers) in a yard for the purpose of more efficiently finding and handling them. Yard management can be combined with optimal dock-door scheduling for more efficient use of labor at the facility or for more optimal inventory movement through a facility. Some yard management systems also include real-time sensory technologies to electronically monitor the locations of vehicles.

**Yard Management Vendors:**

- Aldata — [www.aldata-solution.com](http://www.aldata-solution.com)
- C3 — [www.c3tools.com](http://www.c3tools.com)
- CDC Software — [www.cdcsoftware.com](http://www.cdcsoftware.com)
  - Catalyst WMS
- Cypress Inland Corporation — [www.yardview.com](http://www.yardview.com)
  - YardView
- Fluensee — [www.fluensee.com](http://www.fluensee.com)
- HighJump Software — [www.highjumpsoftware.com](http://www.highjumpsoftware.com)
- Infor — [www.infor.com](http://www.infor.com)
- InSync Software — [www.insyncinfo.com/yardmanagement.asp](http://www.insyncinfo.com/yardmanagement.asp)
- Manhattan Associates — [www.manh.com](http://www.manh.com)
- Oracle — [www.oracle.com](http://www.oracle.com)
- Ortec — [www.ortec.com](http://www.ortec.com)
- RedPrairie — [www.redprairie.com](http://www.redprairie.com)
- Retalix — [www.retalix.com](http://www.retalix.com)
- SAP — [www.sap.com](http://www.sap.com)
  - SAP SCM eWM
- Sterling Commerce — [www.sterlingcommerce.com](http://www.sterlingcommerce.com) (IBM closed its acquisition of Sterling Commerce in August 2010)
- Zebra Enterprise Solutions — [zes.zebra.com](http://zes.zebra.com)

**Voice-Directed WMS**

Voice-directed WMS has been around for over 10 years. However, the commercial acceptance of speech recognition as an input mode, whether it's our cars or smartphones to support hands-free driving, is knocking down barriers that have in the past impeded widespread use. The momentum is
also being fueled by the ability to use the existing codec and processor capabilities that have been integrated into mobile clients to support voice-over-wireless LAN (VoWLAN) functionality. This availability of resources within existing mobile clients and basic knowledge of the functionality within the user community allows operations managers to focus on the benefits of improving the business processes through multimodal data collection, rather than having to sell the technology as part of the solution.

Voice-directed warehouse management solutions involve the use of speech recognition and speech synthesis technology to drive activities in warehouse operations, integrating speech-collected information into a WMS. This enables hands-free and eyes-free operations. Enterprises that use speech recognition applications to replace paper-based or cumbersome, manual RF processes or pick-to-light solutions can achieve an ROI of less than one year. Other applications in the warehouse that can also use speech recognition include receiving, shipping, put-away and cycle counting/inventory management, but the payback on these implementations is less clear.

Most speech recognition applications or middleware provide supplemental processing or translation of the inputted information before it’s sent to a mobile/voice client from the application or upstream after the information has been collected. The value of this step is that it allows not only multimodal operations to be defined as part of the information collected through speech and other fields through scanning or keyboard input, but it also provides multilingual capabilities for a diverse workforce, where each worker is able to listen and respond to commands in their native language while having the same upstream data from all workers sent to the application. In addition to improving the collection process, the solution allows enterprises to use a larger worker pool, letting employees work more comfortably in their native language without impeding the process flow.

Understanding the capabilities and functionality is an important part of the evaluation process for this solution, since specific implementations and vendor selection will depend on the enterprise use scenario. For additional information, see "The Three Key Components of Industrial Speech Recognition Solutions."

**Voice Vendors:**

- Aldata — [www.aldata-solution.com](http://www.aldata-solution.com)
- Datria — [www.datria.com](http://www.datria.com)
- Genesta — [www.genesta.com](http://www.genesta.com)
- Inther — [www.inthergroup.com](http://www.inthergroup.com)
- Lucas Systems — [www.lucasware.com](http://www.lucasware.com)
- Vocollect — [www.vocollect.com](http://www.vocollect.com)
- Voxware — [www.voxware.com](http://www.voxware.com)
- Wavelink — [www.wavelink.com](http://www.wavelink.com)
Parcel Management

See the "Transportation — Multicarrier Parcel Management" section.

Workforce Management (WFM) Systems for Warehousing

A longtime sister application to WMS software, this application category has historically been called labor management software (LMS), or just "labor." But as enterprise WFM software vendor offerings (e.g., time and attendance and staff scheduling) and warehouse labor management vendor offerings converge, the distinction between the two approaches are blurring. Gartner now finds it better to simply call the category WFM and to identify this category specialization as workforce management in the warehouse.

WMSs help companies perform and manage warehouse tasks and activities efficiently.Warehouse WFM exists to get the most out of warehouse employees and give distribution management a way to accurately track and improve worker performance against standards for every task a worker might encounter. These systems can be used to help raise the overall average work performance of an entire staff.

Industrial engineers design and develop work patterns in order to construct goal times for the ideal performance of each discrete task in the warehouse, always considering worker safety and then best task performance. These are called "engineered labor standards" and the work patterns "preferred methods." This is done at a detailed level, and, in some cases, it may be based on a library of established best-practice work standards that specialist engineers and vendors have predeveloped and packaged as part of their WFM offerings.

One of the most important components of this system is the incorporation of travel times and task complexity into the overall goal time. For this reason, it's important to pay attention to how the travel paths are constructed in the system and to accommodate for start zones, end zones, person assigned and work duration (e.g., account for fatigue). For example, engineered labor standards take into account the difference it takes to reach the top shelf of a warehouse rack versus one at ground level. Plus, products have different weight characteristics, requiring more or less strength and time to move. Some can only be moved using forklifts (full pallets, for example). And just like people have different walking speeds, forklifts have different operating speeds. Some of the more advanced WFM systems can account of these variables.

Once the standards are developed and entered into the WFM system, the actual task times are compared to the goal times, and performance achievement is evaluated. This is superior to systems that evaluate only the completion of an aggregate number of tasks during a work period, such as picks per hour, because the precise specifications for goals and performance enable the manager to properly evaluate workers and better counsel for improvement. Comparing to an ideal time standard also allows management to compensate good performance with incentive pay, which rewards employees who produce better than the set standard.

Although basic labor reporting is mature, some of the WFM systems only offer post-activity reporting. Others, however, offer dynamic feedback to workers in real time on their performances against the standard.
Some of the more advanced WFM systems support forward-looking workforce and resource planning and scheduling. They consider the activities of the warehouse projected over time so that the labor and resource requirements are forecast with accuracy. These systems use historical data, actual order data and demand forecasts to feed the planning systems.

Workforce planning is important in environments that have cyclical variations in demand, such as extreme seasonality or quarter- or year-end volume increases. In these cases, projecting labor requirements is critical for having the right resources when needed. Since many warehouses pull from a pool of temporary staff to meet demand, these tools help companies solve the challenge with more accurate projections of staffing needs.

Consider the following:

- WFM systems have primarily been implemented within the United States, since they haven’t been built to comply with more restrictive labor practices and cultures or stronger union laws in other regions.
- Companies that implement WFM for the warehouse can experience typical gains that can include a 15% to 20% rise in productivity for distribution operations. Historically, WFM for warehousing was limited to large, complex warehouses with workforces of hundreds of workers, largely because of the cost of stand-alone WFM applications and the cost and effort needed to build and maintain the engineered standards. As WFM has increasingly been bundled with WMS and engineered standards have been more prepackaged, the total cost of ownership (TCO) has lowered, making WFM a potential fit for more warehouse environments.
- When first introduced, WFM was a stand-alone application. Most of the recent implementations, however, are integrated with an established WMS. The WMS creates the tasks and directs them to the worker, and the WFM monitors the performance of the tasks against the standard.
- Companies should expect an implementation project that will last somewhere between 15 and 30 weeks. Obviously, this depends on the number of warehouses, the complexity of the operations and whether or not a library of standards can be used as a baseline for standards generation.

**WFM Vendors:**

- Argent Consulting Group — [www.argentconsulting.com](http://www.argentconsulting.com)
- CDC Software — [www.cdcsoftware.com](http://www.cdcsoftware.com)
- HighJump Software — [www.highjumpsoftware.com](http://www.highjumpsoftware.com)
- Infor — [www.infor.com](http://www.infor.com)
- Johnson Stevens Consulting — [www.johnsonstephens.com](http://www.johnsonstephens.com)
- Kronos — [www.kronos.com](http://www.kronos.com)
Dock Scheduling

Manual scheduling of appointments can be a very labor-intensive process, with little visibility into how the operation is performing in real time versus the planned schedule. Well-managed appointment scheduling results in higher productivity, lower transportation costs, lower labor costs, better product and inventory flow, and better supplier, customer, and carrier relationships. Dock appointment scheduling is usually an Internet-based portal application that provides suppliers and carriers with online, self-service scheduling capability, while giving customer service and warehouse personnel visibility into carrier pickup and delivery appointments. The lack of real-time appointment visibility can cause a delayed reaction to a symptom, rather than proactive actions to avoid congestion or scheduling conflicts. Dock appointment scheduling can either stand alone or integrate with the dock calendar of the WMS.
Transportation Management

As more businesses recognize the need to improve transportation processes to reduce costs and to become more productive and efficient, the demand for TMS solutions continues to rise. These requirements are critical in business environments characterized by increased business process complexity, resource constraints, and rising and volatile operation costs. In particular, the volatility and steady rise of fuel costs affects all shippers, carriers and logistics service providers (LSPs). Shippers with as little as $15 million in annual freight spending are now considering TMS solutions.

Planning and execution were traditionally the focus of TMS evaluations, but Gartner now finds buyers equally interested in the overall breadth of TMS, especially in areas such as procurement, freight audit and payment, collaboration and globalization. Leading TMS vendors continue to improve and expand the functional breadth and depth of their TMS offerings. Areas such as freight procurement, freight audit and payment, support for more modes of transport (e.g., parcel, rail, air and private/dedicated fleets), global logistics, visibility/event management (e.g., track and trace), support for LSPs, asset-based planning, and execution and performance management add to the value of TMSs (see "Hype Cycle for Transportation, 2010").

Managing domestic transportation remains a primary focus for many TMS initiatives. However, supply chain globalization is driving additional TMS growth, and TMS support of global logistics has become a more important consideration for many buyers. Globalization, in terms of international TMS deployments and multileg, multimode international shipment support, is a bigger issue for buyers, as leading TMS vendors continue to invest in more global transportation capabilities.

TMS Suites

TMS generically refers to a category of software that deals with the planning and execution of the external physical movement (transportation) of goods across supply chains. Multiple subcomponents make up comprehensive TMS solutions across planning and optimization (e.g., load consolidation, routing, mode selection and carrier selection), execution (e.g., tendering loads to carriers, shipment track and trace, freight audit and payment), and visibility and performance management (e.g., global visibility, event management, business activity monitoring [BAM], track and trace, and analytics). At a minimum, TMS solutions are used to manage freight planning and execution. In addition, TMS suites have been extended to include all transportation management functions, from the strategic planning and sourcing of freight to the visibility of freight, payment services and audit capabilities (see Figure 2).
TMS suites comprise multiple functions and subfunctions. We consider the following capabilities as making up a holistic TMS suite, although not all vendors provide every capability or provide differentiated solutions across capabilities (see "Magic Quadrant for Transportation Management Systems").

**TMS Suite Components:**

- Strategic/tactical planning
- Strategic sourcing
- Collaborative tactical planning
- Optimization (routing, consolidation and carrier selection)
- Transportation execution and carrier communication
- Parcel shipping
- Fleet planning and scheduling
- Load building/design
- Freight rating and contract management
- Freight payment and audit
- Freight billing
- Visibility and event management (track and trace)
- Analytics, performance management and BAM
- Globalization (international logistics/global capabilities)
TMS Suite Vendors:

- Descartes Systems Group — www.descartes.com
- i2 Technologies — www.i2.com (JDA Software acquired i2 Technologies in 1Q10)
- IBM — www.ibm.com
  - IBM Ilog Transportation PowerOps
- Infor — www.infor.com
- JDA Software — www.jda.com
- LeanLogistics — www.leanlogistics.com
- Logility — www.logility.com
- Manhattan Associates — www.manh.com
- MercuryGate International — www.mercurygate.com
- One Network — www.onenetwork.com
- Oracle — www.oracle.com
  - Oracle Transportation Management (OTM)
- Precision Software — www.precisionsoftware.com
- RedPrairie — www.redprairie.com
- SAP — www.sap.com
  - SAP Transportation Management (TM)
- Sterling Commerce — www.sterlingcommerce.com (IBM closed its acquisition of Sterling Commerce in August 2010)
- Transplace — www.transplace.com
- Varsity Logistics — www.varsitynet.com

Carrier-Focused TMS Suites

Carrier-focused TMS suites are solutions specifically focused on the broad needs of trucking carriers (e.g., truck load, less than truck load, flat bed and bulk commodities). Since carriers control their assets (e.g., drivers, tractors, trailers), these solutions share some characteristics with private fleet routing and scheduling (see the "Private/Dedicated Fleet [Asset-Based] Routing and Scheduling" section), but also provide additional capabilities needed by carriers, such as order entry, dispatching, rating, invoicing, settlement, accounting, driver pay, driver logs and sometimes maintenance.
Carrier-Focused TMS Suite Vendors:

- Accellos — www.accellos.com
- Cheetah Software Systems — www.cheetah.com
- Descartes Systems Group — www.descartes.com
- Integrated Decision Support Corporation (IDSC) — www.idscnet.com
- Manhattan Associates — www.manh.com
- McLeod Software — www.mcleodsoftware.com
- Oracle — www.oracle.com
  - Oracle Transportation Management (OTM)
- TMW Systems — www.tmwsystems.com

TMS Suite Applications Offered as SaaS

Several TMS vendors offer their TMS solutions as SaaS. Our definition of SaaS applications is software that is owned, delivered and managed remotely (see "Evaluating the Efficacy of TMSs as SaaS"). Users don’t own the TMS; they rent or subscribe to the TMS functionality on demand, paying as long as they use the software.

Here are the key characteristics of SaaS TMS:

- Hosted off premises
- Multitenant application with a single code base that’s maintained across all user organizations
- Web-based/native architecture
- Subscription/transaction-based pricing model
- Vendor provides outsourced access to the application, as well as maintenance and upgrade services.

Although all SaaS-type applications share these characteristics, what distinguishes SaaS TMS is the notion of a network of carriers, where the SaaS TMS vendor onboards carriers to the TMS platform, then makes these potentially available to all its TMS users.

The "pay-as-you-go" nature of SaaS TMS minimizes upfront costs, and investments scale in parallel with TMS use growth. SaaS TMS providers offer an array of TMS capabilities: planning and optimization, tendering and booking, freight payments, and track and trace.
SaaS TMS Vendors:

- Descartes Systems Group — [www.descartes.com](http://www.descartes.com)
- JDA Software — [www.jda.com](http://www.jda.com)
- FreightMatrix
- LeanLogistics — [www.leanlogistics.com](http://www.leanlogistics.com)
- Manhattan Associates — [www.manh.com](http://www.manh.com)
- MercuryGate International — [www.mercurygate.com](http://www.mercurygate.com)
- One Network — [www.onenetwork.com](http://www.onenetwork.com)
- Sterling Commerce — [www.sterlingcommerce.com](http://www.sterlingcommerce.com) (IBM closed its acquisition of Sterling Commerce in August 2010)
- Transplace — [www.transplace.com](http://www.transplace.com)
- Transwide — [www.transwide.com](http://www.transwide.com)

Private/Dedicated Fleet (Asset-Based) Routing and Scheduling

Fleet routing and scheduling are specialized transportation management applications aimed at organizations that directly (e.g., private fleet) or indirectly (e.g., dedicated contract fleet) control and manage shipping assets (e.g., tractors and trailers) and resources (e.g., drivers). These solutions create plans for the enterprise assets and resources that are considering demands (e.g., orders or projected daily/weekly route requirements). The tools then build schedules and routes considering all constraints (e.g., equipment availability, delivery times, demand volume, equipment capacity, driver rules and hours of service) and organize the goals for fleet operation (e.g., to minimize miles and minimize costs). These tools are typically used to develop route plans that meet all delivery objectives at minimal cost/mileage based on the firm’s input (e.g., orders), rules and constraints.

When first introduced, fleet routing and scheduling applications focused principally on planning and optimization. However, as these solutions mature, we find vendors broadening the application footprints of the solutions to support more fleet management capabilities, such as dispatching, automated vehicle locating (AVL), driver mobility capabilities (such as real-time communication or proof of delivery or appointment scheduling) and integration with onboard vehicle telematics. Indeed, mobility is a growing area of innovation for fleet routing and scheduling vendors, as the cost of mobility hardware and communications has declined.

There are two primary types of routing and scheduling. Dynamic routing is where daily orders are dropped into the application for building delivery routes for the next day or several days only for the orders currently in the system. Static routing is where the routing tool uses a forecast of daily/weekly volume to build the appropriate path a driver would take on each day/shift during the course of the week. In the first example, industries like retail and grocery would take daily store demands in the form of orders and would build optimal routes for the next day. In the latter example, static
routing would be used by organizations that schedule visits with specific locations, such as beverage and snack food companies selling to convenience stores or uniform companies dropping off and picking up employee uniforms at factories or hospitals. The underlying algorithms that support each environment are different, although many vendors support both capabilities with their solutions.

**Routing and Scheduling Vendors:**

- Descartes Systems Group — [www.descartes.com](http://www.descartes.com)
- IBM — [www.ibm.com](http://www.ibm.com)
  - IBM Ilog Transportation PowerOps
- Infor — [www.infor.com](http://www.infor.com)
- Intergis — [www.intergis.com](http://www.intergis.com)
- JDA Software — [www.jda.com](http://www.jda.com)
- Made4Net — [www.made4net.com](http://www.made4net.com)
- Manhattan Associates — [www.manh.com](http://www.manh.com)
- Ortec — [www.ortec.com](http://www.ortec.com)
- Paragon Software Systems — [www.paragonrouting.com](http://www.paragonrouting.com)
- Quintiq — [www.quintiq.com](http://www.quintiq.com)
- RedPrairie — [www.redprairie.com](http://www.redprairie.com)
- UPS Logistics Technologies — [www.upslogisticstech.com](http://www.upslogisticstech.com)

In addition to packaged routing and scheduling applications, there are a variety of local service providers that can take generic algorithms in this area and custom build a routing system. These offerings aren't included here.

**In-Bound and Web-Based Carrier Appointment Scheduling**

Carrier appointment scheduling refers to the use of collaborative, Web-based scheduling tools to automate carrier appointment scheduling and improve the overall use of shipping and receiving docks in distribution centers. In this system, a dock calendar is maintained, showing all operating constraints, such as open/close time, commodities accepted through the dock door (e.g., refrigerated or ambient) and trailer types accepted. Carriers, customers and suppliers with pending shipments or receipt requests can query the system to determine available dock times. In the most sophisticated optimization systems, these external queries are held together with load tenders and are optimally assigned at a specified point based on maximum resource use. For example, if there's congestion during a particular period, then the system wouldn't operate on a first-come, first-serve appointment basis. Instead, the materials being delivered or shipped would be evaluated based on
criticality or capacity to determine the appointments that must be scheduled during the congested period and the ones that can be scheduled during alternative periods.

Advanced scheduling functionality is a long-standing concern among many of the world’s largest shippers. However, recent challenges in carrier capacity, increasing customer requirements for on-time shipment performance and the effects of government mandates, such as hour-of-service rules that demand faster and more consistent shipment turnaround, have driven more enterprises to evaluate this technology. With the economic slump, some of the business drivers have eased, but pressures to reduce costs and increase productivity have kept up interest in dock scheduling. In addition, a scheduling and appointment management system can be used in conjunction with constraint-based warehouse optimization to begin creating a supply chain execution model that moves more toward flow-through and cross-docking models.

Integration with WMSs, TMSs or yard management systems is becoming a more important consideration, with vendors of these types of solutions adding rudimentary, often Web-based appointment requesting and dock-door allocation. More advanced solutions are emerging from the leading WMS vendors. Current models use portals to request appointments, but increased acceptance and availability of mobile applications offer the potential to move this closer to the driver and mobile assets. It also allows for adding other capabilities such as geo-fencing, where a GPS device notes when a truck is within a certain distance of the DC, with the appointment then electronically confirmed.

Carrier appointment scheduling reduces the amount of administrative time required to set carrier appointments and manage the dock schedule. If managed properly, this approach can improve relations with an enterprise’s carriers, customers and suppliers because the system can be more responsive than manual processes. Finally, scheduling and appointment management can improve the overall throughput and capacity of a warehouse by optimizing appointments and activities, reduce operating labor costs by reducing idle time and lower transportation costs by increasing the number of cross-docking opportunities.

- Blue Sky Technologies — www.blueskylogistics.com
- Descartes Systems Group — www.descartes.com
- i2 Technologies — www.i2.com (JDA Software acquired i2 Technologies in 1Q10)
- JDA Software — www.jda.com
- LeanLogistics — www.leanlogistics.com
- Manhattan Associates — www.manh.com
- One Network — www.onenetwork.com
- Oracle — www.oracle.com
  - Oracle Transportation Management (OTM)
- RedPrairie — www.redprairie.com
Mapping/Geographic Information Systems: Mapping, Visualization and Analytics

A geographic information system (GIS) is a series of computer-based technologies used for producing, organizing, analyzing and outputting spatial (geographical) data as well as other associated textual, numeric and graphical data. GISs typically have capabilities for database management, mapping, image processing and statistical analysis that support the display and analysis of geographic information. Using GIS in a transportation context enables the visualization of freight operations on maps. More importantly, it provides analytical capabilities based on this geographical information. Because of the geographical nature of freight movements, it’s common for daily routes and shipment plans to be displayed on maps, but less common for historical information to be analyzed and displayed geographically.

Because of the strong geographical nature of transportation and freight movements that go from one geographic location to another, having the ability to view and analyze freight movements visually and geographically is important for spotting trends and visually monitoring current and historic activities. The analogy that a picture (or graphical representation) is worth 1,000 words is readily apparent in transportation, where highlighting data on a map can enable users to easily see things that might be harder to infer from reports and spreadsheets. For example, displaying move density in a specific geography might reveal movement bottlenecks more clearly than trying to infer a potential problem from the same data in a spreadsheet.

Most TMSs provide basic mapping capabilities, with many leveraging the vendors below for mapping- and GIS-related data, such as the distance between two points. Several of the vendors listed have used their GIS-centric solutions to build packaged applications, such as rudimentary vehicle routing and scheduling solutions. Furthermore, most TMS and routing and scheduling vendors embed mapping tools and use the underlying data for determining distance and providing maps to display planned routes and shipments for visualizing shipment activities. Although this may be acceptable for showing daily delivery and pick-up information, the use of geographical visualization and analysis is limited in most TMSs. Many transportation groups use other GIS tools for more analytical work, such as assessing lane density, traffic congestion, traffic problems (e.g., seasonal road construction) or other situations by geography.

TMS vendors now offer enhanced data-centric performance management capabilities. Gartner anticipates some TMS vendors will consider adding more GIS-based analytics, even going as far as considering simulation capabilities to make this analysis more predictive. Initial GIS analytical solutions will focus on historical reporting and analysis. However, combining GIS with other information, such as weather reports, could provide additional management capabilities. Finally, systems that use GIS-based interfaces for interactions with the system, rather than just reporting functions, could provide more intuitive access to complicated business transactions, which would be a dramatic step forward in driving the adoption of this technology.
Mapping/GIS Vendors:

- Alk Technologies — www.alk.com/pcmiler
  - PC*Miler
- Caliper — www.caliper.com
  - TransCAD
- Esri — www.esri.com
  - ArcLogistics
- Microsoft — www.microsoft.com
  - Streets & Trips
- Rand McNally — www.randmcnally.com
  - IntelliRoute
- Tele Atlas — www.teleatlas.com

Multicarrier Parcel Management

Multicarrier parcel management solutions are specialized transportation management applications that focus primarily on parcel/small-package shipping environments. These tools help users manage the rules and restrictions of multiple parcel carriers in a single software solution, so that individual shipments can be allocated to different carriers based on the properties of the shipment and carrier shipping rules and tariffs. The tools also provide the necessary documents, manifests and shipping labels required by each parcel carrier. These systems manage parcel rating, rate shopping and carrier selection. They can generate carrier-compliant labels and carrier manifests for parcel shipments.

Multicarrier Parcel Management Vendors:

- Agistix — www.agistix.com
  - Logistics Management Automation (LMA)
- Best Way Technologies — www.bestwaytech.com
  - ProShip Velocity
- Creative Logistics Solutions (CLS) — www.creativelogistics.com
- Kewill — www.kewill.com
- Manhattan Associates — www.manh.com
- Pierbridge — www.pierbridge.com
Global Trade Management

Supply chain globalization necessitates redesigns of extended GTM function and activity flows to allow for greater control, efficiency and effectiveness of cross-border trade. Companies face numerous challenges as they navigate the complex regulatory, financial and logistics issues created from international trade. Companies must assess their current capabilities, application portfolios, and global trade vision and strategies to develop the tactics they employ for their global operations. To begin, they must understand how global trade affects and changes their business processes and the activities that support them today, as well as how global trade will evolve in the future.

There are numerous capabilities that make up a holistic GTM process architecture (see Figure 3).

Figure 3. GTM Functional View

<table>
<thead>
<tr>
<th>Trade</th>
<th>Comply</th>
<th>Move</th>
<th>Finance</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Sourcing</td>
<td>• Pref. Trade Agrm.</td>
<td>• Booking</td>
<td>• Letter of Credit</td>
</tr>
<tr>
<td>• Selling</td>
<td>• License Detrm.</td>
<td>• Global Logistic Ex.</td>
<td>• Settlement</td>
</tr>
<tr>
<td>• Export Orders</td>
<td>• Document Mgmt.</td>
<td>• Shipment Plan</td>
<td>• Reconciliation</td>
</tr>
<tr>
<td>• Import Orders</td>
<td>• Document Filing</td>
<td>• Multimodes</td>
<td>• Invoice Mgmt.</td>
</tr>
<tr>
<td>• Collaboration</td>
<td>• Classify (HTS)</td>
<td>• Shipment Route</td>
<td>• Payment</td>
</tr>
<tr>
<td>• Vendor Mgmt.</td>
<td>• Customs Decr.</td>
<td>• Carrier Comm.</td>
<td>• Insurance</td>
</tr>
<tr>
<td>• Document Mgmt.</td>
<td>• Import Rules</td>
<td>• Global Visibility</td>
<td>• Trade Financing</td>
</tr>
<tr>
<td></td>
<td>• Export Rules</td>
<td>• Landed Cost Cntrl.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Duty/Taxes</td>
<td>• Shipment Docs</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Restricted Party Screening</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source: Gartner (December 2010)
Companies should consider the following:

- **Trade** — In large part, trade functions simply are extensions to or modifications of common business processes, such as buying and selling, recognizing the nuances of conducting trade across country borders. Given that the rules that govern trade vary whether importing or exporting, where products are sourced and destined matters, security concerns increase when moving goods internationally. The longer cycle times of international shipping will force adaptations of business processes. This SCM vendor guide does not include a section for vendors because these processes are often extensions of existing systems. Typical trade processes include sourcing, selling, export (customer) orders, import (purchase) orders, collaboration, product management, vendor management and document management.

- **Comply** — Trade compliance addresses the activities that ensure transactions comply with the rules and regulations of both importing and exporting countries. They also ensure all reporting, document and financial obligations are met in a timely fashion. Compliance processes must address the various regulations mandated by importing and exporting countries, the parties involved in the transaction, the categorization of goods, the intended usage/state of the goods, the source and final destination of goods, the effects of preferential trade agreements, and required documents and financial obligations imposed by governments, such as duties and taxes. Security considerations also require the screening of customers, but also potentially suppliers, trading partners and destination countries. Key trade compliance activities are preferential trade agreements, license determination, document management, document filing, product classification, customs declarations, import rules, export rules, duties and taxes, taxes, and restricted party screening.

- **Move** — The move functional view refers to all activities needed to ship goods internationally (e.g., international logistics). International movements are typically complex, multileg shipments that involve many parties (such as supplier, land transportation, consolidators, shipping port operations, ocean/air carriers, receiving port, deconsolidation and domestic land transportation). More parties touch shipments, and more documents flow between parties. Key global movement activities are carrier booking, global logistics execution, shipment planning, multimode transportation, shipment consolidation, shipment routing, carrier communication, global visibility, landed cost control and shipment documentation.

- **Finance** — The finance functional view includes capabilities such as determining true total landed costs for trades; calculation of duties, tariffs, fees and taxes; duty drawback (e.g., recapturing tariffs paid for imported components when finished goods are then exported); and collaboration with financial institutions for documents, such as letters of credit, invoicing and settlement. Key finance activities are letters of credit, settlement, reconciliation, invoice management, payment, insurance and trade financing.

**Global Trade Compliance**

Global trade compliance is fundamental to the execution of cross-border transactions. It must address the regulations of the importing and exporting countries, the parties involved in the transaction, the categorization of goods, the intended use/state of the goods, and the source and destination of goods, considering factors such as free-trade zones. Critical to trade compliance
solutions is the richness and flexibility of the content databases that codify trade regulatory rules and trade restrictions.

Trade Compliance Vendors:

- CDC Software — [www.tradebeam.com](http://www.tradebeam.com) (CDC Software acquired TradeBeam in 2010)
  - TradeBeam
- Customs Info — [www.customsinfo.com](http://www.customsinfo.com)
- CustomsNow — [www.customsnow.com](http://www.customsnow.com)
- Descartes Systems Group — [www.descartes.com](http://www.descartes.com)
- eCustoms — [www.ecustoms.com](http://www.ecustoms.com)
- Global Data Mining — [www.gdmllc.com](http://www.gdmllc.com)
- Integration Point — [www.integrationpoint.net](http://www.integrationpoint.net)
- JPMorgan Chase Vastera — [www.jpmorgan.com](http://www.jpmorgan.com)
- Kewill — [www.kewill.com](http://www.kewill.com)
- Management Dynamics — [www.managementdynamics.com](http://www.managementdynamics.com)
- MIC Customs Solutions — [www.mic-cust.com](http://www.mic-cust.com)
- OCR Services — [www.ocr-inc.com](http://www.ocr-inc.com)
- Oracle — [www.oracle.com](http://www.oracle.com)
- Precision Software — [www.precisionsoftware.com](http://www.precisionsoftware.com)
- QuestaWeb — [www.questaweb.com](http://www.questaweb.com)
- SAP — [www.sap.com](http://www.sap.com)
- Shipping Solutions — [www.shipsolutions.com](http://www.shipsolutions.com)
- Take Supply Chain — [www.takesupplychain.com](http://www.takesupplychain.com)
- TradeCard — [www.tradecard.com](http://www.tradecard.com)

Global/International Logistics

Global/international trade logistics (ITL) applications help automate the movement of goods on a global basis by helping to ensure processes are synchronized with all the parties involved in the international shipment. International shipments are typically complex, multileg movements where goods and information flow among many constituencies.

Upward of 20 parties can be involved in international shipments, from suppliers to land, ocean or air carriers; 3PL companies; freight forwarders; customs brokers; banks; insurance companies; and
governments from the exporting and importing countries. Likewise, numerous documents are created and must be managed as goods flow across the international supply chain. Mandates from organizations such as the U.S. Customs and Border Patrol require certain information to be transmitted electronically at specified times.

**Global Logistics Vendors:**

- Damco — [www.damco.com](http://www.damco.com)
- Descartes Systems Group — [www.descartes.com](http://www.descartes.com)
- GT Nexus — [www.gtnexus.com](http://www.gtnexus.com)
- i2 Technologies — [www.i2.com](http://www.i2.com) (JDA Software acquired i2 Technologies in 1Q10)
- IES — [www.iesltl.com](http://www.iesltl.com)
- Intra — [www.intra.com](http://www.intra.com)
- JDA Software — [www.jda.com](http://www.jda.com)
- Kewill — [www.kewill.com](http://www.kewill.com)
- Management Dynamics — [www.managementdynamics.com](http://www.managementdynamics.com)
- Manhattan Associates — [www.manh.com](http://www.manh.com)
- MercuryGate International — [www.mercurytgate.com](http://www.mercurytgate.com)
- Oracle — [www.oracle.com](http://www.oracle.com)
  - Oracle Transportation Management (OTM)
- Precision Software — [www.precisionsoftware.com](http://www.precisionsoftware.com)
- RedPrairie — [www.redprairie.com](http://www.redprairie.com)
- SAP — [www.sap.com](http://www.sap.com)

**Global Visibility (Event Management) Vendors**

Global visibility, a key element of the "move" section of the GTM functional view above (again see Figure 3), provides improved connectivity and visibility across facilities, multiple transportation modes, transportation providers, trading partners, suppliers, customers and, eventually, governments. Because of the complex nature of global trade when compared to domestic, additional visibility is needed for proper management and oversight. Although much of the international supply chain is outsourced, shippers still need to retain a visibility and control layer because, ultimately, the brand owner is responsible for any infraction — logistics, compliance, financial or otherwise. Figure 4 highlights a general global visibility ecosystem.
Global visibility enables the tracking and tracing of orders and shipments as well as event-driven, early problem detection and notification.

**Global Visibility Vendors:**

- CDC Software — [www.tradebeam.com](http://www.tradebeam.com) (CDC Software acquired TradeBeam in 2010)
  - TradeBeam
- Damco (A.P. Moeller-Maersk Group) — [www.damco.com](http://www.damco.com)
- Descartes Systems Group — [www.descartes.com](http://www.descartes.com)
- GT Nexus — [www.gtnexus.com](http://www.gtnexus.com)
- i2 Technologies — [www.i2.com](http://www.i2.com) (JDA Software acquired i2 Technologies in 1Q10)
- IES — [www.iesltd.com](http://www.iesltd.com)
- Inttra — [www.inttra.com](http://www.inttra.com)
- JDA Software — [www.jda.com](http://www.jda.com)
Global Trade Finance

Global trade finance addresses the finance functional view of GTM, which includes capabilities such as determining true total landed costs for trades; calculation of duties, tariffs, fees and taxes; duty drawback (e.g., recapturing tariffs paid for imported components when finished goods are then exported); and collaboration with financial institutions for documents, such as letters of credit, invoicing and settlement. Although these solutions are normally owned and operated outside the supply chain organization, we’ve seen a trend of GTM software providers offering more support for trade finance. In addition to the supply chain vendors listed here, there are also smaller regional players and other financial institutions with proprietary platforms.

Global Trade Finance Vendors:

- CDC Software — [www.tradebeam.com](http://www.tradebeam.com) (CDC Software acquired TradeBeam in 2010)
  - TradeBeam
- Citibank — [www.citibank.com](http://www.citibank.com)
- GT Nexus — [www.gtnexus.com](http://www.gtnexus.com)
- QuestaWeb — [www.questaweb.com](http://www.questaweb.com)
- Royal Bank of Scotland — [www.rbs.com](http://www.rbs.com)
- SAP — [www.sap.com](http://www.sap.com)
- TradeCard — [www.tradecard.com](http://www.tradecard.com)

Supply Chain Planning

SCM requires processes that can anticipate customer demand and plan the supply to satisfy this demand effectively. The technology required to support these demand- and supply-planning processes is called typically called supply chain planning (SCP). The market for foundational SCP
technology is mature, but continues to enjoy a period of good growth on the backs of companies' needs to drive more efficiency and, in some cases, effectiveness out of their supply chains.

Many companies have already deployed SCP tools. In fact, SCP is one of the most highly adopted of the SCM technologies: Over 85% of organizations have at least actively investigated the technology, with some evaluating the deployment of second- or even third-generation SCP implementations. Others are investigating the replacement of local, point planning solutions with more centralized and integrated SCP solutions.

Globalization challenges also are pushing more companies to examine how they run their supply chains and to evaluate what the appropriate investments in SCP technology might be. The majority of end users deploying or looking to deploy SCP applications are using select tools from SCP process automation vendors. These users are characterized as looking for best practices to apply and focusing mainly on supply chain efficiency, not on process innovation aimed at creating differentiating business processes (see Figure 5). These users require strong, foundational SCP capabilities that allow for standardizing, and often centralizing, SCP business processes. Capabilities must also provide an integrated planning framework that connects demand planning to supply planning, supports more end-to-end supply chain visibility and facilitates the basics of an S&OP process to help manage supply chain performance.

Figure 5. SCP Ecosystem

SCP is defined as the collective capabilities that enable the operational demand- and supply-planning processes of a company, such as demand planning, inventory planning, replenishment planning, manufacturing planning and scheduling, and collaborative planning. These capabilities are typically found in SCP process automation suites. More advanced and innovative capabilities, such
as inventory strategy optimization (ISO), advanced S&OP and service parts planning (SPP), are subcategories of SCP and usually support more innovative business processes. These capabilities are typically found in SCP process innovation solutions or SCP process automation suites, which have additional, specific SCP process innovation support, typically through the use of additional modules (see "Supply Chain Planning Market Is Bifurcating Into Process Automation and Process Innovation Markets").

**SCP Process Automation Suites**

Gartner defines an SCP suite as a multiproduct SCP software application that includes at least four of the key functional areas of demand planning, inventory planning, replenishment planning, available to promise, manufacturing planning and scheduling, and collaborative planning. SCP for process automation denotes a part of the SCP market that focuses on the use of SCP technologies for best practices to streamline and make more efficient the SCP business processes (as opposed to SCP for process innovation, which seeks to change or evolve specific SCP business processes for unique competitive advantage). For more information, see "Magic Quadrant for Supply Chain Planning for Process Automation, 2010."

The following points define the key criteria for SCP for process automation, first from the perspective of the technology provider:

- SCP process automation solutions tend to be integrated suites composed of demand, inventory, replenishment, manufacturing planning and production scheduling.
- SCP process automation supports standardized and formalized business processes.
- Functionality is mainly targeted at nondifferentiated business processes.
- Increasingly, there will be common attributes of complexity and capability across different vertical markets, with minimal industry specialization.

Second, from the perspective of the end-user organization:

- Established business processes in the enterprise are automated. New, innovating processes aren’t developed.
- Common SCP practices are implemented, striving toward standardized best practices.
- Process-automation-focused organizations don’t view supply chain business processes as a primary source of meaningful competitive advantage.
- Benchmarking will be prevalent to help institutionalize best practices.
- Supply chain improvement activities will be in the context of an evolutionary development model, as opposed to a revolutionary approach. Six Sigma in the supply chain is becoming a common approach to drive evolutionary development.
- SCP process automation projects will seek clear, fast and demonstrable returns (in much fewer than 12 months) in a risk-averse SCP development environment.
SCP process automation tends to favor a single-vendor sourcing model over best-of-breed sourcing (for specialized or differentiated functionality).

Here are the key value propositions for end users of SCP process-automation-focused implementations:

- Reducing costs over customer service improvements
- Improving process efficiency and performance
- Providing a capability foundation for further supply chain development activities
- Adapting the business processes of the company to meet the solution, rather than tuning the solution to meet 100% of the company processes

**SCP Process Automation Suite Vendors:**

- Adexa — [www.adexa.com](http://www.adexa.com)
- AspenTech — [www.aspentech.com](http://www.aspentech.com)
- Barloworld Supply Chain Software — [www.barloworldscs.com](http://www.barloworldscs.com)
- Demand Solutions — [www.demandsolutions.com](http://www.demandsolutions.com)
- DynaSys — [www.dys.com](http://www.dys.com)
- Epicor — [www.epicor.com](http://www.epicor.com)
- FuturMaster — [www.futurmaster.com](http://www.futurmaster.com)
- GainSystems — [www.gainsystems.com](http://www.gainsystems.com)
- Generix Group — [www.generixgroup.com](http://www.generixgroup.com)
- IBS — [www.ibs.net](http://www.ibs.net)
- Icon-SCM — [www.icon-scm.com](http://www.icon-scm.com)
- IFS — [www.ifsworld.com](http://www.ifsworld.com)
- Infor — [www.infor.com](http://www.infor.com)
- Inform — [www.inform-ac.com](http://www.inform-ac.com)
- JDA Software — [www.jda.com](http://www.jda.com)
- John Galt — [www.johngalt.com](http://www.johngalt.com)
- JustEnough — [www.justenough.com](http://www.justenough.com)
- Kinaxis — [www.kinaxis.com](http://www.kinaxis.com)
- Lawson — [www.lawson.com](http://www.lawson.com)
- Logility — [www.logility.com](http://www.logility.com)
SCP Process Innovation

SCP process innovation is an SCP strategy that describes programs focused on changing the "how" of doing SCP. Typically, this strategy is adopted by companies where the supply chain is viewed as a source of competitive differentiation. SCP process innovation focuses on the following:

- Developing new ways of "doing" and "managing" the supply chain
- Process effectiveness, rather than just efficiency
- Disruptive, revolutionary approaches more often than evolutionary cost management

Although we see suites of functionality supporting the SCP process automation market, we see narrower but deep, functionally rich solutions typically servicing the process innovation area (see Figure 6). In fact, the process innovation market is more accurately described as a set of smaller submarkets: S&OP and integrated business planning (IBP), SPP, ISO, advanced production planning and scheduling, and strategic network design.
Although we’ve seen reduced vertical-industry emphasis in SCP process automation suites, the need for an industry-specific focus is still highly relevant in the area of advanced production planning and scheduling. Most SCP process automation suites and vendors have some manufacturing scheduling capability. Some of these are highly capable scheduling solutions, able to support more complex scheduling environments, whereas others can cope with low to moderately complex shop-floor planning and scheduling requirements. It’s not uncommon for a company with a complex scheduling environment to couple an advanced production planning and scheduling solution with an SCP process automation suite that handles the rest of the SCP puzzle. Often, production planning and scheduling tools are vertically focused because of the depth of functionality that’s often required, especially in complex process manufacturing industries (e.g., metals manufacturing).

Capabilities of advanced production planning and scheduling solutions include the following:

- **Highly specific sequencing capability** (e.g., tank mixing and scheduling)
- **Highly configurable, multiple scheduling and optimization capabilities**
- **Very tight integration between production planning and detailed scheduling to ensure feasible plans, even at an aggregate level**
- **Multisite and multilevel scheduling, including supplier collaboration and network scheduling**
- **Capable to promise, as well as available to promise**
Ability to replan very quickly to support order promising and/or operational what-if analysis

**Advanced Production Planning and Scheduling Vendors:**
- AspenTech — [www.aspentech.com](http://www.aspentech.com)
- Broner — [www.bronermetals.com](http://www.bronermetals.com)
- i2 Technologies — [www.i2.com](http://www.i2.com) (JDA Software acquired i2 Technologies in 1Q10)
- IBM — [www.ibm.com](http://www.ibm.com)
  - IBM Ilog Transportation PowerOps
- Icon-SCM — [www.icon-scm.com](http://www.icon-scm.com)
- Infor — [www.infor.com](http://www.infor.com)
- Logility — [www.logility.com](http://www.logility.com)
- Kinaxis — [www.kinaxis.com](http://www.kinaxis.com)
- OM Partners — [www.ompartners.com](http://www.ompartners.com)
- Oracle — [www.oracle.com](http://www.oracle.com)
- Planscape Technologies — [www.planscape.com](http://www.planscape.com)
- Quintiq — [www.quintiq.com](http://www.quintiq.com)

**Inventory Strategy Optimization**
ISO applications are a class of optimization tools used to determine the total inventory level for all locations simultaneously, taking into account all the various dependencies, constraints and sources of demand/supply variability across the entire network. All policies can be modeled and evaluated from storage, sourcing, safety stock, replenishment and other factors.

Initial ISO projects focused on the multiechelon aspect of inventory optimization, although the number of policies evaluated and constraints modeled have since expanded. Pressing business needs are causing more enterprises to realize they must do more than just evaluate safety stock at locations. They need to better align all their supply chain assets to more dynamically adjust and segment their supply chain responses. Gartner envisions the technology will continue to develop and, in time, integrate more effectively and functionally, overlapping with other parts of the SCP product footprint. With the divergence in the SCP market under way, other business processes supported by SCP will converge with ISO to be more near real time, more operational, more real world centric (more constraints), yet more integrated to supply chain design processes, sourcing and multienterprise processes.

ISO is a small market segment within the overall SCP market, and it’s slowly embodying a distinct set of requirements. Gartner expects the growth of this segment to be more than SCM market performance during the next couple of years. As a result, most large SCP vendor offerings will have
evolved to support some aspects of ISO, either through organic developments, partnerships with specialist vendors, or acquisition. The market is made up of some small startup technology providers and large application vendors. It’s a source of partnering for others.

**ISO Vendors:**

- Barloworld Supply Chain Software — [www.barloworldscs.com](http://www.barloworldscs.com)
- GainSystems — [www.gainsystems.com](http://www.gainsystems.com)
- i2 Technologies — [www.i2.com](http://www.i2.com) (JDA Software acquired i2 Technologies in 1Q10)
- IBM — [www.ibm.com](http://www.ibm.com)
- JDA Software — [www.jda.com](http://www.jda.com)
  - Manugistics
- LLamasoft — [www.llamasoft.com](http://www.llamasoft.com)
- Logility — [www.logility.com](http://www.logility.com)
  - Optiant
- Manhattan Associates — [www.manh.com](http://www.manh.com)
- MCA Solutions — [www.mcasolutions.com](http://www.mcasolutions.com)
- Optiant — [www.optiant.com](http://www.optiant.com) (Logility acquired Optiant in 2010)
- Oracle — [www.oracle.com](http://www.oracle.com)
- SAS — [www.sas.com](http://www.sas.com)
- Servigistics — [www.servigistics.com](http://www.servigistics.com)
- SmartOps — [www.smartops.com](http://www.smartops.com)
- Terra Technology — [www.terratechnology.com](http://www.terratechnology.com)
- ToolsGroup — [www.toolsgroup.com](http://www.toolsgroup.com)

**Integrated Business Planning and Sales and Operations Planning**

S&OP, as an SCM concept, has been around for several decades. It’s traditionally seen as a business process aimed at harmonizing plans across different functional departments within a company. When first proposed, the scope of S&OP included the harmonization of strategic plans through to operational plans, as well as the harmonization across disparate operational planning environments. However, the strategic alignment aspect of S&OP has been increasingly de-emphasized during the intervening years to the detriment of the overall S&OP process to deliver value to the business.
Traditionally, S&OP capabilities have been borne out of SCP functionality supporting operational planning processes. Gartner defines an S&OP software application as a discrete set of capabilities that can support the key steps of an integrated, global S&OP process. We consider S&OP solutions (see "MarketScope for Sales and Operations Planning") that support up to Level 3 of the Gartner S&OP/IBP maturity model (see "Assessing the Maturity of Your Sales and Operations Planning Process" and "Integrated Business Planning Fills the Gap Between Strategic Planning and S&OP"). They include the following capabilities:

- **Support for the different steps of a typical S&OP process** — Although there are various S&OP best-practice models, Gartner references the five-step Oliver Wight framework in our analysis of this market because we see it as the best-known and most relevant framework for organizations. The five steps are marketing/events activity review, demand review, supply review, demand and supply balancing review and executive review.

- **Active plan amendments** — An active S&OP solution enables aggregate plan changes to be automatically pushed back into the operational planning processes for execution with full audit capabilities.

- **Scenario management** — An important characteristic of the S&OP process is the development of alternative plans and scenarios as well as the subsequent socialization, evaluation and management approval of these scenarios.

- **Constraint-based planning** — As part of the longer-term balancing of supply and demand within the S&OP solution, some basic constraint-based capabilities are needed to support the evaluation of feasible, longer-term product family plans, without having to drive back into the details of the operational planning applications.

- **Assumption management** — A key requirement of an S&OP solution is the ability to manage the assumptions that underpin the plans. A critical agenda item for the reviews is the validation and updating of these assumptions.

- **Integration with operational planning applications and processes** — For organizations that lack a single common set of operational planning applications, S&OP will need to integrate and aggregate data and plans from multiple planning applications into the S&OP solution. Part of the integration capability may include the ability to perform the data management and transformations necessary to support harmonization across a heterogeneous operational planning landscape. This can take one of two forms: provision of an overlay S&OP capability that has its own database and can sit over any SCP application environment or S&OP functionality that is tightly integrated into vendors through SCP applications.

- **Performance management** — This refers to the management and communication of the key performance indicators (KPIs) that are an essential part of any S&OP process.

- **Workflow and process management** — S&OP is a process. Therefore, it benefits from process management.
S&OP Vendors:

- i2 Technologies — [www.i2.com](http://www.i2.com) (JDA Software acquired i2 Technologies in 1Q10)
- Cognos
- Infor — [www.infor.com](http://www.infor.com)
- JDA Software — [www.jda.com](http://www.jda.com)
- Jonova — [www.jonova.com](http://www.jonova.com)
- Kinaxis — [www.kinaxis.com](http://www.kinaxis.com)
- Logility — [www.logility.com](http://www.logility.com)
- OM Partners — [www.ompartners.com](http://www.ompartners.com)
- Oracle — [www.oracle.com](http://www.oracle.com)
- Quintiq — [www.quintiq.com](http://www.quintiq.com)
- River Logic — [www.riverlogic.com](http://www.riverlogic.com)
- SAP — [www.sap.com](http://www.sap.com)
- Steelwedge Software — [www.steelwedge.com](http://www.steelwedge.com)
- TXT e-solutions — [www.txtgroup.com](http://www.txtgroup.com)

Network Design/Planning

Historically, network design applications were solutions used strategically (one to five years) to determine the overall, optimal physical supply/demand network (e.g., plants, DCs and warehouses), considering costs, service goals and objectives. More recently, network design/planning tools have been enhanced for use in tactical business planning scenarios (less than one year — for example, to answer such questions as what the company’s channel strategies should be, or what will be the impact of switching suppliers or global sources of supply). Most recently, environmental factors, such as carbon footprints, have been added to these types of solutions to enable optimization for environmental parameters.

Network Design/Planning Vendors:

- Barloworld Supply Chain Software — [www.barloworldscs.com](http://www.barloworldscs.com)
- i2 Technologies — [www.i2.com](http://www.i2.com) (JDA Software acquired i2 Technologies in 1Q10)
  - Ilog LogicNet Plus XE
- Infor — [www.infor.com](http://www.infor.com)
Service Parts Planning

Gartner defines SPP as an extension to SCP, targeting the specific needs of service and repair parts forecasting/demand planning, inventory planning and replenishment planning. Although sharing similar capabilities with SCP, SPP must model and support the particular features required to address the distinctive needs of service parts. The vendors included in this research offer solutions that contain most but not necessarily all the specific SPP functionality.

Core SPP Capabilities

Specific requirements are universally necessary for planning service parts that must be addressed by SPP applications:

- Supporting very large numbers of stock-keeping units (SKUs), often millions of parts/location combinations
- Significant item cost variability, from very low (less than $1) to high (more than $1,000)
- Significant item demand variability, from very low (a few pieces per year) to high (many pieces per week)
- Low levels of demand predictability
- Highly sporadic and intermittent demands
- Need for specialized techniques, such as Croston's forecasting method, to address intermittent demand
- Addressing the operational impact of high levels of part obsolescence
- Where possible, using predictive techniques, such as mean time between failure
- Supporting part substitutability and super session
- Helping plan returns and repairs (that is, reverse logistics)
- Supporting kitting and other forms of dependent demands

**Advanced SPP Capabilities**

- Networkwide optimization that minimizes total systemwide parts cost, while meeting service targets and systemwide considerations and constraints
- Causal forecasting that uses historical predictive metrics (e.g., mean time between failures per hours of operation)
- Better forecasting methodologies, such as Croston’s method or variations of it, and techniques, such as fractional forecasting, for addressing highly sporadic, intermittent and low-volume demands
- Networkwide safety stock optimization versus bottom up (referred to as multiechelon inventory optimization)
- Flexible and more robust part segmentation beyond simple ABC classifications
- Sourcing and replenishing parts horizontally across stocking locations (such as depot to depot) versus fixed, hierarchical source destination pairing, such as depots sourced only from regional warehouses that are then supplied by the central warehouse
- Asset/product bill of materials built into planning process (that is, as used or as configured)
- Visibility into contractual obligations, such as service lead-time and service-level agreements (SLAs)
- Ability to forecast material requirements based on asset populations
- Parts planning, considering those in use and the erosion of asset populations
- Ability to model SLAs, including a complex array of parts by order, customer and/or channel across a network (sourced from one or more locations)

**SPP Vendors:**

- Baxter Planning Systems — [www.bybaxter.com](http://www.bybaxter.com)
- GainSystems — [www.gainsystems.com](http://www.gainsystems.com)
- IBM — [www.ibm.com](http://www.ibm.com)
- IFS — [www.ifsworld.com](http://www.ifsworld.com)
- Infor — [www.infor.com](http://www.infor.com)
- JDA Software — [www.jda.com](http://www.jda.com)
- Lawson — [www.lawson.com](http://www.lawson.com)
Supply Chain Supporting Technologies

Radio Frequency Identification (RFID)

The hype over RFID technology appears to be settling down. Enterprises now understand that it’s a suite of technologies, not a single technology used to solve a variety of unique business problems within the supply chain. From 13.56 MHz passive to 2.4 GHz active RFID solutions, enterprises continue to test the waters with closed-loop applications, looking to improve inventory management or asset management while achieving a positive ROI.

Inventory management deployments are centered on the visibility and tracking of inventory across a supply chain. It’s now a relatively mature application area, typically using passive RFID. New applications continue to emerge, such as real-time locating systems (RTLS) using passive RFID, or solutions requiring sensor input, such as temperature or vibration monitoring. Mobile asset optimization is centered on the use of SCM concepts in tandem with RFID to help optimize the use and positioning of mobile assets for RTLS, compliance or security applications. It’s often associated with active RFID, including 433 MHz and 2.4 GHz solutions, though some usage scenarios can be implemented using passive technology. Depending on the size and importance of the asset, RFID is also being combined with GPS to better keep track of assets. Mobile asset optimization is an emerging area for RFID, one that often holds significant business value for companies.

The market response to these evolving solution areas is that technology providers are moving to provide industry-focused and issue-focused solutions for end users. Increasingly, the capability of middleware to support multiple devices, multiple types of RFID technology, business rules and analytics as well as integration to existing business applications, along with other software capabilities, will become important.

This list shows a sample of RFID vendors that focus on SCM areas and includes companies that provide tags or different frequencies, readers and middleware across a combination of technologies for vertical-market-specific solutions.
RFID-Centric Vendors:

- AeroScout — www.aeroscout.com
- Avery Dennison — www.averydennison.com
- Axcess International — www.axcessint.com
- Ekahau — www.ekahau.com
- Fluensee — www.fluensee.com
- GlobeRanger — www.globeranger.com
- Impinj — www.impinj.com
- Intelleflex — www.intelleflex.com
- Intermec — www.intermec.com
- Manhattan Associates — www.manh.com
- Mojix — www.mojix.com
- Microsoft — www.microsoft.com
- Motorola — www.motorola.com
- Oat Systems — www.oatsystems.com
- Odin — www.odintechnologies.com
- Oracle — www.oracle.com
- RedPrairie — www.redprairie.com
- RF Code — www.rfcode.com
- Rush Tracking Systems — www.rushtrackingsystems.com
- SAP — www.sap.com
- Sybase — www.sybase.com
- Tego — www.tegoinc.com
- ThingMagic — www.thingmagic.com
- Time Domain — www.timedomain.com
- Vue Technology — www.vuetechnology.com
- WaveMark — www.wavemark.net
- William Frick and Company — www.fricknet.com
Voice

See the "Voice-Directed WMS" section.

Ruggedized Mobile Computers

The market for ruggedized mobile computers continues to be a mature environment, but many of the functional aspects of ruggedized devices have been creeping into their commercial counterparts. For example, the ability for durable devices, such as mobile phones, to survive a three-foot drop to concrete have greatly increased over recent years. From displays and keyboard layouts to operating systems and applications, durable and oftentimes less expensive devices can complete the tasks that were once reserved for "ruggedized-only" computing platforms.

As a result, the definition of ruggedized mobile computers is changing so that only applications such as intrinsically safe, freezer operations or DC powered are warranting the additional expense both in upfront capital expenses as well as ongoing service and maintenance costs for deploying ruggedized mobile clients. Although the target market available for ruggedized platforms is getting smaller and durable unit sales continue to grow, vendors of ruggedized mobile clients look to expand their market definition by integrating SCM-specific data collection methods, such as RFID, in addition to freezer operations or fork-truck-mounted computers. Historical input methods such as touchscreen, keyboard, imagers/cameras and even speech recognition are now available in durable or ruggedized form factors.

Unlike business-oriented computers and even most durable solutions, ruggedized mobile computers are designed to serve more specialized functions. Survivability is of paramount concern, since these devices journey with their users through demanding environments each day. To ensure durability and high availability, these industrial units normally have reinforced displays and hinges, shock-resistant cases, high-capacity fast-recharge batteries and nonslip grips.

Designs are increasingly modular to ensure the flexibility to add functionality as needs arise and to maximize investment protection. Modular products help reduce the number of SKUs, thus lowering inventory costs and minimizing downtime. Ruggedized mobile clients include peripherals, such as imagers, sensors and connectors, which allow various types of measurements or data inputs beyond the traditional keyboard and scanner. A variety of wireless communication options, such as Wi-Fi and wireless WAN, are often used to enable real-time communication.

Enterprises must ensure their ruggedized mobile computer investments closely align with long-term infrastructure commitments, such as databases, application development tools, wireless communications, and security and management systems. Most ruggedized components of an ERP solution have a lifetime of four to five years. Strictly cost-focused procurement processes that have traditionally resulted in life spans of five to seven years could be seriously detrimental to business process improvement. As a result, closer alignment with PC procurement practices (that is, a four-year life cycle) is encouraged because of a higher degree of integration with overall business processes than in previous purchasing cycles. For additional information, see "MarketScope for 'Ruggedized' Handheld-Computer Market (Global)."
Ruggedized Mobile Computer Vendors:

- Casio — www.casio4business.com
- DAP Technologies — www.daptech.com
- Datalogic — www.datalogic.com
- Hoft & Wessel — www.hoeft-wessel.com
- Honeywell Scanning and Mobility — www.honeywellaidc.com
- Intermec — www.intermec.com
- Janam Technologies — www.janam.com
- LXE — www.lxe.com
- Motorola — www.motorola.com/enterprise
- Psion Teklogix — www.psionteklogix.com
- Unitech — www.unitech-adc.com

Recommended Reading

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

"Hype Cycle for Transportation, 2010"

"Forecast: Enterprise Software Markets, Worldwide, 2009-2014, 2Q10 Update"

"User Survey Analysis: Understanding Supply Chain Management Software Buyers, North America, 2010"

"Stratifying WMS: A Multilevel View"

"Magic Quadrant for Warehouse Management Systems"

"Magic Quadrant for Midmarket and Tier 2-Oriented ERP for Product-Centric Companies"

"Magic Quadrant for Transportation Management Systems"

"Evaluating the Efficacy of TMSs as SaaS"

"Supply Chain Planning Market Is Bifurcating Into Process Automation and Process Innovation Markets"

"Magic Quadrant for Supply Chain Planning for Process Automation, 2010."

"MarketScope for Sales and Operations Planning"
"Assessing the Maturity of Your Sales and Operations Planning Process"

"Integrated Business Planning Fills the Gap Between Strategic Planning and S&OP"

"MarketScope for 'Ruggedized' Handheld-Computer Market (Global)"
Regional Headquarters

Corporate Headquarters
56 Top Gallant Road
Stamford, CT 06902-7700
USA
+1 203 964 0096

Japan Headquarters
Gartner Japan Ltd.
Aobadai Hills, 6F
7-7, Aobadai, 4-chome
Meguro-ku, Tokyo 153-0042
JAPAN
+81 3 3481 3670

European Headquarters
Tamesis
The Glanty
Egham
Surrey, TW20 9AW
UNITED KINGDOM
+44 1784 431611

Latin America Headquarters
Gartner do Brazil
Av. das Nações Unidas, 12551
9º andar—World Trade Center
04578-903—São Paulo SP
BRAZIL
+55 11 3443 1509

Asia/Pacific Headquarters
Gartner Australasia Pty. Ltd.
Level 9, 141 Walker Street
North Sydney
New South Wales 2060
AUSTRALIA
+61 2 9459 4600