

9 Overview on Supply Chain Management Systems

Karl Maria Grünauer, Elgar Fleisch, Hubert Österle¹

9.1	Introduction	176
9.1.1	Objectives	176
9.1.2	Supply Chain Pyramid	177
9.2	Planning Processes and Planning Horizons	179
9.3	Software Concepts for Supply Chain Management	180
9.3.1	Transaction and Planning Systems	180
9.3.2	Material Requirements Planning (MRP I)	181
9.3.3	Manufacturing Resource Planning (MRP II)	181
9.3.4	Advanced Planning Systems	183
9.4	Brief Overview on Advanced Planning Systems	185
9.4.1	Functionality and Modules	185
9.4.2	Rhythm Solutions of i2 Technologies	188
9.4.3	Manugistics6 of Manugistics	189
9.4.4	APO of SAP	189
9.4.5	Numetrix of J.D. Edwards	190
9.5	Conclusions	190

¹ The authors would like to thank Alexander Blount, The Information Management Group (IMG), for his valueable input.

9.1 Introduction

For decades industry has been trying to match supply with demand. Supply chain management (SCM) is process-oriented management of the complete logistics network through the planning and control of material, information and funds flows on the basis of new information and communication technology. This gives rise to the question of ‘old logistics wine in new IT bottles’. At the end of the eighties, the CIM concept (computer integrated manufacturing [cf. Scheer 1990a]) was already based on the idea of an integrated, holistic view of logistics from order receipt to shipment, thus “building a bridge from work flows based on the division of labor to integrated processes” [cf. Bothe 1998, 33].

According to [Scheer 1998, 3] the CIM concept failed for two basic reasons:

1. At the time the necessary tools in the form of software and open hardware were not available.
2. The end users were insufficiently involved and ultimately overwhelmed.

In this Chapter we investigate whether a similar fate to that of CIM is likely to befall the SCM concept due to a lack of suitable IS systems. It then goes on to look at the advanced systems currently available on the market for depicting interorganizational planning processes.

In summary, suitable IS systems are available for managing the supply chain. The real challenge lies in managing the cooperation between the business units involved in the supply chain (cf. Chap. 14). Cooperative behavior on the part of the project initiator plus the involvement of all the relevant partners in the supply chain is the only way to ensure that the required transactional data will be available so that the functionality provided by advanced planning systems can be utilized in line with business objectives.

After looking at business objectives (cf. Chap. 9.1.1) we start off by visualizing the planning process and planning horizons for supply chain management (cf. Chap. 9.2) and examine the existing software concepts MRP I, MRP II and APS for planning tasks (cf. Chap. 9.3). The assignment of typical modules of an APS solution to generic SCOR planning processes shows that functional requirements are depicted; a brief overview of four selected APS systems provides an indication of the focus and trends amongst various software vendors (cf. Chap. 9.4).

9.1.1 Objectives

The partners in a supply chain can be suppliers, manufacturers, wholesalers or retailers. Individually, these partners need to balance the supply chain objectives of customer service levels (maximization), supply chain assets (minimization), and supply chain costs (minimization) to achieve the greatest ROA (return on

assets). Supply chain management takes this one step further and seeks to allocate these costs and benefits equitably across supply chain partners.

Service Levels

One of the major requirements is to provide the end customer with a suitable *service level*. This refers to the capability of a supply chain to deliver to the customer the right product in the right quantity and the right quality at the right time and at the right place. Building on from here, it is possible to develop objectives, such as improvement in quality or reduction in cycle and response time, which, for example, lead to an increase in customer satisfaction and secure sales revenues for all the business units in a supply chain for the long term.

Supply Chain Assets

The service level can, however, only be maintained if the partners in a supply chain build up *assets*. This can be done by means of current assets in the form of inventory, or fixed assets, such as production plant or information systems. Examples of objectives for supply chain asset management are quantitative targets for reducing the inventory days of supply and cash-to-cash cycle time, or for increasing the asset turn.

Supply Chain Costs

Providing the required service level and building up assets lead to *costs* for all the business units in the supply chain. Costs include order fulfillment costs, material acquisition costs, inventory carrying costs, logistics costs as well as manufacturing labor and overhead costs. This gives us objectives, such as the reduction of total supply costs or value-added productivity.

9.1.2 Supply Chain Pyramid

Selecting the right level of service for the customer means ensuring that the customer can be served in accordance with his needs. This leads to sales revenues at all value creation stages in the supply chain.

The customer may, for example, demand a high level of product availability. In the case of make-to-stock production, this can be achieved by stock levels, for example, in the case of make-to-order through short lead times. At each stage of the supply chain, provision of the required service level is paid for with assets and costs.

Intraorganizational objectives, such as the ROA, give partners in a supply chain an indication of the ratio of benefits (achieved sales or profit) to expenditure (assets and costs). The challenge lies in managing these objectives which are interwoven and mutually influence one another. This is shown for one business unit as a gray

triangle in Figure 9-1, intraorganizational planning processes in procurement, production and distribution ensure the internal optimization of ROA.

However, it is not sufficient for each partner to try and optimize its ROA on an individual basis. A household appliance manufacturer, for example, may set up a cost-efficient manufacturing process. This will ensure an optimal ROA for the short term through efficient internal material requirements and production planning.

Unfortunately, failure to invest in projects aimed at improving communication between the manufacturer and downstream trading stages means that the retailer passes on information regarding changes in market demands to the manufacturer too late in the process. A lack of flexibility in the cost-efficient manufacturing process leads to delays in making the required changes to the efficient but no longer effective production operations.

Stock shortfalls occurring at the manufacturer and downstream trading stages are unable to provide the level of service required by the market. Delivery problems occur. Shortfalls in sales lead to a decrease in ROA for all concerned. Viewed over the long term, the complete supply chain is destined to fail.

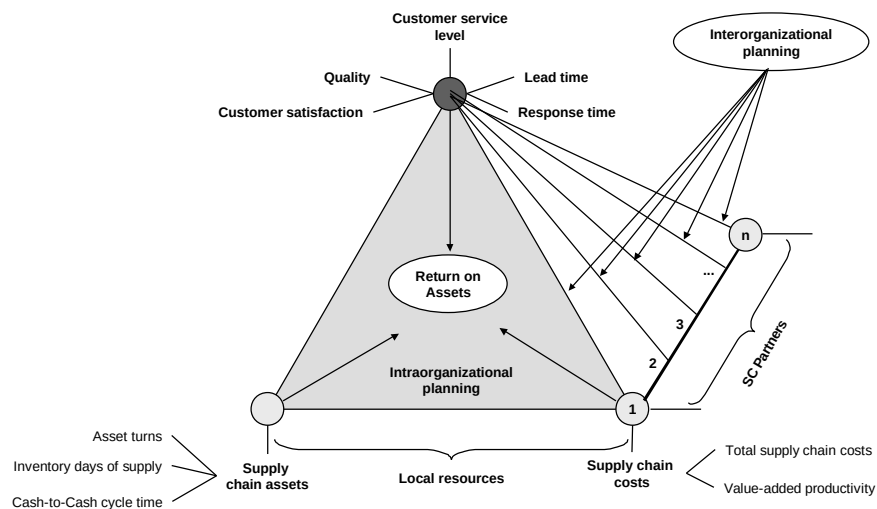


Figure 9-1: Supply Chain Pyramid²

Interorganizational planning between SC partners (see ellipse in Figure 9-1) ensures that in a first step customer requirements are identified, prioritized and ag-

² Compiled from ([Scharj/Skjott-Larsen 1995, 20], [Christopher 1998, 286], [Bowersox/Closs 1996, 679], and [Becker/Geimer 1999, 32]).

gregated throughout the whole supply chain. In a second step interorganizational planning balances these requirements with partner-internal procurement, production and distribution resources in good time.

The interorganizational and synchronized exchange of information between partners in a supply chain permits an optimal customer-oriented balance between service level, local supply chain assets and local supply chain costs at every stage in the chain. Viewed overall, synchronization means that a higher ROA is achieved for all concerned.

9.2 Planning Processes and Planning Horizons

Recently, the top down approach SCOR for capturing and designing supply chain configurations has been made publicly available³. On its top level, the SCOR model differentiates the supply chain processes plan, source, make and deliver (cf. Chaps. 4.3.2 and 6.2.1). On the next level, which is called the configuration level, SCOR defines four interorganizational planning processes P0: plan infrastructure, P1: plan supply chain, P2: plan source, P3: plan make and P4: plan deliver. These processes have planning horizons, which range between minutes, hours, days, weeks, months and years and can be classed as strategic, tactical and operative planning tasks (see Figure 9-2).

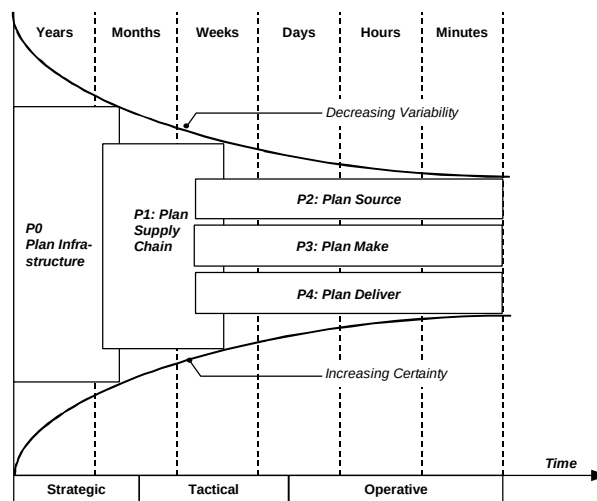


Figure 9-2: Types of Supply Chain Planning Processes

³ SCOR stands for Supply Chain Operations Reference-model (e.g. [Hankason 1999, 205], [SCOR 1998]).

P0: plan infrastructure is the SCOR process where the supply chain is reconfigured, make/buy decisions are made and long-term planning of capacities, resources and business plans are performed (e.g. [SCOR 1998, 56], [SCOR 1998 26]).

P1 starts with the identification, prioritization, and aggregation of supply chain requirements (P1.1) and of supply chain resources (P1.2). In the next two steps supply chain requirements are balanced with supply resources under consideration of product/process data and business rules (P1.3) and supply chain plans are established (P1.4). Outputs of P1 are courses of action over specified time periods that represent a projected appropriation of total supply chain resources to meet total supply chain demand requirements and executable sourcing/production/delivery plans for customers and suppliers in the entire business network.

P2 balances materials resources with material requirements and establishes detailed sourcing plans. P3 balances production resources with production requirements and establishes detailed production plans. P4 balances delivery resources with delivery requirements and establishes detailed delivery plans.

Decreasing variability and increasing planning certainty in the transition from strategic via tactical through to operative planning tasks are shown in Figure 9-3 over various planning horizons (years, months, weeks, etc.) as a function of time.

9.3 Software Concepts for Supply Chain Management

9.3.1 Transaction and Planning Systems

BPR (cf. Chap. 3.3.1) projects and the introduction of ERP (cf. Chap. 2.3.1) systems have laid the foundation for the efficient execution of intraorganizational processes. ERP systems, such as R/3 from SAP AG, are primarily oriented towards depicting the as-is situation and managing transactional data. A trading company, for example, is provided with support for transactions in the areas of (a) stock management and procurement and (b) quotation, price and order management, invoicing etc. by the modules material management (MM), and sales and distribution (SD). As a rule, each business unit operates one or more ERP systems.

ERP systems provide up-to-date information e.g. on stock levels or the current value of orders. Non-order-based master data depict the structure of an object in the supply chain, for example, the bill of material for a product. The benefits of these systems for planning the supply chain as a whole consist mainly in the provision of a consistent database.

Planning systems on the other hand manage planning data, such as order forecasts or production plans. Viewed historically, three software concepts have developed for planning systems. In order of creation, these are material requirements planning (MRP I), manufacturing resource planning (MRP II) and advanced planning systems (APS). Each concept represents a further development of its predecessor.

In practice, the two traditional concepts MRP I and MRP II are often found to be integrated with the transaction systems in the form of the above mentioned ERP systems. APS represents independent applications that sit on top of ERP. Common to all planning systems is the use of master and transaction data embedded in the various transaction systems of a supply chain.

9.3.2 Material Requirements Planning (MRP I)

Material requirements planning is a batch-oriented determination of net requirements on the basis of gross requirements, such as current customer orders, rough-cut distribution and production plans, inventory levels and pending purchase orders. The breakdown of bills of material using fixed lead times gives planned production orders or ordering dates for bought-out parts.

With the MRP I concept the only planning principle taken into consideration is material availability. The availability of resources, for example through checking warehouse, transport or production capacity, is not taken into account. As a result it is not possible to guarantee that calculated plans are actually feasible, because there might not be sufficient capacity available.

9.3.3 Manufacturing Resource Planning (MRP II)

The disadvantages of MRP are toned down in the successor concept MRP II through the inclusion of additional planning modules. This results in a comprehensive planning and control system, which helps to achieve the following objectives simultaneously [cf. Pfohl 1994, 254]:

1. Ensure the availability of materials, components, and products for planned production and for customer delivery,
2. Maintain the lowest possible level of inventory, and
3. Plan manufacturing activities, delivery schedules, and purchasing activities.

The MRP II concept typically includes the following modules (cf. [Schary/Skjott-Larsen 1995, 144], [Winter 1991, 183]):

- Modules for financial planning and business forecasting,
- Modules for demand management for final products, such as production planning and master production scheduling (MPS),
- Modules for forecasting, such as demand management, production and sales planning and distribution requirements planning (DRP),
- Modules which take capacity considerations into account, such as resource requirements planning, rough cut capacity planning (RCRP) and capacity requirements planning (CRP),
- Modules for materials requirements planning (MRP I) and for controlling operations, such as purchase planning and control, final assembly scheduling (FAS) and production activity control (PAC).

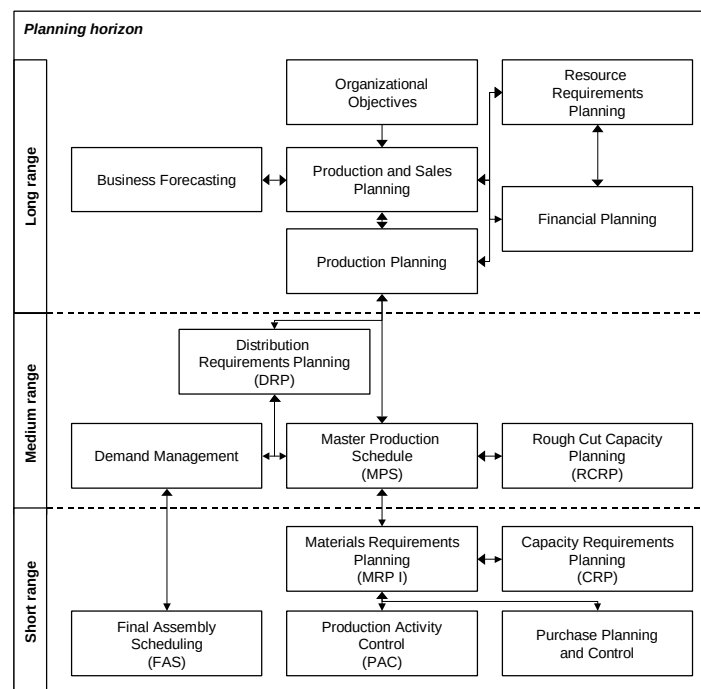


Figure 9-3: Structure of an MRP II System [cf. Schary/Skjott-Larsen 1995, 144]

The structure is based on steps, i.e. the results of long-range planning (e.g. production and sales planning) and medium-range planning (such as master production scheduling) are passed on to the next level (see Figure 9-3). If it is not possible to implement a plan (e.g. due to capacity restrictions in the case of master schedule items), successive solution approaches are pursued by feedback with the higher planning levels [cf. Gronau 1997, 66].

MRP II's most evident improvement over its predecessor concept is the expansion of planning to include capacity calculation [cf. Kilger 1998, 53]. On the other hand, there are a whole series of disadvantages to be considered. Uncertainties with respect to demand, lead times, etc. are not taken into account. In the case of lead times, waiting times due to capacity overload situations (waiting for capacity or waiting for material) are not recorded in the system. MRP II systems are also batch-oriented: capacity requirements planning (CRP), for example, is performed independently of material requirements planning (MRP I). If boundary conditions are encountered (e.g. insufficient capacity) the material requirements planning has to be executed again. Long throughput times for calculation makes producing plans an arduous task and also means that they cannot be readily adapted to new situations [cf. Kilger 1998, 54]. Orders are processed in the order in which they are received (first come–first served principle). The user has no means of including objectives in real time, reserving material or correcting existing plans. MRP II systems are site-oriented. This prevents the integrated planning of the interorganizational supply chain from material procurement via the various stages of the production process through to the delivery of products to customers. While MRP II systems optimize individual elements of a supply chain locally, the lack of an overview of dependencies along the supply chain makes it impossible to arrive at an optimal solution for the supply chain as a whole.

9.3.4 Advanced Planning Systems

The existing deficits of MRP II systems have provided the motivation for developing Advanced Planning Systems (APS)⁴. The main object of APS is the total optimization of an objective, such as ROA. This presupposes that the topology of a supply chain with its various resources and the consideration of boundary conditions, such as capacity constraints, are visible. For this reason, APS systems are based on an interorganizational model of a supply chain⁵.

In the case of the household appliance manufacturer, an interorganizational planning model supports not only the production and material requirements planning but also the downstream distribution and sales planning in coordination with the business units further along the supply chain, such as retailers. Integrating the transaction systems of the retailers with the manufacturer's APS system ensures that data, such as forecast quantities or actual customer order quantities, are com-

⁴ According to [Prockl 1998, 443] the abbreviation APS stands for advanced planning systems, however this abbreviation is not always used to mean the same thing in the available literature. Authors such as (e.g. [Lapide 1998, 3], [Pirron et al. 1999, 69]) understand APS to mean 'advanced planning and scheduling'.

⁵ The model of an interorganizational supply chain includes e.g. suppliers, plants, various stages of distribution centers and points of sale.

municated in time. This enables the manufacturer to react quickly to fluctuations in demand and to plan more flexible production capacities.

The main advantages of APS relate to the following points (e.g. [cf. Prockl 1998, 443], [i2 1997], [Fritsche 1999, 50], [AMR 1999], [Simchi-Levi et al. 2000, 223]):

- *Depiction of complex, interorganizational supply chains.* Modeling of realistic restrictions ('constrained based systems') is made possible through the use of object-oriented technologies. Analyze. plan activities and make trade-offs based on information from the entire supply chain.
- *Simultaneous planning philosophy.* In the case of APS, contrary to the sequential planning philosophy of MRP II, all planning processes are considered simultaneously; interaction and restriction infringements are checked (concurrent planning).
- *Incremental planning capability.* While MRP II systems create plans from scratch, APS can update requirements, inventory and capacity data and show the effects of the respective changes.
- *Bi-directional communication of changes.* Changes to plans are immediately transmitted upstream and downstream.
- *Positioning as DSS.* The departure from rigid planning processes, as was the case with MRP II, positions APS as decision support systems (DSS). Target groups, such as e.g. product managers, procurement planners or stock planners, can simulate the effects of changes by means of 'what-if' analyses.
- *Integration with transaction systems.* Middleware allows APS to be linked with transaction systems⁶ in order to load operative data and conversely to be able to make planning results available to the transaction systems.
- *Main memory-resident data storage.* Leads to high processing speeds which allow good response times; enhanced information capability through available-to-promise in real time).
- *Single-point-of-contact:* Access any data in the system from a single-point-of-contact

⁶ On the transaction system side there are standardized interfaces, one example being the production optimization interface (POI) from SAP.

9.4 Brief Overview on Advanced Planning Systems

9.4.1 Functionality and Modules

With APS, planning processes in the areas of source, make and deliver are depicted against the background of various planning horizons in integrated modules with mutually complementary functionality. Figure 9-4 represents individual APS modules in three main areas: (1) supply chain design, (2) supply chain planning and (3) tactical/operative planning.

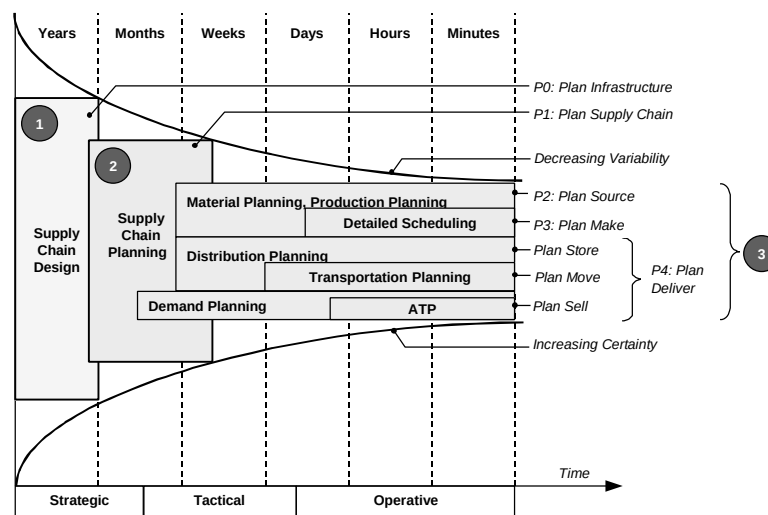


Figure 9-4: Modules of APS Solutions (cf. [Pirron et al. 1998, 62], [Pirron et al. 1999, 70], [Hiemenz 1998, 57])

(1) Supply chain design modules cover strategic planning with a time horizon, which can span months or years. It ensures that an optimal structure is found for a supply chain in the long term. This is done, for example, by simulating and evaluating investment alternatives. This might mean answering the question of whether existing warehouse capacity should be expanded, whether it would make sense to set up new distribution stages or whether it would be advisable to aim for consolidation. Supply chain design corresponds with the SCOR-process P0.

(2) Supply chain planning modules correspond with the SCOR-process P1. They operate within the supply chain design model with all its constraints. This enables the modules to plan the flow of materials, components and products along the entire supply chain by the synchronized exchange of sourcing, production and

distribution plans between entities, such as suppliers, plants, distribution centers and transportation lanes.

(3) The different tactical planning APS-modules correspond with the SCOR-processes P2: plan source, P3: plan make and P4: plan deliver. Functionality for enabling P2 and P3 processes are typically provided by material planning and production planning/detailed scheduling modules:

- Material planning ensures that sufficient quantities of critical material are available before beginning production. Time-phased material availability, dynamic part/ingredient substitution and synchronized material allocation to reduce work-in-process inventories enable business units to position the right materials effectively.
- Based on customer service, profitability, and cost, *production planning* and *detailed scheduling* allocates constrained production capacities to the appropriate parts. It optimizes the use of machines, labor, and material within each production facility by providing multi-site planning, detailed scheduling, and real-time communication with the plant floor.

Typically, software vendors distinguish between the sub-processes plan store, plan move and plan sell when depicting SCOR's P4 process. The corresponding APS functionality can be found in distribution planning, transportation planning, demand planning and available-to-promise (ATP):

- Distribution planning helps to optimize the flow of goods throughout the network of distribution centers and local warehouses.
- Transportation planning helps to optimize mode and carrier selection and consolidate freights to create shipments in the most cost-effective manner.
- Demand planning provides demand signal visibility (cf. Chap. 13) which helps to understand the current market dynamics and to accurately predict future customer demand (forecasting).
- ATP increases customer service via reliable confirmation dates by performing high-speed availability checks against stocks, allocation plans, forecasts etc. at the time of order entry.

Different APS manufacturers depict the modules with different emphasis. Solutions have been developed by an evolutionary process centered around the planning modules for tactical/operative tasks.

Additional functionality required has been added successively by the APS manufacturers through buying or collaborating with specialized software houses; this applies in particular to supply chain design and supply chain planning. As a result, the module landscapes within the APS systems tend to be heterogeneous.

This brief overview of APS systems covers the following four manufacturers⁷,

- Market leader i2 Technologies with the *Rhythm Supply Chain Management (SCM) solution*,
- Their strongest competitor Manugistics with the product *NETWorks solution set* based on the predecessor *Manugistics6*,
- The newly developed APS solution from SAP which goes under the name of *Advanced Planner and Optimizer (APO)*,
- J.D. Edwards with their SCM products offerings based on *Numetrix/3* and *Numetrix/xtr@*.

Both i2 Technologies and Manugistics are independent software manufacturers who specialize in APS solutions. Together they accounted for over 50% of worldwide sales in the APS market segment in 1998.

As market leader in the field of ERP systems, SAP is in a position to offer customers a complete solution from a single source thanks to the new development of APO, which started in 1997. ERP manufacturer J.D. Edwards pursues the same objective. However, this company avoided self-development by acquiring Numetrix in the summer of 1999. This acquisition is part of a continuing trend. In the past we have seen e.g. Peoplesoft consolidate its position as a provider of SCM solutions (transaction system and APS solution) by taking over Red Pepper, or Baan, acquiring CAPS Logistics and the Berclain Group.

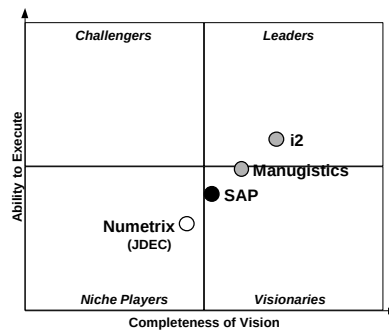


Figure 9-5: Leading APS Vendors

Figure 9-5 shows the positioning of the four manufacturers in the four cells of the Gartner Group matrix [cf. Enslo 1999]. Software vendors are classified according to their ability to meet current market demands ‘ability-to-execute’, and ac-

⁷ For a detailed explanations of the functionality of APS tools (cf. [Benchmarking Partners 1997], [Bermudez/Girard 1997], [Pirron et al. 1998], and [Pirron et al. 1999]).

according to their ability to meet new market challenges ‘completeness of vision’. Niche players like Numetrix/J.D. Edwards focus on a small market segment, whereas visionaries (Manugistics and SAP) are already performing well but show weaknesses in meeting future market challenges. Gartner Group sees i2 Technologies as the only vendor in the leaders quadrant. New APS market studies like [IML-FHG 1999, 150] and [FIR-RWTH 1999, 322] will show, whether Manugistics and SAP can move into the leaders quadrant.

[AMR 1999] estimated that sales revenues from the worldwide APS market reached approx. USD 800 million in 1997 and around USD 1,300 million in 1998.

Table 9-1 shows the latest annual revenue, the 1-year revenue growth trend and the current market capitalization per manufacturer. For SAP⁸ and JD Edwards we estimate, that the annual revenue from APS sales amounts to 15%-20%.

Company	Latest Annual Revenue in Millions of USD, 1-yr Revenue Growth in %	Market Capitalization in Millions of USD (08/24/00)
JD Edwards	USD 944.2 (10/1999), -4.9%	USD 2,424.21
Manugistics	USD 152.4 (02/2000), -6.8%	USD 1,632.66
i2 Technologies	USD 571.1 (12/1999), +64.8%	USD 30,826.09
SAP	USD 5,146.0 (12/1999), +0.2%	USD 44,103.00

Table 9-1: Latest Annual Revenues and Market Capitalization of Leading APS Vendors⁹

9.4.2 Rhythm Solutions of i2 Technologies

Originally founded in 1988, this company’s sales are over 50% higher than those of manufacturer No. 2 (Manugistics): in 1998, i2 Technologies recorded total sales revenues of over USD 362 million with a workforce of over 2,300 employees. The company’s background lies in realizing software based on the ‘Optimized Production Technology’ concept (OPT) of Goldratt/Cox (e.g. [Bermudez/Girard 1997, 11], [Goldratt/Cox 1995]) in the area of production planning.

A major factor contributing to the success of i2 in sectors, such as high-tech (electronics and semiconductor industry) or the steel industry, is the value-added

⁸ [Bermudez/Richardson 1999, 19] estimate that SAP will achieve sales revenues for APO of around USD 810 million in the year 2001, which equates to roughly 16% of SAP’s total sales for 1998.

⁹ [cf. MGFS 2000].

sales approach. Introduction projects are billed according to the benefits achieved for the customer. The potential customer benefits of a solution are reduced costs, delayed or avoided expenses, increased responsiveness to customer demand and increased revenue growth. According to [Miller-Williams 1998], i2 generated customer benefits to the tune of USD 3,537 million during the period 1996-98.

The company's intention is to expand its market leadership e.g. through electronic Business Process Optimization (eBPO). With this initiative i2 Technologies is attempting to tap new market segments, such as product life cycle management or customer relationship management (CRM), alongside its traditional area of supply chain management (SCM). i2's acquisition of the CRM system manufacturer 'Smart Technologies' highlights the growing significance of CRM for supply chain management.

9.4.3 Manugistics6 of Manugistics

This APS vendor was set up in 1986 and focuses on short projects delivering rapid results, primarily in the consumer goods, process and automotive industries. Its background is forecasting and distribution requirements planning (DRP). After a restructuring in the beginning of 1999, the company has been trying to establish a foothold in the business-to-business (B2B) and business-to-consumer (B2C) area with its e-Chain™ concept and thus expand its APS product-suite called Manugistics6. This is aimed at giving the customer the possibility of linking its business processes with those of its partners and integrating end users via the Internet. One module in the suite is an implementation¹⁰ of the CPFR standard (collaborative planning, forecasting and replenishment [cf. VICS 1998]).

With the middleware product, OAI/Net Manugistics is also endeavoring to improve the integration of transaction systems of various business units with APS solutions through the use of Internet technologies.

9.4.4 APO of SAP

SAP entered the APS market segment at the end of 1998 with its newly developed Advanced Planner and Optimizer (APO) against the background of anticipated saturation in its traditional segment of ERP systems (R/3). The high level of market penetration in the area of ERP will help SAP to achieve a leading position with APS systems as well: according to [Bermudez/Richardson 1999] 60%-70% of R/3 customers prefer to purchase their APS solution from the ERP supplier.

¹⁰ This relates to the Manugistics product NetWORKS™.

With the latest Release 1.1 and 130 installations worldwide to date [cf. SAP 1999a], SAP has developed a comprehensive solution within a short period of time. The 'grace of late arrival' [cf. Pirron et al. 1998, 67] meant that SAP was able to learn from the deficiencies of solutions already on the market. Beta tests were completed in the first quarter of 1999, and the first solutions are expected to go live as of mid-1999.

The APO concept includes all the APS modules shown in Figure 9-4. The strengths of the solution lie in the modules for strategic design and planning, and demand management [cf. Bermudez/Richardson 1999, 4]. In addition to the improvement in stability, the emphasis for Release 2.0 will be on the area of collaborative planning [cf. Kühn 1999] and enhanced user-friendliness (Enjoy SAP) among others.

9.4.5 Numetrix of J.D. Edwards

Numetrix was established in 1977 and a year later brought the first commercial application software for finite capacity planning (FCP) onto the market [cf. Benchmarking Partners 1997, 50]. The acquisition of the Numetrix/3 and Numetrix/xtr@ solutions by J.D. Edwards expanded the supply chain planning competence of this ERP manufacturer. J.D. Edwards will integrate these products into its own SCOREx¹¹ supply chain solution. For Numetrix this could enable them to move beyond their previous niche position (see Figure 9-5).

In addition to sophisticated planning functionality, the special feature of the Numetrix products lay in the Internet-enabled supply chain planning strategy. Numetrix/xtr@ builds on the distributed object messaging system architecture (DOMA) and makes it possible to plan and optimize the complete supply chain via the Internet. A push procedure [cf. Pirron et al. 1998, 68] is used to forward planning data via a communication channel to internal and external business units. Numetrix/xtr@ permits the definition of business rules for running the channel and the conditions which initiate the exchange of information, notification or warning.

9.5 Conclusions

Information systems for managing the interorganizational supply chain take the form of ERP systems and planning systems (in particular APS). These allow business units to manage the necessary basic data consistently and to handle both intra and interorganizational planning tasks. APS system suppliers cover planning tasks

¹¹ SCOREx stands for supply chain optimization and real-time extended execution.

with different functional emphasis, identifiable trends include (a) the use of the Internet for message-based system link-up, (b) the depiction of collaborative planning scenarios, such as CPFR, and (c) the expansion of APS focus and stronger customer focus through customer management.

While the systems are available, the challenge nevertheless remains to utilize the system functionality offered and to realize business potential. According to [Gartner Group 1998a] the majority of large corporations will not succeed in using APS systems in all three time horizons of supply chain planning tasks by the year 2003.¹²

Organizational measures, such as creating the necessary acceptance on the part of users both during operation and during the implementation of SCM systems, will thus become the most important task. An inability to gain this acceptance will doom SCM to failure, like CIM before it.

The implementation of SCM systems requires both technical and organizational skills. Since SCM systems involve data and processes of several different business units, the technical and organizational challenges required for its implementation top those of ERP systems. However, the future development in IT will make SCM systems more agile, easy to implement and easy to use. The complexity of cooperation among people and organizations will stay if not increase.

¹² "Through 2003, the majority of large enterprises will fail to achieve great supply chain management (SCM) because they will not master the application of advanced technologies in all three SCM time horizons: strategic planning, tactical planning and operational execution (0.8 probability)" [Gartner Group 1998a].

