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Logistic Core Operations with SAP

Inventory Management, Warehousing, Transportation, and Compliance

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Chapter 1
Introduction

The most imperative challenge facing a number of managers in recent years has been to regain lost market share and secure new competitive advantages. The impetus for this trend continues to be the ubiquitous tendency toward globalization and the ensuing intensification of international competition. *Customer orientation*, *lean management* and *re-engineering* are the buzzwords that characterize these efforts.

In fact, several companies need to reorganize their value-added processes, whereby special attention should be paid to the interfaces between the sales and procurement markets, which are increasing in importance. Within this context, there is hardly a corporate function that has grown in significance in recent years as much as *logistics*.

Treated until just a few years ago as an operational aid and an object of isolated rationalization efforts, logistics – especially in the age of *supply chain management* – now is considered an essential element of strategic corporate leadership. More and more, logistics is being functionally mapped in standard business software. Accordingly, there is great demand for logistical expertise in connection with the know-how surrounding the implementation of logistics in complex information systems.

Definition of supply chain management

Supply chain management (SCM) is the observation and administration of logistical processes along the entire value creation chain, which includes suppliers, customers and end consumers.

1.1 Purpose of This Project

We have divided our presentation of logistics operations with SAP into two volumes. The purpose of them is to provide you with an introduction to the world of logistics with SAP software and assist you in understanding the terminology, concepts and technological components as well as their integration. Because the described processes are complex and include a number of functional details, we

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have attempted to make the examples as representative as possible in terms of the presentation and functional explanation of the SAP system components, SAP ERP (Enterprise Resource Planning) and SAP SCM (Supply Chain Management). This means that the two volumes cover all components of SAP Business Suite and core functions within the context of logistics. A few components, especially technical ones, and functional areas (e.g. disposal, maintenance and service management) will not be covered.

We have taken care to explain business-related questions and their SAP-specific solutions as well as technical terms, and illustrate their relationships. The books are designed to provide an easily understandable yet well-substantiated look at the respective process chains, and be a useful source of information for everyone – from IT experts with only basic knowledge of the business-related issues, to employees in logistics departments who are not yet familiar with SAP terms and applications.

1.2 Whom Do These Books Address?

Logistic Core Operations with SAP cannot answer every query, but we hope to give you the tools with which to ask the right questions and understand the essential issues involved. The contents of this book are thus aimed at the following target groups:

1.2.1 SAP-Beginners

The books are dedicated to everyone looking for a lucid, informed introduction to logistics with SAP. Thus, each chapter describes in detail a specific logistics field and provides an overview of the functionality and applications of the respective components in practical business use. In this regard, we address SAP beginners and employees in departments where SAP is to be implemented, as well as students wishing to obtain an impression of the logistic core processes and their mapping in SAP software.

1.2.2 Ambitious Users

We also speak to ambitious users of SAP Business Suite who, in addition to relevant logistical processes, want a look at process integration and the functions up- or downstream, as well as their mapping in SAP Business Suite.

1.2.3 Managers and IT-Decision-Makers

Last but not least, we turn to management staff and IT decision-makers who are considering the implementation of SAP Business Suite or its individual components and wish to obtain an overview of logistical processes with SAP systems.

1.3 Operational Significance of Logistics

The operational significance of logistics for many companies still lies in its rationalization potential. In general, a reduction of logistics costs should improve corporate success by achieving a competitive advantage. Surveys of businesses have demonstrated that, for the coming years, companies are still counting on a considerable cost-reduction potential of 5–10% of total costs (see 3PL Study 2009, The State of Logistics Outsourcing 2009, Third-Party Logistics). This statement does not contradict the fact that the share of logistics costs of many companies was more likely to increase in the past because, for instance, it is directly related to which operational processes are included in the logistics process.

Thus, the scope of logistics in recent years has continually expanded, for example to include production planning and control (PPS systems) or quality control. In addition, significant investments are being made in IT technology, in areas such as supply chain management planning. In the near future, this will lead to a decrease in administrative logistics costs (e.g. through shipment tracking, transport organization or Internet-based ordering).

Further savings are expected in commercial and industrial firms by subcontracting logistics services (logistics outsourcing). In particular, operative logistics tasks, such as transport, storage, commissioning and packaging, have already been outsourced to a high degree to external logistics service providers. However, since a lack of quality in logistics services is generally not blamed on the service providers involved, but rather on the supplier, outsourcing logistics functions can be problematic.

1.3.1 Supplementary Logistics Services

When the quality of competitor products continues to become more comparable and there is hardly room to lower prices any further, competition takes place on the level of service performance. Within these services, logistics ranks highly: Delivery dependability, rapid returns processing and a high degree of customer service quality are characteristics with which a company can set itself apart from its competitors.

1.3.2 Customer-Oriented Logistics

Several logistics processes either include interfaces with customers or have effects on the customer. That is why logistics processes must be oriented toward customer needs and performed in a service-friendly manner. In an era when logistics demands are becoming ever more exacting and, by the time the consumer is

reached, ever more customized, companies that master these processes to the advantage of their customers will experience a competitive edge that, at least in the short term, cannot be bridged by the competition. Firms boasting excellent logistics management can hardly be replaced by other suppliers. Thus, there are cases in which logistics in commercial and industrial businesses is one of the core competences for which outsourcing should *not* be considered. This is not to say that the fulfillment of basic logistics functions (e.g. transport or storage) cannot be outsourced, as there are plenty of providers on the market that are capable of taking over the logistics tasks of a previous supplier on a short-term basis without detriment to quality (make-or-buy decision).

1.3.3 Definition of "Logistics" for This Book

There are a growing number of ever-changing definitions and classification options offered in print as well as on the Internet for the term *logistics*. Of these, we would like to use the functional, flow-oriented definition of the American logistics society "Council of Supply Chain Management Professionals" as the basis for this book and its journey into the logistics options of the SAP Company:

> Logistic management is that part of supply chain management that plans, implements, and controls the efficient, effective forward and reverse flow and storage of goods, services, and related information – between the point of origin and the point of consumption in order to meet customers' requirements.(Source: Council of Supply Chain Management Professionals)

According to this definition, logistics serves to move goods within the entire value chain and requires coordination and integration between companies. It focuses primarily on real goods, tangible assets and services that provide benefit to the customer, and it integrates them into the core logistics functions of transport, transfer and storage.

Logistics therefore comprises the planning, control and execution of goods and information flow – between a company and its suppliers, within a company, and between a company and its customers.

1.3.4 Differentiation from Materials Management

Materials management, on the other hand, includes all activities involved in supplying a company and its production processes with all necessary materials at optimal cost. Logistics takes into account spatial and temporal gaps involved in supply processes, not only with regard to the materials, but also to the information to be exchanged between business partners. That is why we consider materials management to be not only a part of logistics, but its center, whereby the functions of logistics are more comprehensive than those of materials management.

1.3.5 Functional Classification of Logistics

A further possibility of logistics classification is the differentiation of logistics phenomena according to functional aspects. As a cross-sectional function, logistics maintains interfaces with the primary functional business areas of acquisition, production and sales.

1.3.6 Classic Logistics Core Areas

We thus traditionally differentiate between the following logistics areas in the order in which goods flow through a company, from the acquisition to the sales market:

- Procurement logistics
- Production logistics
- Distribution logistics

1.3.7 Expansion of the Traditional Core Areas

Current logistics definitions augment these traditional core areas to include further aspects. These include disposal logistics and operational maintenance, or service management. Spare parts logistics ensures the materials-management-related supply and availability of spare parts.

1.3.8 Objective: As Comprehensive a Portrayal As Possible

With this project, we have attempted to provide as comprehensive a portrayal of logistics processes and issues as possible, which include not only theoretical principles but also problems of practical use, as well as their implementation in SAP Business Suite. Therefore, we have expanded the traditional cross-sectional business functions to include the following logistics areas, to which chapters in Volume 2 are dedicated:

- Transport logistics
- Warehouse logistics and inventory management

1.3.9 Related Literature in the Appendix

Due to our goal of providing basic knowledge of logistics core processes and their mapping in SAP Business Suite within the framework of conceptual possibilities,

disposal logistics and service management and maintenance (as well as compliance) are not within the scope of this book. For more information on these topics, refer to the bibliography. There you will find information concerning all of the books or sources we have quoted or referenced.

1.3.10 Logistics Functional Areas

Figure 1.1 shows the classic and expanded functional areas of logistics that will be discussed in more detail in *Logistic Core Operations with SAP*.

1.3.11 Procurement Markets

On the side of the *procurement markets,* it is the task of *procurement logistics* to acquire the articles as well as raw materials and supplies necessary for the operational processes of manufacturing and distribution. Procurement is carried out with reference to a certain procurement and stock situation, especially based on materials management planning as part of *production logistics*. The result of such planning may be a purchase requisition. The purchase requisition is cleared for procurement, converted into an order and transferred to the determined source for internal or external procurement. The conclusion of a procurement transaction may involve receiving and paying a supplier invoice, in addition to goods receipt into the

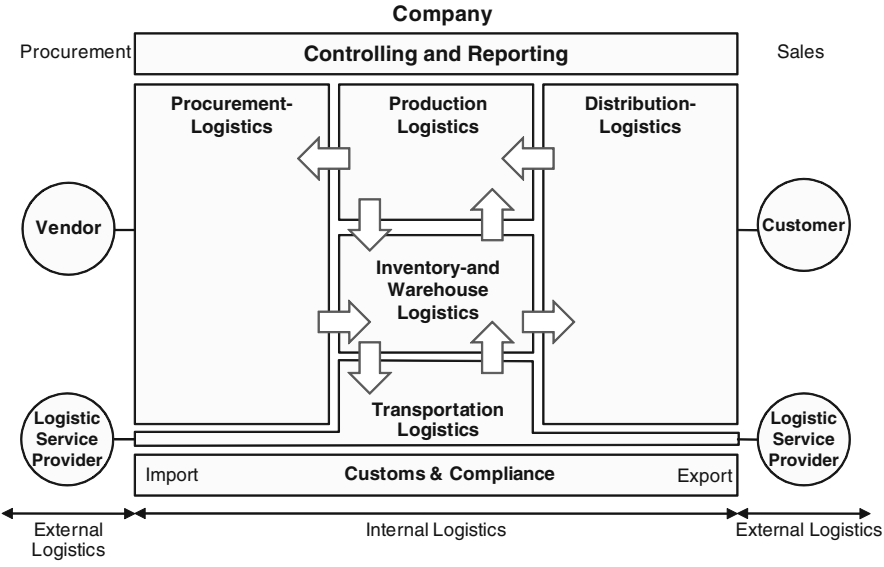

Fig. 1.1 Functional areas of logistics

warehouse. The Goods Receipt Department not only records stock but also its valuation for the Accounting Department. Transfer of the materials to stock, their quality inspection and inventory management are part of *warehouse logistics* and *inventory management*.

1.3.12 Sales Markets

Distribution logistics primarily concerns sales processes that generally begin with a customer ordering materials and indicating a desired delivery date. Using this information, a sales order is generated. Depending on the delivery date, shipping activities are initiated such that the materials reach the customer in a timely manner. *Warehouse logistics* takes over the task of commissioning and material provision. As soon as the materials have left the warehouse, a goods issue is booked to update stock and inventory management values.

A carrier can be commissioned to deliver the materials. *Transport logistics*, in a cross-sectional function, takes on the task of booking the transport planning and the transport itself. At the end of the sales procedure, an invoice is produced for the customer. As soon as the customer has paid for the materials, payment receipt is recorded in Accounting.

1.4 Structure of This Book

Logistic Core Operations with SAP is divided into two volumes. *Inventory Management, Warehousing, Transportation and Compliance* represents the second volume.

1.4.1 Transport Logistics

Due to its logistic significance and related SAP applications, we have dedicated the entire second chapter following this introduction to "Transport Logistics" (Chap. 2), which illustrates the various SAP solutions regarding the topic of transport. We not only shed light on the perspective of shipping agents from the realms of manufacture and trade, but also that of transport service providers. In addition to the basics of transport logistics and its business significance and transport from the standpoint of shippers and logistics service providers, we explain in detail the individual systems and applications, and their integration into the procurement and distribution logistics systems as well as the necessary master data.

1.4.2 Warehouse Logistics and Inventory Management

Chapter 3, "Warehouse Logistics and Inventory Management", describes warehouse logistics as a link between the internal and external logistics systems. Thus, we present those SAP processes in the realm of inventory management, goods movement and warehouse management. In doing so, we make a clear, systematic distinction between stock and warehouse management. This chapter also discusses warehouse management using the Warehouse Management solution in SAP ERP (WM) as well as in SAP SCM, SAP Extended Warehouse Management (SAP EWM).

Besides the application-specific description of the basic warehouse processes in the areas of goods receipt and goods issue, we also have a look at the fundamentals of inventory management, its evaluation and the integration of system components. We illustrate special stock and special procurement forms, consignment and subcontract order processing based on their significance to central logistics, as well as the technical differences between WM (ERP) and EWM (SCM) processes.

1.4.3 Trade Formalities

Chapter 4 focuses on "Trade Formalities: Governance, Risk, Compliance". This chapter offers an overview of the functions of foreign trade and customs processing with SAP ERP and SAP Business Objects Global Trade Services.

1.4.4 Controlling and Reporting

Logistic control and the related reporting process are the focus of Chap. 5, "Controlling and Reporting", which also covers integration into the SAP logistics processes. We primarily examine SAP Event Management as a *Track & Trace* system for the tracking of shipments and events, the classic SAP ERP-based functions in the realm of distribution and logistics information systems, as well as SAP NetWeaver Business Warehouse (SAP NetWeaver BW). The classic reporting functions are complemented by SAP BusinessObjects. SAP thus offers the necessary tools to support users in the generation, formatting and distribution of conclusive reports, or so-called *dashboards*. Dashboards enable more than simple data evaluation, focusing on the integration and generation of intuitive visualizations that immediately display where there is a need for action.

1.4.5 Overview of Volume 1

The first volume of this series *procurement, production and distribution logistics,* provides a detailed look at the components and functions of SAP Business Suite and SAP NetWeaver as they relate to logistics. It begins with an explanation of master data and the organizational structures used in the logistics components of SAP Business Suite. This is followed by an examination of the integration of these components and functions in specific logistics applications. Internal and external procurement are featured, including requirements determination, order processing, invoicing and purchasing optimization. It also highlights production logistics, with an emphasis on the deployment side. Sales and procurement planning using SAP ERP(SAP Enterprise Resource Planning) and SAP APO (SAP Advanced Planning & Optimization) are also discussed. Finally, the book illustrates how distribution logistics can be managed with SAP, including order processing in SAP ERP and SAP CRM (SAP Customer Relationship Management), the processing of inquiries, quotations, orders, and deliveries, and special distribution situations, such as returns processing, returnable packaging and consignment processing.

1.4.6 Appendix

At the end of both volumes, you will find a glossary (Appendix A), a bibliography (Appendix B) and a detailed index that can help you find important terms and their definitions quickly.

1.5 Thanks

This book was created with the aid and the direct and indirect expertise of several SAP colleagues, whom we wish to sincerely thank.

We are very grateful to Dorothea Glaunsinger and Hermann Engesser at Springer Verlag for their guidance and support. Thanks also to Frank Paschen and Patricia Kremer at SAP-Press for their first-rate assistance during the making of the original German publication of this book. We also wish to thank translator Andrea Adelung and copy editor George Hutti.

We would like to express our special thanks to our wives and families:

- Susanne Kappauf with Leni and Anni
- Yumi Kawahara with Kai and Yuki
- Susanne Koch with David and Leah

You are the ones who, through your patience and willingness to do without a great deal of things, have made this book possible.

Chapter 2
Transport Logistics

Transport logistics refers to the transport of goods of all kinds using a variety of means, such as trains, trucks, airplanes, ships or parcel services.

Transport logistics is a major component of business process networks. Its significance has increased in recent years due to increasing globalization. Whereas companies in the 1980s and 1990s frequently focused on reducing internal costs by introducing ERP systems, among other measures, now rising energy costs are shifting that focus to logistics outside the company. In recent years, we have seen similar cost optimization tendencies in the realm of transport.

2.1 The Fundamentals of Transport Logistics

The topic of transport can be considered from the perspective of various business models, such as that of logistics service providers and carriers, or from the view of a producing or trading company (called the *shipper view* in this context). Both business models exhibit their own special features in the business process. The cooperation of business partners in the network has its own character and set of rules. In addition, goals can be different. Figure 2.1 illustrates the transportation relationships between various business partners. The transport logistics involved in external logistics can be organized by the shippers themselves as well as by logistics service providers.

From the perspective of transport logistics, we generally differentiate between local and long-haul transport. Local transport involves a vehicle executing pick-up or delivery and returning to the starting point on the same day. This category generally includes the delivery of cargo that has been fed from a long-haul into a local transport network (*on-carriage*), and pick-ups that have been transferred from the local to the long-haul transport network (*pre-carriage*). The truck is the most commonly used vehicle in local transport.

Long-haul transport is either carried out as direct long-haul transport (*direct leg*) or via line haul. For direct long-haul transportation, a means of transport containing the goods to be conveyed is sent directly from the shipper to the recipient over a

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long distance. For line-haul processing, goods picked up on local transport routes are transferred to another means of transport (airplane, ship, train or truck) in a logistics center and transported along with goods from other shippers. Several transfer processes are also possible along the entire transport route. Figure 2.2 illustrates the transportation lanes and the transportation network in local and long-haul transport.

For long-haul transport, organizational processing efforts are generally much higher than for local transport. Depending on the type of transportation (air, sea, etc.), the type of goods (dangerous goods, foodstuffs, etc.) and geographic circumstances of the origin, points of transit and destination, long-haul transport can require the following additional tasks:

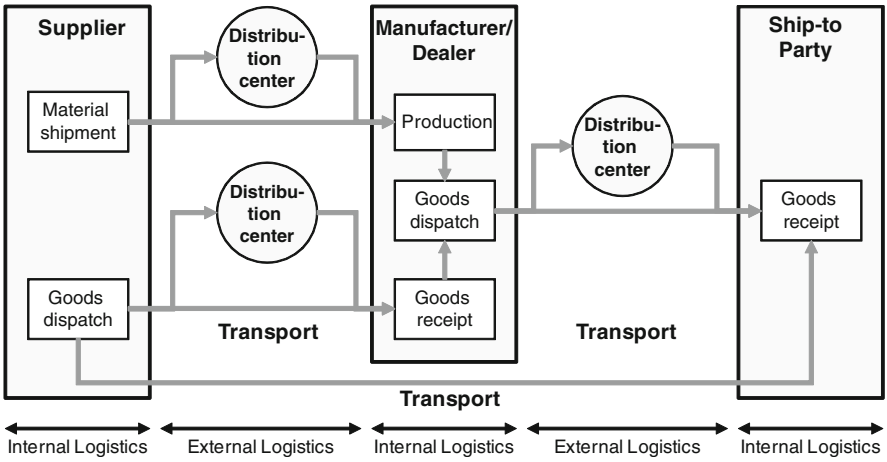

Fig. 2.1 Transportation relationships between various business partners

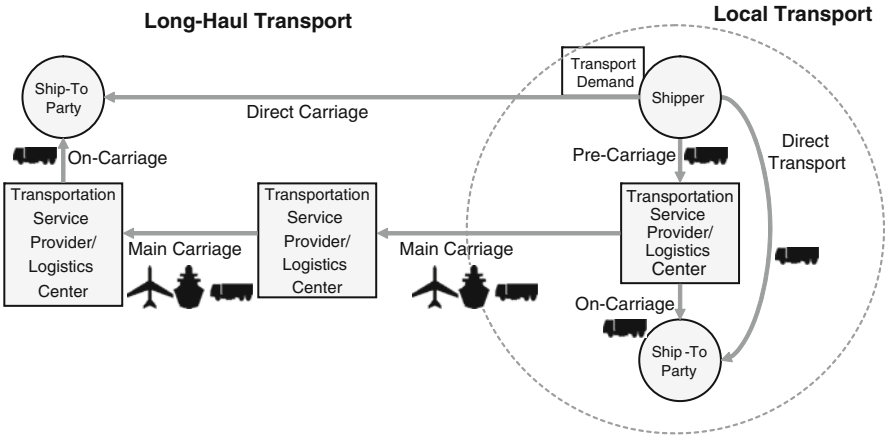

Fig. 2.2 Transportation network in local and long-haul transport

- Shipping space reservation on ships or airplanes
- Foreign trade processing with export and import permits, customs fees and embargo checks
- Dangerous goods processing with various national or transport mode-specific regulations
- Coordination and seamless planning of goods movement at the various load transfer points and on various modes of transport
- Cost calculation, processing and risk responsibility according to various Incoterms

International air and sea transport can become very complex as a result.

2.1.1 Business Significance

Transport logistics does not occur in an isolated fashion. It is always connected to other business processes, whether they be in one's own company or at a business partner's location. It organizes the exchange of goods between business partners. Bad organization can harm or impede the subsequent business processes. In times of very advanced internal process optimization, a well-functioning, optimized transport logistics is becoming ever more important. Here, even greater savings potential, total process optimization and service advantages can be achieved.

The optimization goal of transport logistics is to process all planned goods transports in such a way that:

- Existing transport means are used as optimally as possible
- As few empty runs as possible occur
- Available service providers can be contracted economically and in close observation of agreements
- All goods are transported according to laws and regulations (dangerous goods regulations, trade regulations, etc.)
- Operating supply, human resources and service provider costs are minimized
- Service times and stipulated service grade and levels (such as 24-h delivery) are observed

Many of these optimization opportunities can be utilized to their fullest with the aid of a suitable software system.

2.1.2 Transportation from the Shipper View

From the view of a shipper, there are three major process types that must be supported in transport logistics:

- *Incoming shipments*, in which ordered goods are picked up or material replenishment is acquired for production
- *Outgoing shipments*, in which produced or deliverable materials or goods are transported from one plant or warehouse to a goods recipient
- *Third-party transactions*, in which the shipper has the goods transported directly from a supplier to the recipient, without the shipper physically receiving the goods.

The desired direction of the transport demand, that is, where the goods to be shipped are staged and where they are ultimately delivered, is virtually insignificant for actual processing. However, you need to observe the stipulated tariffs and any related Incoterms.

A forwarding agent can conduct transport logistics in three different ways:

- **Completely autonomous transport logistics**
  The shipper maintains his own fleet and drivers, and, with them, attempts to achieve optimal capacity utilization with the goods to be transported. Cost minimization is a primary goal. The objective is to execute all goods shipments using as few vehicles as possible. This type of organization can be observed more often in smaller producing enterprises or retail companies. Transport logistics is primarily in the form of local transports to and from factories and distribution centers.
- **Internal transportation planning with external logistics service providers**
  The shipper can master the planning of the shipments in an optimal manner. However, he does not own his own fleet, and thus commissions a logistics service provider or carrier to execute the shipments according to precise instructions. This type of organization is often seen in companies in which a number of independent suborganizations transmit their transport demands to one central planning office.
- **Complete outsourcing of transportation tasks and services**
  The shipper transfers the individual transport demand tasks to a logistics service provider and has that agent decide on their processing. In a more extreme form, the service provider is given further tasks for the external logistics chain (warehouse management, order processing, and inventory control) and takes on increased responsibility.

2.1.3 Transportation from the View of the Logistics Service Provider

Logistics service provider is the collective term for carriers as well as freight forwarding agents. In both types of companies, the core process and value creation

concern the processing of shipments. For the purposes of this book, freight forwarding agents refers to companies that organize the transportation of goods, while carriers execute the physical transport of goods.

Both kinds of companies work closely together. Freight forwarders who do not own their own fleets are dependent upon carriers who act as the executing business partner. Larger logistics enterprises often comprise both types of companies; the logistics service provider organization accepts, plans and processes aggregated orders, and then passes them on to internal carriers and other external carriers.

Carriers have responsibilities in the following realms:

- Provision of mode-specific transportation capacities (on rail, air, sea, and road)
- Optimized use of an internal fleet and thus the opportunity to offer attractive prices for transportation services and the provision of transport means (such as containers)

The responsibilities of a logistics service provider include the following:

- The consolidation of goods from various customers to achieve maximum profitability
- Complete processing of goods transport for a customer, including the performance of all legally required services (customs clearance, dangerous goods treatment, paper printouts, import/export processing, goods movement) and the professional subcontracting of all involved carriers

Consolidation and profitability. The consolidation of goods from various customers gives the logistics service provider the opportunity to optimize profits. For instance, he can commission a carrier to execute a container shipment (full container) for $1,000 and subsequently resell the available 24 pallet spaces to a customer for $100 each. The service provider turns a profit from the 11th sold pallet space. Of course, he also carries risk of incomplete capacity utilization.

2.1.4 Shipper and Service Provider Hybrids

From the viewpoint of the shipper, transportation processing is generally not a core competence upon which he wishes to concentrate, but rather a necessary task in the completion of the process chain. Instead of completely outsourcing all transportation services, the shipper can outsource his shipping department (with or without a fleet) in order to optimize his own competences and also provide them to other business partners for their transportation processing needs. With such efforts, outsourced logistics departments of larger enterprises increasingly represent direct competition to logistics service providers.

2.2 SAP Systems and Applications

Especially in the realm of transportation, several transpiration solutions have been developed in the history of SAP systems, each of which had a certain user group and focus (see Fig. 2.3):

1. In 1987, the first transportation solution in the mainframe system SAP R/2 was introduced to the market (*Realtime Vertrieb*, RV, with *Realtime Transport*, RT), whose functions were strongly influenced by shippers in the chemical industry.
2. In 1993, with SAP R/3, the transportation processing solution SD-TRA entered the market, which represents a generic solution from the view of the shipper. Release SAP R/3 4.6 saw the categorization of the solution in the *Logistic Execution System* (LE-TRA).
3. In 2000, as a supplement to SAP ERP Transport, SAP introduced transportation planning and optimization for shippers in SAP APO (APO-TP/VS, *Transportation Planning/Vehicle Scheduling*).
4. *SAP Event Management* (SCM-EM) was introduced to the market in 2001 as a tracking and tracing solution for shippers as well as logistics service providers and integrated into ERP Transport for purposes of tracking shipments.
5. With *SAP Transportation Management* (SAP TM) in 2007, SAP supplied a comprehensive, independent transportation solution that served the needs of logistics service providers as well as shippers.

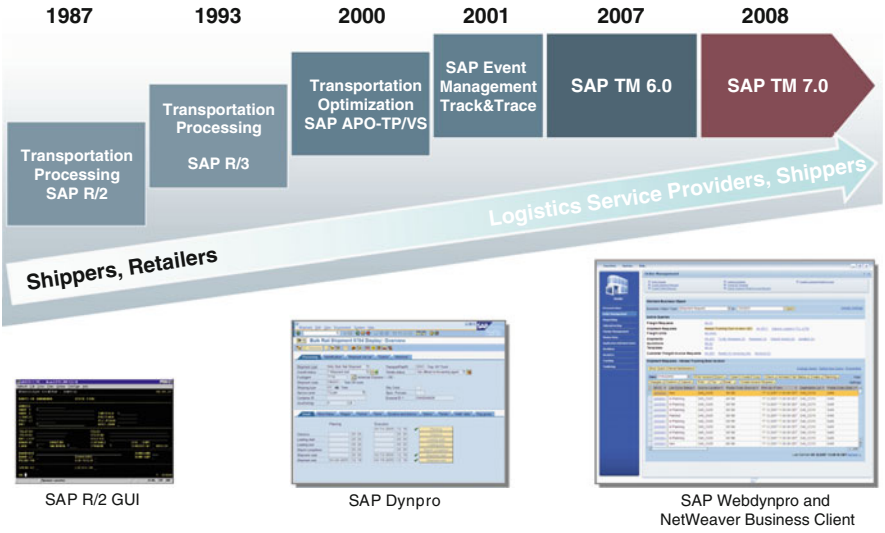

Fig. 2.3 History of transportation solutions in SAP

2.2.1 Subprocesses and Components of SAP Transportation Solutions

An overview of the transportation solution components is illustrated in Fig. 2.4. It shows how the components and individual subprocesses are integrated to enable transportation processing.

The main components of this transportation solution include:

- **SAP ERP: Sales and Distribution (SD) and Logistics Execution System (LES) for sales orders and delivery**
  The sales order (see Volume 1, Chap. 6, "Distribution Logistics") represents the starting point for the outgoing transport demands of a shipper. The goods purchased by a customer stemming from one or more points of departure generate the transport or individual shipment requirements. These individual requirements are defined in the deliveries that are put together based on the sales order.
- **SAP ERP: Materials Management (MM) and LES for purchase orders, stock transport orders and incoming deliveries**
  The purchase order (see Volume 1,, Chap. 4, "Procurement Logistics") is the source document for the transport demand of a shipper, in which the goods to be procured are defined along with their procurement locations. A purchase order can lead to deliveries, which then represent the individual shipment

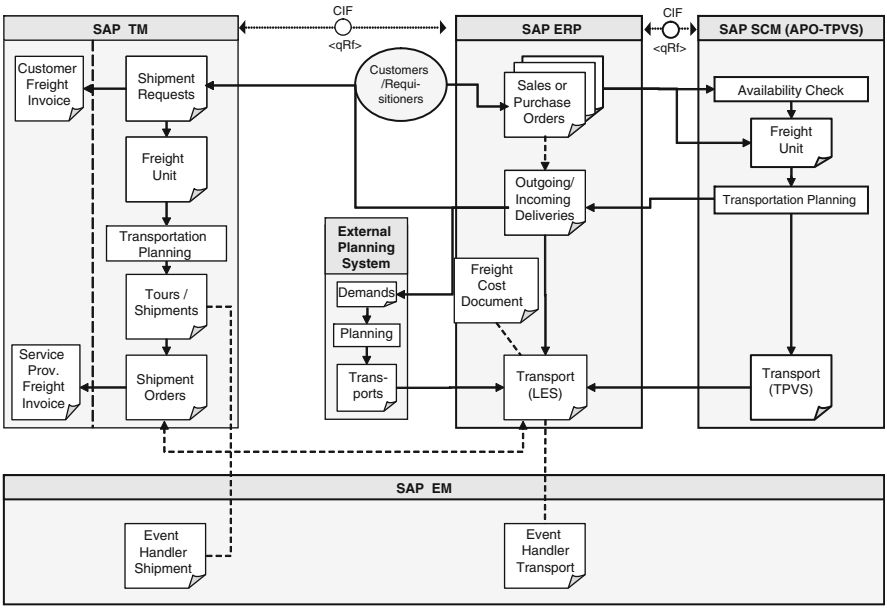

Fig. 2.4 Overview of SAP transportation components and their integration

requirements. Stock transfer orders (see Volume 1,, Chap. 4, "Procurement Logistics") between plants are a special type of order. In SAP ERP, they are treated similarly to a normal order, with the single exception that, in addition to an incoming delivery, an outgoing delivery is also generated, which represents the outgoing side from the stock view.

- **SAP ERP: Logistics Execution System (LES) for shipment and freight cost documents**
  The ERP shipment document and corresponding freight cost document are planning, execution and billing documents for transportation processing. With the component *Logistics Execution System*, you can create shipments and transportation chains, consolidate deliveries either manually or in a rule-based way, and document the process. Shipping costs can be calculated here as service provider costs from the shipper view and can be invoiced. In the customer order, you have the opportunity to access transport costs and pass them on to the customer in the normal invoice of that particular order.
- **SAP APO: global Available-to-Promise (gATP)**
  The global Available-to-Promise (see Volume 1, Chap. 6, "Distribution Logistics") in the APO system supports sales order processing by determining the best source for the materials ordered by a customer (sourcing). A customer's requested delivery dates, as well as shipping times, available and reserved material quantities, and available material alternatives, are also taken into consideration. SAM SCM 5.0 and later releases include this global availability check in APO Transportation Planning, where you can consult a detailed transportation plan to schedule shipments.
- **SAP APO: Transportation Planning/Vehicle Scheduling (TP/VS)**
  APO Transportation Planning is an optimization tool for transportation planning that consists of several subcomponents. Transport demands are sent to the optimizer along with information on the utilized transportation network and existing vehicle resources. The optimizer calculates an optimal cost solution for the respective transport demands: Routes with consolidated transport demands are generated and are executed using the most economical resources. Via the service provider selection, you can find the best service provider(s), which can be determined according to a variety of criteria (price, allocation, quality, preference, etc.)You then have the opportunity to conduct a service provider bid invitation to confirm the selection.
- **SAP Transportation Management (SAP TM)**
  SAP TM is a complete solution for the processing of transportation processes as a logistics service provider or shipper. It offers comprehensive functions for quotation and order management, transportation planning, posting, route determination and subcontracting to service providers or internal organizations. In addition, flexible functions are integrated for transportation cost calculation for the sale and purchase of transportation services, and for the calculation of internal transportation costs. Integration with SAP ERP (FI/CO) is available as a standard feature for billing customer and service provider freight costs.

- **SAP Event Management**
  SAP Event Management (see Chap. 5, "Controlling and Reporting") is a universal and very flexible tool that supports all types of visibility and status tracking processes (Tracking & Tracing: Shipment Tracking). It enables you to record performance data on your own and your partners' processes and thus generate a performance evaluation in connection with SAP NetWeaver BW.
  SAP Event Management is integrated with ERP transportation processing as well as SAP TM, and a variety of standard tracking scenarios are configured.
- **Special components for particular industries**
  Within the framework of the SAP portfolio, you can use further components for special industrial requirements that are not depicted in Fig. 2.4. These components include:
  - *SAP Oil & Gas Traders and Schedulers Workbench* (TSW) to plan and execute tanker transports while especially considering the raw material sale of in-transit stock.
  - *SAP Oil & Gas Transportation and Distribution* (TD) for the processing of bulk commodity transports in the downstream realm (such as for the supply of gas stations). Meter readings, temperature-dependent volume changes of bulk commodities and the compatibility of previous and subsequent tank loads are among the elements taken into account.
  - *SAP Rail Car Management* (RCM) for the processing of rail transports with a company's or a railway's freight cars. RCM, which is used by several companies in the chemical industry, is based on SAP Event Management, which it uses for freight car tracking. In addition, you can plan and execute the individual activities of the cars and manage your own loading railway stations and marshaling yards with *Onsite Event Management* (OSEM).

The number of resulting solutions is a direct reflection of the diversity of the transportation industry.

2.2.2 Transportation Processing Scenarios and Their Integration in Procurement and Distribution Logistics

Using the subcomponents and processes mentioned above, you can select various approaches for transportation processing with SAP. Each of these approaches offers a basic transport functionality that can be tailored through add-ons and integration mechanisms and is thus especially suited to support the demands of its respective user groups. The following rough guidelines can aid in the selection of the transportation solutions, described subsequently in more detail:

- **Traditional transportation processing for shippers (SAP ERP, Logistics Execution System)**
  Production or commercial enterprises with general transport demands that do not need complex strategies for source determination or availability check processes involved in transportation planning.
- **Traditional transportation processing with add-ons (SAP APO Transportation Planning and Service Provider Selection)**
  Production and commercial enterprises that have increased demands on transportation planning and optimization or service provider selection and bid invitation processes, but do not require the integration of an availability check.
- **Shipper solution with global availability check and transportation optimization (SAP APO-TP/VS)**
  Production and commercial enterprises for whom optimal transportation processing and minimized transport costs play a great role and for whom transportation is strongly dependent upon source determination and the availability of goods. This is especially true where issues such as material substitution or decisions regarding international source determination and supply sources are of great importance.
- **Traditional shipper solution with support by SAP TM**
  Production or commercial enterprises that already use the traditional SAP shipper solution for transportation processing can use this variant when transitioning to a new SAP TM system. The sales order integration with freight cost billing has been preserved, but transportation planning is transferred to the much more powerful TM system. Processing of transports can either be done in SAP ERP or directly in SAP TM.
- **Shipper solution with service provider reference (SAP TM in combination with SAP ERP Distribution Logistics)**
  Production or commercial enterprises where transportation processing is a multidepartmental or outsourced function. Such companies often have their own transportation departments that receive transport demands from several company divisions (or, under certain circumstances, from various ERP systems). However, the processing of these requirements should be consolidated to keep costs down. The transport departments often serve as a transportation service provider within the company.
- **Transportation service provider solution (SAP TM in combination with SAP ERP Financials)**
  Transportation service providers who sell transportation as a service to other companies and purchase transportation services from other companies (carriers).

  Now we will take a closer look at these transportation solutions.

2.2.2.1 Traditional Transportation Processing for Shippers (SAP ERP, Logistics Execution System)

The traditional SAP transportation solution for shippers, used by more than 2,000 SAP customers around the world, is transportation processing with the SAP ERP

component *Logistics Execution System*. It supports the shipments of outgoing goods, goods to be picked up and to be transferred. Figure 2.5 provides an overview of this transportation solution. The standard process for sold goods begins with an order initiated by the customer (see ❶ in Fig. 2.5). The customer order documents the goods sold that are to be transported and have to be delivered from one or more plants. Based on the customer order, one or more deliveries are generated (Distribution/Shipping) ❷. Through manual or rule-based planning, you can then put together shipments that contain one or more deliveries. You can also consolidate deliveries from various plants. To map long-haul transports, you have the opportunity to create individual shipment documents for pre-carriage, main and on-carriage legs, each of which reflects different legs of the same delivery. For each shipment document, you can create an *event handler* in SAP Event Management that enables tracking of the shipment ❸. With reference to the data cited in the shipment document and the indicated delivery dates, you can create a freight cost document and calculate the freight charges to be paid to the service provider ❹.

The sales price calculation based on the sales order for a material and the subsequently generated invoice can include the conditions used for the freight charges. This allows you to pass the charges paid to the transportation service

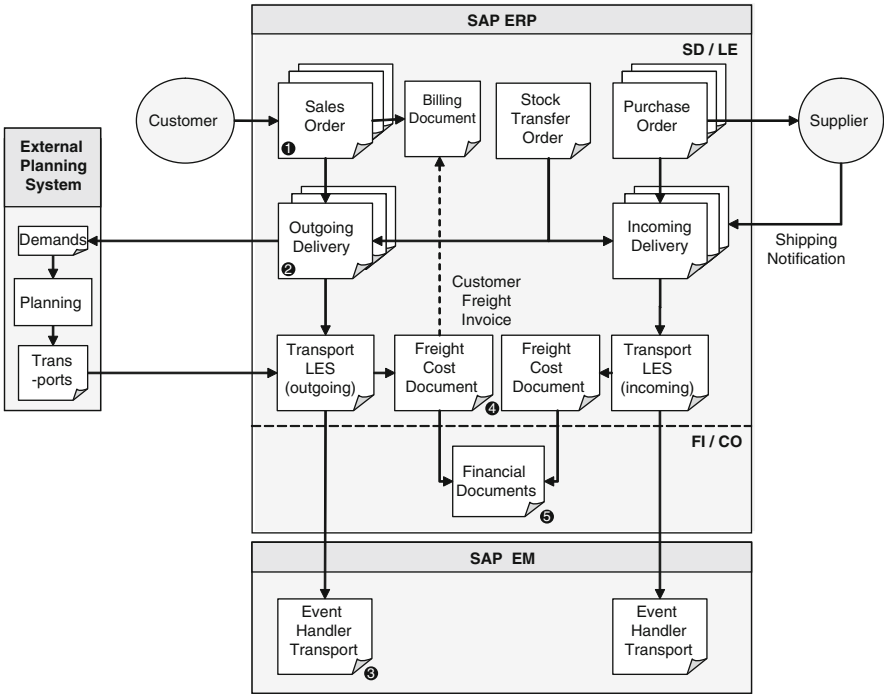

Fig. 2.5 SAP ERP transportation processes for sales orders and purchase orders

provider on to the customer. You can then use the freight cost document to trigger the transfer of the service provider costs to Financial Accounting, including the accrual of reserves ❺.

The process described above is the same for incoming deliveries whose transport demands result from purchase orders; in this case, charging the customer with freight costs is not possible. For an order initiated from within your company that is sent to a supplier, one or more deliveries are generated. Each incoming delivery can be organized into shipments in the same way as outgoing deliveries.

Special case when forming shipments with ERP Shipment Processing. Please note that for transportation processing using the component *Logistics Execution System* it is not possible to consolidate incoming and outgoing deliveries into a single shipment. A shipment is thus always *only in one direction*. If both incoming and outgoing deliveries must be planned, you need to create separate shipments for them.

Stock transfer orders between plants are created as a special type of order. From these stock transfer orders, outgoing deliveries are generated from the issuing plant on the goods issue side, and incoming deliveries to the receiving plant on the goods receipt side. Because the shipment is often necessarily based on the transport demand of the issuing side, stock transfer order shipments are created on the basis of outgoing deliveries. They can be consolidated with normal outgoing deliveries into a single shipment, but not with incoming deliveries. In the case of stock transfer orders, there is no customer invoicing of freight costs.

2.2.2.1 Traditional Transportation Processing with Add-Ons (External Transportation Planning System or Bid Tendering Function)

Transportation processing in SAP ERP offers you the options of manual or rule-based transportation planning. Optimization with regard to the shortest route, the best vehicle utilization or the lowest costs is not possible. To achieve such optimization, you can link to an external planning system via a *standard interface for external transportation systems* (SD-TPS) (see Fig. 2.5). Outgoing and incoming deliveries are divided according to a selection process based on preset rules or several specialized, external transportation planning systems. For instance, it is possible to link a planning system for road transport in Germany and a planning system for Europe-wide rail transport and supply them with the respective delivery documents. The shipments planned – and, depending on functionality, optimized – in the external planning systems are then sent back to ERP Shipment Processing, where they trigger the respective shipment documents. You can determine whether the external planning system should maintain the planning authority over the shipments from that point on or whether they are allowed to be edited in ERP