ENTERPRISE RESOURCE PLANNINGEnterprise Resource Planning software will be explained in this chapter. Attention is given to the advantages and disadvantages of ERP software. Enterprise Resource Planning can be considered as follow-up development coming out of Material Resource Planning.The functions of Enterprise Resource Planning are presented in a diagram and are explained in the text. The flow of goods and the transformations they may undergo are explained in paragraph 1.4. In paragraph 1.6 the flow of goods is linked with Enterprise Resource Planning.

1.1 ENTERPRISE RESOURCE PLANNING SOFTWARE Enterprise Resource Planning software (ERP software) can be defined as software supporting the whole range of operations by processing the information associated with goods flows and financial flows. ERP software above all has an important added value since it facilitates integrated recording of information throughout the organization. The information kept on record by an organization is similar for most companies and can easily be accommodated within a standard package.In the past, each department installed its own computer system. The personnel department used a personnel management system, the financial administration an accounting package, while several planning and warehouse systems were in use in the production department. The separate systems often worked to the complete satisfaction of departmental users, but the links between these systems led to many problems, high cost levels and poor flexibility. An integrated ERP package offers a solution to this problem.

A large production company will be able in general to get by with a system for office automation (e.g. MSOffice), an ERP package (for example SAP S/4HANA) and some highly specialized software in the field of process automation (for example CAD/CAM systems).The development of ERP software is a booming business. The wealth of advertisements and job recruitment sites like www.monsterboard.nl in publications specializing in computer and information specialist recruitment indicates a great demand for SAP consultants, Oracle experts, etc.SAP (SAP S/4HANA, SAP ERP and SAP R/3) was in 2018 with a market share of 22% still the market leader. Oracle, who took over Peoplesoft and JD Edwards, is number two.ERP systems attempt to offer a fully integrated solution for the management of financial flows, goods flows and information flows within organizations. Many ERP systems have their roots in production planning. This is sometimes apparent from the fact that the production module is significantly better developed than the other modules. The original nature of the production (discrete vs. process industry) often has a distinct impact over contemporary software. SAP originally started as software for finance and controlling and has consequently developed functionality features centered on production, logistics and HR. Nearly all the large players in the market are converging with respect to functionality of the ERP package. Meanwhile SAP has process modules designed to support the process industry.

1.2 ENTERPRISE RESOURCE PLANNING AS A FOLLOW-UP TO MRP ERP is also seen as a supplement to MRP II. In the Material Requirements Planning concept (MRP I) a demand forecast is drawn up on the basis of bills of materials, calculated according to range of production orders and purchasing orders expected. Manufacturing Resource Planning (MRP II) was a later extension. This concept represents an expansion of MRP I into a more integrated planning and management concept. MRP II for instance also takes into account the available production capacities. MRP I and MRP II are compatible for use within a single organization. Increasingly far-reaching internationalization means that management must take place 'over the heads of individual plants'. Mutual deliveries between organizational units are included in the concept, for instance. ERP is compatible with this. The functionality of ERP software has been drastically expanded over recent years to include Customer Relation Management (CRM), sales support, Supply Chain Management (SCM), workflow management (WFM), Human Resources Management (HRM), etc. This trend continues; ERP software is further expanding its borders. Nearly all operational functions are now supported.

1.3 ADVANTAGES AND DISADVANTAGES OF ERP Some of the advantages have already been discussed above. The most important of these are:• Integration: the coherence between processes is seamlessly supported. Island automation is no longer an issue. Integration reduces problems caused by redundancy and errors in the data.• Process orientation: instead of supporting activities in departments, ERP orientates itself towards operational processes that take place throughout the whole of the organization (and outside it), and indeed you see this in so-called Workflow Management solutions that the ERP systems offer. These cater to the support and direction of operational processes.• Openness: ERP systems can communicate with other systems; this means that the Supply Chain concept, a far-reaching chain integration into the industrial process, can be utilized. ERP systems can also communicate with other systems, such as Customer Relationship Management software (CRM).• State-of-the-art: the research being carried out by ERP suppliers is sufficiently comprehensive to ensure that a company using an ERP system can be confident that the functionality will both continue to be available and continue to be expanded. Associations of users often have some influence on aspects of functionality earmarked for expansion or improvement.• Industrial sector orientation: ERP suppliers ensure that their software supports various sectors of industry. This support (called Industry Solutions) is constantly being expanded.• Internationalization: ERP can be used supra-locational, supra-organizational and beyond national borders. This is an ideal solution for multinationals, since data taken from all their subsidiaries needs to be consolidated.ERP is not a universal panacea. Naturally there are some disadvantages to the introduction of a system such as this. You might like to consider the following, for instance:• High costs: the price of the software license is fairly high. The consultancy costs involved in the implementation of an ERP package exceed the license cost by a factor of approximately 2–4. A Dutch theme park, for instance, recently implemented an ERP system at a cost of about €3.5 million, of which €0.5 million was for the software license.• Lengthy implementation: the time taken for making enhancements, customizing and the implementation often exceeds a year. Accelerated implementation techniques, Accelerated SAP, are available however, under which a selection is made of best practices in the implementation, where the need for labour-intensive fine tuning of the software is partly eliminated. In this case processes in the organization (as regards its operational processes) are adapted to the software. A solution like this is welcomed particularly by smaller organizations. In the case of medium and small companies, an implementation of this kind takes something in the order of 3 to 6 months, depending on the complexity involved.• No tailor-made solution: ERP remains a standard solution: the user may have to modify his expectations as far as his package of requirements is concerned. Tailor-made systems are generally much more expensive than standard software. Modifications made to standard software are costly and can cause problems with upgrades. For that reason it becomes the policy of some companies to avoid modifications during the implementation.Since the 1990s we have seen more organizations transferring to standard software. On the one hand, each company is individually aware of its own unique operational processes, yet these unique points are often remnants from the past. There is something to be said for taking a look to see whether the best practice options, which ERP systems offer, are not in fact better than one's own solutions. Why should my organization differ from the many other companies in my sector that have already been studied? Moreover, are my (unique) deviations from the general pattern as regards operational processes really as necessary as

I think they are?The employee learning period for new functionality in an ERP package is, as a matter of fact, generally much shorter than in cases where a totally new software package is acquired.

1.4 FUNCTIONS OF ENTERPRISE RESOURCE PLANNING

1.2 shows the most important functions that can be used by an ERP system in corporate operations. In this overview, the supporting functions are grouped around the logistics, the primary processes. The central feature is the flow of goods from the supplier to the customer: procurement results in the receipt and storage of raw materials (triangle), the various raw materials are processed during production into finished product units; these are subsequently delivered to the customer from stock. The way in which content is given to the primary processes of procurement, sales, stock control, shop floor control and manufacturing, is market and product specific. The flow of goods from the supplier to the customer is counterbalanced by a cash flow in the opposite direction: from the customer to the supplier. Recording of this cash flow takes place in the accounts receivable (AR) and accounts payable (AP) sub-administrations and in the ledger administration (general ledger). In sales and distribution (SD) the sales statistics for the previous year form the basis for establishing a sales forecast for the coming year. This sales forecast makes up the demand for production capacity. By gearing the availability of capacity to sales demand, provision is made for the necessary capacity within the production planning (PP) by establishing both the nominative capacity and the expected annual capacity (year capacity plan and capacity allocation). The planning of the annual capacity constitutes the basis for establishing the main production plan within PP, as well as the basis for setting up the necessary procurement within Materials Management (MM). The master production plan has a planning horizon of one year and consists of production objectives relating to product units per period. The master production plan thereby creates a procurement requirement for raw materials/ components. This requirement is met by establishing a procurement plan. The master production plan is converted into a detailed production plan, with a planning horizon of less than one year. The planning quantities are the number of units to be produced and the number of production orders. Even at this level, sales figures are coordinated according to production objectives and procurement. The planned production orders are converted into actual production orders, raw materials/components are issued and processed into finished products. The finished products are made available for delivery to the customer by MM. The planning for distribution to customers, which is also factored into this, takes place from within sales and distribution, SD.

1.5 SUPPLY CHAIN MANAGEMENT

The Supply Chain concept is central in SAP S/4HANA: the chain from the original supplier to the final consumer has to be managed. By bringing optimum co-ordination to the flow of information, the flow of goods and the cash flow, a maximum customer response is achieved at minimum cost according to SAP. It is possible for a customer, to gain information from the Internet regarding the products of a particular company, to adapt your own products accordingly and to place an order. This order then automatically ends up in SAP S/4HANA; where necessary, this package automatically generates orders to suppliers (multi-company planning) and even initiates the necessary processes within the organization of a company. In this way, open systems can be linked to each other and transactions extended over various individual companies.The Supply Chain comprises all activities that have to do with the flow of goods and the transformations they may undergo, all the way from raw materials through to the end user, complete with the associated information flows We are concerned here in fact with the activities that take place within the manufacturing process. In the case of simple products, this supply chain can readily be identified and surveyed, but when you think of the automobile industry, for instance, the situation is more complex.Supply Chain Management (SCM) is therefore the control and integration of these activities by making use of all kinds of cross connections and networks in order to achieve a significant competitive advantage. The chain goes upstream in a supplier network and downstream in a distribution network (customers). The supplier network consists of all the companies that provide an input in any way whatsoever; these inputs could be physical raw materials, but they could also be information, for instance. In the case of the automobile industry, this chain would represent a supplier network of thousands of companies supplying goods ranging from steel and plastics, but also including complete gearboxes, brake systems, car radios and similar. Even the production of these gearboxes etc. is part of the supply chain. Some authors say that when looking for the start of a supply chain you always come back to Mother Earth. The main point, however, is that each supply chain consists of a (generally large) series of linked suppliers and customers; each customer becomes a supplier in the next link of the supply chain until the product reaches the end user.Seen from within an individual company, you can say that the three SCM perspectives are:1. internal functions (transforming inputs into outputs);2. upstream supplier functions;3. downstream customer functions.The management challenge is that coordination takes place between these three aspects in such a way that the company maintains its right to exist within the supply chain.

1. Internal functionsWhere the internal functions are concerned, these relate to various operational processes, including the transformation processes of raw materials or semi manufactures into finished products. These raw materials or semi-manufactures are supplied by the suppliers and the finished products are supplied to the distribution channel (the dealer organization in the case of the automobile industry). Orders from purchasers of automobiles must be translated into production orders. It is easy to imagine for instance that in the case of large freight lorries (as with DAF), this takes place on a one-to-one basis. Each customer order = one production order = one freight lorry. Even with private vehicles, things are beginning to move in the direction of production on demand. On deciding to purchase a new car, for instance, you can now specify the version, the color and whether it should have air-conditioning, etc. The influence of the final consumer over the production is steadily increasing.The sales order data are very detailed: quotation prices, latest possible delivery dates, delivery scenarios, etc. Production planning is also extremely important. Use can be made of MRP here.2. Upstream supplier functionsThis refers to functions that take place outside the individual organization. Upstream is the procurement function. You think here of the selection of suppliers who can meet our requirements and wishes and who are reliable when it comes to delivery. The maintenance of good relations with suppliers is extremely important. In SCM, you see contacts with suppliers fanning out into the product development, commercial office, warehouse and administration departments and so on.In this situation, there is close contact with the suppliers from within the internal operational processes.3. Downstream customer functionsThese functions comprise all distribution channels and processes used in facilitating the flow of products to the final customer. In most cases, it involves matters such as storage, transport, and sales activities.SCM is orientated towards the control between various components in the supply chain. Five levels of integration are identified within SCM:1. standardization of master financial data;2. standardization of master logistics data;3. exchange of time-dependent data;4. standardization of planning and control procedures;5. supply chain planning.

1.6 SUPPLY CHAIN MANAGEMENT AND ENTERPRISE RESOURCE PLANNING

Supply Chain Management has primarily to do with the building up and maintenance of close ties with

suppliers and customers. You see that this is made possible by developments in ICT. SCM is therefore both relationship- based and technology-driven, to use a few words of 'newspeak'. A combination of ERP and Internet (E-Business/E-Commerce) provides many options for the successful use of SCM. The advent of these technologies even makes a worldwide supply chain possible. As an example you can take the DOW Chemical Company, an industrial undertaking with branches in 168 countries and an annual turnover of more than $50 billion in something like 3,100 products in the chemicals, plastics and agricultural sectors. The company employs 45,000 people and has 150 production locations in 35 countries. The most important aspect of SCM for DOW is that the company tries to offer consumers what they want at an acceptable cost (an acceptable price). The company has a Supply Chain Technology Center (based at Terneuzen in the Netherlands and at other locations worldwide) that will be responsible for cross-pollination between best practices and new technologies. The Center also scans for best practices and new technologies which DOW can also make use of. The deployment of ERP and a strong focus on operational processes is an important outcome of the Center's activities.

HANDS-ON WITH SAP S/4HANA AND GBIenterPrIse resourCe PlannInG24Modern ERP systems integrate the planning, control and monitoring of processes within an organization. Because the internal flow of information between important departments within a company is integrally coordinated by ERP, it is possible to bring products to the market quicker, reduce costs and guarantee the loyalty of customers and suppliers. Using the right ERP system, a company can expand its ability to monitor its activities to the whole of the supply chain. The initiative of SAP in relation to Supply Chain Management (SAP SCM), for instance, covers all aspects of supply chain integration.SCM solutions are on hand within SAP in the form of APO, Advanced Planner and Optimizer, and LES, Logistics Execution System. APO is responsible for improved demand forecasting and increased efficiency in production processes. LES facilitates more efficient, rapid and accurate flow of goods in the supply chain.