

SUPPLY CHAIN MANAGEMENT 4.0

MODELLING AN OPTIMAL DIGITAL PACKAGING SUPPLY CHAIN

Potential opportunities from the perspective of packaging manufacturers and their chemical, pharmaceutical, and food industry customers as well as chances for digital collaborations

The topic of packaging is often not given the necessary attention in supply chain management. Not least, packaging and packaging materials are often ranked as C-parts. On the other hand, packaging planning is becoming increasingly complex, coupled with high expectations from customers in the chemical, pharmaceutical and food industries. This, in turn, results in decreasing batch sizes, increasing article diversity and enormous time and cost pressure. Smart digital packaging logistics embedded in an integral packaging management system can raise enormous efficiency potentials.



How value chain analysis can help to optimize supply chains and improve production planning

There is one thing representatives of all industries can agree on immediately: Continuing high cost pressure due to global competition combined with an increasing market transparency in terms of product and pricing due to digitalization turns supply chain management into an uphill battle.

But what are the specific trends in managing packaging supply chains? The focus will be on manufacturers of packaging materials as well as on their customers in the chemical, pharmaceutical and food industries. A few of the most important challenges are listed and explained in more detail:

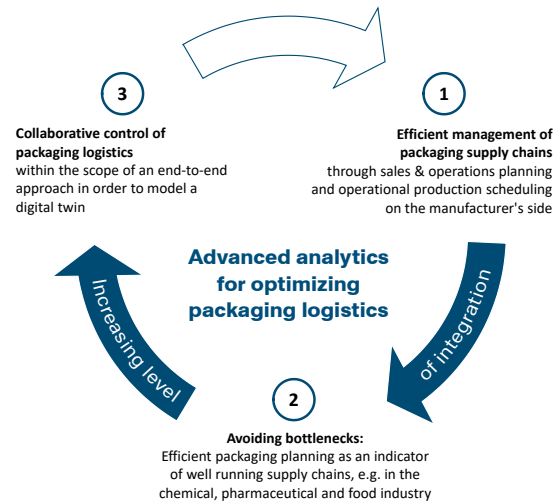
- Eroding procurement markets with rising prices and shortages in the area of fibre-based raw materials, metals, plastics and glass, but also energy
- Ever-shorter go-to-market and product life cycles lead to decreasing batch sizes of individual orders, an increasing variety of articles as well as customer and country-specific adaptations of packaging and shorter order intervals
- Integration into complex just-in-time value-added processes with strictly timed availability expectations and the complex trend toward glocalisation (globalization + localization) of supply chains, i.e. the partial or complete shift of the value chains towards a more global spread, while other supply relations in turn become more localized despite higher price levels
- Customers increasingly demand customized products and value-added services combined with high planning and delivery reliability
- High demands on packaging and packaging materials – a primary differentiation is made in terms of protective and transport, labelling and marketing and storage functions of packaging
- Industry-specific packaging directives such as the CLP regulation on the classification, labelling and packaging of chemical products (in addition to REACH), complex aspects of packaging serialisations in the pharmaceutical industry or the topic of "food grade" – packaging that comes into direct contact with foodstuff
- Separate legal regulations for the placing on the market, the take-back and high-quality recovery of packaging (packaging act) valid for manufacturers, traders, marketplace operators and recycling systems
- Introduction of supply chain acts, which regulate due diligence obligations with regard to human rights violations and damage to the environment within one's own scope of business, with contractual partners and other (indirect) suppliers

Consequently, the described market and industry specific overall situation result in detailed requirements for supply chain management and a particular expectation with regard to production planning optimization processes:

- Stabilization of supply and value chains through digital transparency with the aim of dialog- and service-oriented customer communication
- Application of an agile, data-driven and flexibly adaptable planning tool in supply chain management

Integrated supply chain planning through the implementation of digital supply chain management solutions

In addition to the optimisation of company-internal processes – both manufacturers of packaging and users of packaging solutions in the chemical, pharmaceutical and food industries can apply a wide range of tools from strategic/tactical sales & operations planning and operational scheduling – digitalisation increasingly provides opportunities to collaboratively optimize cross-company supply chains. The application of diverse methods of advanced analytics – such as heuristics, mathematical solver-based optimisation methods, artificial intelligence (AI) and machine learning (ML) – opening up completely new opportunities.



Bidirectional data analysis and evaluation with the aim of modelling a digital twin

While performing an end-to-end packaging supply chain, a large number of information is accumulated, whereas analysing and applying these data allows modelling a digital twin. Sharing this information within upstream and downstream supply chain partners may provide a huge potential for further optimization. Thus, the manufacturer of packaging and packaging materials can use forecasts and historical order data from the customer to optimally schedule orders for production, to source and plan materials at an early stage, to stock equipment and tools and to plan production capacities. In this way, for example, order patterns can be recognised and orders clustered respectively, e.g. into make-to-order (MTO) and make-to-stock (MTS) production or a combination thereof.

In the sense of a digital twin, however, manufacturers of packaging materials can also benefit from information provided straight from their customer's packaging lines. For example, the influence of product properties of the packaging such as thickness, elasticity, material quality or printing behaviour on the performance of the packaging machine. In addition, the efficiency of the packaging line in relation to a certain batch can be reported back to the packaging manufacturer. This information might be used to improve the processing of future orders resulting in time and cost savings on both sides.



Building a common digital ecosystem: Vendor managed inventory as a tool for cross-process and collaborative optimisation of packaging supply chains

The advantages of a collaborative packaging supply chain management can be subsumed, organised and contractually anchored through a vendor managed inventory (VMI) approach. VMI describes a practice of inventory management in which a supplier of goods, usually the manufacturer, is responsible for optimising a customer's inventory. In line with this practice, unnecessary costs for storage space, transport, machine downtime or the disposal of material overcapacities or incorrect orders can be avoided on both sides of the logistics chain. VMI can be applied in very different forms and depths of integration.

VMI as an effective tool to counteract the bullwhip effect in supply chain management

An empirically proven phenomenon in supply chain management is the so-called bullwhip effect, which describes the negative effect of a marginal change in demand on multilevel supply chains. Slight fluctuations in the ordering behaviour of the customer of only 3% - 5% can result in fluctuations up

to 30% - 50% at the end of the supply chain. [Cf. Corsten, D., Gabriel, C., Umsetzung SCM, 2004, p. 9 f.] The reasons for the bullwhip effect are complex and may conditioning one another, in the worst case:

- Traditional supply chains without collaboration and insufficient information exchange between the players,
- sporadic (ad-hoc) ordering cycles and inadequately communicated sales promotions, and
- the effort of each player within the supply chain to "somehow manage and push" the order.

Dominated by these experiences, suppliers, in turn, react with a variety of internal measures, such as high stock levels, increased safety stocks and the flexibilisation of production and transporting capacities in order to avoid delivery delays and shortfalls in the case of unscheduled demands. The vendor managed inventory concept can successfully counteract the bullwhip effect.



ORSOFT use-case: The successful implementation of vendor managed inventory for a packaging manufacturer

Key customers of the described packaging manufacturer are well-known globally operating companies in the fast moving consumer goods segment. With the aim of achieving both a long-term and stable commitment as a supplier to these companies and making the processes more cost-efficient, all customers of the packaging manufacturer are offered to organize the supply chain as vendor managed inventory (VMI).

In the use-case described, the customers provide information about inventory and planned consumption from their systems at regular intervals. Based on this information and a jointly agreed set of rules, the packaging manufacturer supplies the required materials. The fixed rules and regulations on which for example minimum and maximum delivery quantities and/or stocks or guaranteed capacities are agreed, can differ greatly depending on the customer. Consequently, some customers expect delivery proposals that must be explicitly confirmed before delivery, while others accept the announcement of a delivery. Special regulations, specifically needed in the case of demand changes, may supplement the contracts. As the provided information and the associated data formats can differ, an integration and coupling with the system of the packaging manufacturer is needed. Thus, a day-accurate data exchange of inventory, demand and delivery information by EDI is assured.

Process optimisation became the primary objective: Implementation and realisation of the VMI solution at the customer

The packaging manufacturer not only transfers quantity and deadline information, but also the complete packaging information from SAP, which are managed as so-called handling units. Non-integrated Excel solutions which has been used so far tend to connect with high workloads and a high susceptibility to errors. The problems caused by outdated information – as well as the loss of involved process caretakers due to illness or holidays – had to be accepted reluctantly.

As VMI increasingly emerges as a competitive advantage, there is growing pressure to standardise the process through IT. VMI enables the company to make processes more cost-efficient and to position itself as a reliable logistics partner to the customers. The described packaging manufacturer uses SAP ERP as the central ERP at its major locations and is expanding this solution to other locations worldwide. However, the VMI functionalities within the SAP ERP system were not suitable to the customer's needs. Using SAP SCM instead was not favoured due to the high technical effort involved in adapting the software to the specifics of the packaging manufacturer. As the company was looking for a functionally equivalent alternative with the need to integrate a potential solution into the existing SAP ERP infrastructure, ORSOFT came into the game.

In most cases, the scheduling process runs fully automatically and generates procurement proposals in a simulated mode. The customer's clerks check the results for plausibility before saving them in SAP ERP. This results in a minimum amount of work and the results are of high quality.

Head of IT/Organisation & Material Management about vendor managed inventory (VMI) with ORSOFT:

“VMI is widely used in other industries, but is rarely dealt with in the packaging industry. We specifically offer our customers to manage supply relation through a VMI process. This brings clear cost advantages to them. Our company positions itself as an innovative partner and achieves long-term customer loyalty. The experiences from the first projects prove us right and we will continue to pursue this path.”

Integral supply chain planning through the implementation of digital supply chain management

The challenges implied by market-related issues – both in the area of procurement and in sales – and in-plant specific requirements of each company reflect a complex overall situation in optimizing supply chains. Indeed, this needs an integral data management.

ORSOFT Enterprise Workbench is the tactical-strategic tool for supply chain management and supports the forecasting of future sales, whilst simultaneously checking required raw material quantities, safety stocks and plant capacities – also in relation to collaborative processes such as vendor managed inventory (VMI). Due to the application of artificial intelligence and machine learning, forecasting and demand planning with volatile demands feature a significantly improved accuracy. Sales & operations planning supports simulations on needed personnel and plant capacities in order to align them with the forecasted quantities. In addition, continuous monitoring of necessary raw materials allows to act tactically on critical price developments and enables the opportunity to taking countermeasures. Also inventories can thus be managed.

ORSOFT Manufacturing Workbench follows the principles of advanced planning and scheduling and provides interactive material and resource simultaneous planning. The software enables to create planning scenarios on which the best result – in line with predefined KPIs – can be collaboratively selected. Industry-specific add-ons – such as the ability to outsource value creation processes through sub-contracting, to optimize cross-supply chain efficiency through collaborative vendor managed inventory (VMI), to plan production campaign in a setup time optimized sequence, and shift & workforce planning – allow the production process to be mapped digitally in accordance with the digital twin principle. Based on SAP ERP or SAP S/4HANA data, the software provides an immediate overview of capacity utilizations, material flows, delay situations and material key figures – even across different sites.

ORSOFT Advanced Planning Board offers a cloud- and SaaS-enabled software solution for detailed production planning based on the ORSOFT Manufacturing Workbench. It is specifically designed for use in medium-sized companies or smaller plant sections of large corporate groups in order to replace asynchronous and decentralised stand-alone solutions. The application creates transparency about the current planning situation. Due to the application of artificial intelligence, the software can run through optimization scenarios for material, capacity, time and demand conflicts and thus deliver automatic planning proposals.



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About ORSOFT

As an internationally acting software and consulting company, ORSOFT develops and implements innovative and reliable solutions in the field of supply chain management (SCM), sales & operations planning (S&OP) and advanced planning & scheduling (APS). With its affiliate companies, ORSOFT is part of the Germanedge Group which incorporates a focus on digital production 4.0. ORSOFT has successfully implemented projects at Boehringer Ingelheim Pharma GmbH & Co. KG, Clariant Plastics & Coatings, Danone Group, Edelmann GmbH, ELCO AG, FRUTAROM Production GmbH, HACO AG, IDT Biologika GmbH, Intersnack Knabber-Gebäck GmbH & Co. KG, Lonza AG, Mondri Gronau GmbH, NMC SA, Sachsenmilch AG (Unternehmensgruppe Theo Müller), Sanofi-Aventis Group and Zentis GmbH & Co. KG, among others.