# A MILESTONE ON THE WAY TOWARD PLANNING 4.0: THE APPLICATION OF BIG DATA ALONG END-TO-END SUPPLY CHAIN MANAGEMENT

A central data analysis and the smart use of the collected information enables companies to profit from the past, to monitor the present and plan for the future. Applying artificial intelligence (AI) and machine learning (ML) turns forecasting processes, inventory management and scheduling as integral elements of Sales & Operations Planning and Advanced Planning and Scheduling toward more efficiency and let them become part of the big data trend.

Since there is no single definition of artificial intelligence (AI), we use Gartner – the market research specialist for supply chain management – to classify the term. Artificial intelligence (AI) (thus) applies advanced analysis and logic-based techniques, including machine learning, to interpret events, support and automate decisions, and take actions.

As a characteristic of AI, the aim of ML is to condition an algorithm through repetitive training in a way that it can perform tasks independently. Unlike conventional algorithms, the detection of (data) structures is not predetermined by an implicit model design, but is left to the "machine" autonomously. With the patterns recognised from the ML, the forecasting quality of time series-based processes may reach a new level of quality.
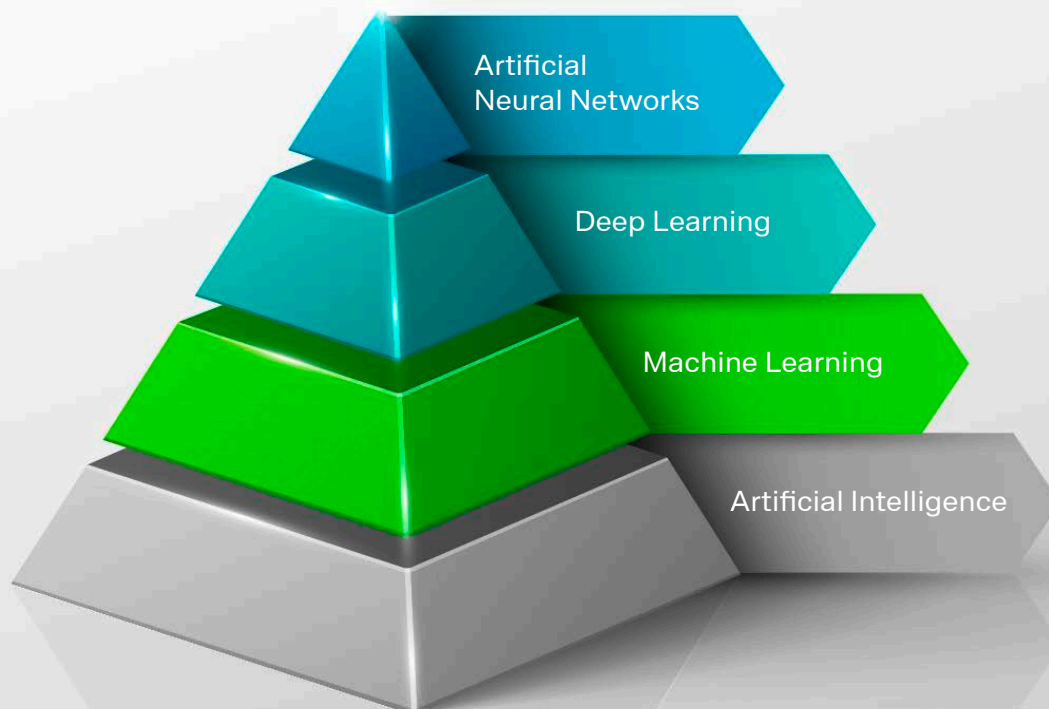
ORSOFT applies Artificial Neural Networks (ANN) in demand planning to reform sales forecasting

As a form of ML, Artificial Neural Networks (ANN) are based on the method to abstract and apply general patterns by utilizing machine learning processes, and to interpret them for taking new decision-making situations. On the way to decision-making, thousands of parameters are processed through complex mathematical calculations. Within the process, each ANN is only as good as the quantity, quality and structure of the available data with which the machine is to be trained.

What are "the right" data for an ANN-based forecasting modelling?

In addition to complex statistical methods, in which time series are processed sequentially and are fed directly from the own live-system, the application of ANN allows to assimilate additional time series-spanning data sets and offline information. The ANN is thus being trained with specially prepared training data sets that has been "fed" with result data for any relevant use cases.
The data used can be both internal and external and can be fed with additional industry, supplier and customer data, but also with other external data sources. The results are modelled from the parallel processing and linking of thousands of data series. The central patterns recognised by the ANN algorithms are processed to be included to the automated demand planning.

Managing the trade-off between delivery reliability and tie-up capital in inventory management: Artificial Intelligence (AI) as an integral planning tool

By using time series prediction methods as well as Deep Learning, AI helps companies manage backlogs and optimise inventories. AI-enriched consolidated and standardised data sets may therefore be used for dynamic real-time control in inventory management. AI can thus not only predict scenarios and recommend data-driven measures, but – if requested – already act autonomously.

Various possibilities for AI-optimised inventory management: from demand to route planning within logistic processes

AI-aided inventory management is primarily concerned with solving one central question: What are minimum and maximum inventory levels and how can the working capital caused by overstocks be reduced? With the help of predefined quantifiable criteria – such as through embodying a certain service level to be maintained (from 0 to 100%) – AI optimises the described trade-off. Though, the use of AI is by no means limited to this aspect. It can also be used, for example, to calculate the route, time or cost-optimised logistics chain of a product from the factory to warehousing and its final supply to the customer. Another use case is the calculation and planning of an optimal batch size of a certain product as a tool of inventory management and its synchronisation with production planning and scheduling.

Autonomous Planning and Scheduling: Turning the MRP-run into an agile real-time AI-process

In a real-time make-to-order world we have to accept that the goal of a perfect schedule is unrealistic. Because the future is simply unknown. New rush orders may arrive at short notice, machines may break, a delivery delay may occur or employees may get sick. Through the application of AI, the classic MRP (Material Resource Planning) run – whose primary focus is on material requirements, and which is finally about creating executable plans for a day, a week or even a month in advance – can be upgraded and turned to be more agile. Autonomous planning through a dynamic MRCP (Material Resource & Capacity Planning)-process, directly includes scheduling, which aims to optimise machine utilisation and the working time of people. Predefined work steps are sequenced and put in the right order so that resource-optimised plans are issued.

With AI-based real-time planning, new rush jobs can simply be introduced into the production plan at any time. They will get appropriately prioritized as they compete for human and equipment resources in each work center. All the scheduling system can do is to make the best decision it can, based on the facts currently available.

Artificial Intelligence (AI) and Machine Learning (ML) in SCM: Taking decisions based on consolidated data rather than on feelings

AI and ML are tools within the planning routine that might help to capture and process complex information and data structures. With their support, a solid basis of decision-making can be issued and thus be prioritised on (pre)defined criteria in order to meet certain objectives.
Thanks to their ability to act independently, it can relieve employees of routine tasks. Long-term data generated by AI and ML can hence provide valuable criteria for strategic decisions.
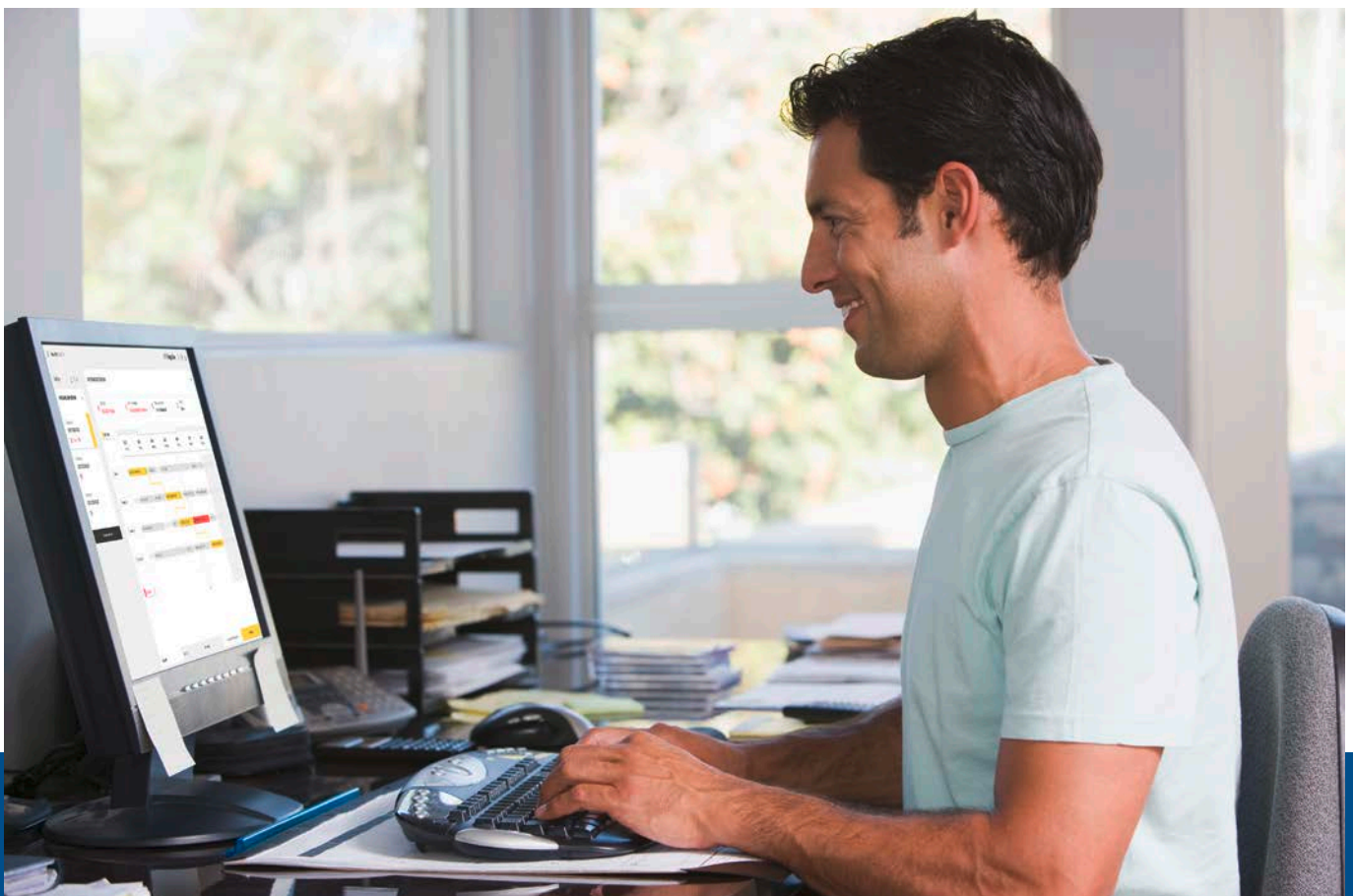
AI and ML-powered supply chain management with ORSOFT: software for strategic/tactical and operational planning

ORSOFT Enterprise Workbench

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 across multi-site factories, or single-product, multi-product or multi-purpose plants. 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

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. 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 Digital Factory Scheduling

The ORSOFT Digital Factory Scheduling 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. Due to its ERP integration, the application creates transparency about the current planning situation – not just for the planning department but throughout the whole organisation. 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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