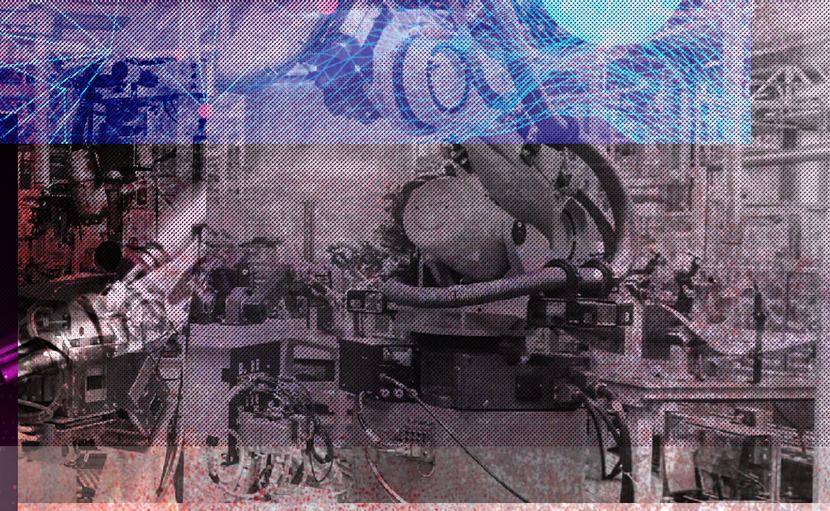
FROM PREDICTIVE TO PRESCRIPTIVE

THE ANALYTICS EVOLUTION IN THE SMART FACTORY



INTERVIEW WITH THOMAS RICHTER

Thomas Richter,
Principal, ROI-EFESO

DIALOG: Mr. Richter, how can you imagine the analytics evolution in production?

TR: Predictive analytics starts with error patterns, such as the overheating of a machine, and shows the conditions and parameters under which these patterns occur. From this, the foresight of potential process errors can be derived. This creates an AI-supported, self-learning system that can be called an intelligent early warning system. It is no longer necessary to interpret the multitude of data, as is the case with classic condition monitoring. Machine learning creates the possibility of automating the interpretation of the conditions of machines and tools and even entire production systems, and it is also possible to observe completely new correlations that were previously not recognised.

The next evolutionary stage that is increasingly coming into focus is prescriptive analytics - the transition from machine learning to machine reasoning. When you know which errors will occur, there are always several coping strategies to choose from, problem-solving scenarios that are the operator's essential know-how. With predictive analytics, the software now develops AI-supported autonomous problem-solving scenarios, which is why one can also speak of self-optimising processes here. This step helps to significantly increase speed. When a problem potentially arises, the possible solution scenarios are run through, the best solution strategy is selected and automated processes are triggered, e.g. ordering tools or spare parts or organising preventive maintenance teams.

DIALOG: In which areas are prescriptive analytics applications already being used?

TR: There are already concrete applications, especially in the context of production planning and scheduling, which is an ideal field of application for machine reasoning methods. The need is particularly great in the automotive industry, but also in consumer-packaged goods, where there are sometimes very complex supply chains. The technical challenge here lies primarily in the intelligent networking and integration of distributed planning systems such as APS, ERP, Scada or MES.

DIALOG: What are the possibilities for controlling a self-optimising process when the operator no longer makes the decisions and cannot comprehend the system's decision-making calculus?

TR: Neither is the case in this form. First of all, such systems cannot function without the operator's know-how. The system initially needs an intelligent library that contains the relevant process knowledge; this is how it starts to learn. The solution strategies proposed later are based on this knowledge; they are not new to the operator. In addition, machine reasoning and machine learning in general use the "next best option" strategy. This means that the solution strategy that has the greatest probability of success is also proposed in a prioritised manner. In the end, the operator responsible for a particular process decides for himself whether he takes the next best option or decides in favour of another option based on experience and knowledge. In principle, he is only supported in the speed of decision-making - which is also necessary with increasing complexity and networking of processes.

Problem-solving approaches in machine reasoning are geared towards multiple connected events and can handle this complexity efficiently. The system helps to reduce the time between the occurrence of a potential process failure and the initiation of the appropriate resolution strategy. This becomes even more critical when an entire supply chain needs to be kept in view. There, choosing the right coping strategy is even more complex and any delay leads to losses. Systemically supported, I am able to initiate the right measures immediately, to start the automated process. The operator remains responsible for the overall process efficiency. This is the collaboration between man and machine.

DIALOG: The optimisation of a supply chain is likely to encounter problems other than complexity. What are the main challenges in using intelligent systems and predictive analytics in the value chain?

TR: Especially where extremely process-heavy and capital-intensive technologies are in use, efficiency of use is of central importance. Here, many companies have their supply chain in mind together with suppliers and there is a common understanding that it is important to share data. The challenge lies more in the fact that many of the technologies used are not network-enabled. Enterprise systems are often still in use here that are not layer-based. However, such systems are needed to introduce appropriate layers for process and data integration. Cloud-based systems and a hybrid cloud architecture are also required. There are certain critical processes that require a private cloud; other processes, such as supplier connectivity, need a public cloud solution. In some cases, certain "deep" core processes are not cloud-enabled at all.

In addition, in terms of overall process efficiency, decisions would have to be made that also affect production sites for which we have no decision-making authority. We are already well networked at the data level, but not at the process level. At least not in such a way that autonomous interventions can be made across companies. Consequently, the prescriptive AI system of an OEM would have to intervene in the systems of its suppliers. I can't imagine that happening in the foreseeable future. There are currently no advanced governance models for the automated control of an end-2-end supply chain.

Another aspect is the lack of operational models. While I can use very advanced systems for decision support and process automation in my own system - there are good solutions for this today that can be implemented quickly and without any special programming effort - the problem lies in the scaling to the entire supply chain that is needed for full automation. So the question is no longer how to bring technologies into my smart factory, but how to bring them in in an industrialised and scalable way. The operating models and organisational concepts for this are missing today - questions such as governance, architecture, technology stack, defined process organisation and mapping of services.

DIALOG: How should one deal with these hurdles, especially with the topics of governance and operating models?

TR: There are essentially two approaches here. One is to start where digitalisation can have the greatest positive impact and where the barriers to entry are relatively low. In the process industry, for example, the business model depends largely on the effective use of the installed assets. The money is earned - to put it bluntly - with the OEE. It therefore makes sense to initially focus digitalisation initiatives on strengthening the overall effectiveness of the factories. There, these topics - up to and including Prescriptive Machine Reasoning - can be developed, the workflows digitised and viable Operating Models built, consisting of five components: Organisation, Governance and Data Security, Quality Management, Technology and Processes. This creates the basis for further topics such as service, operations and competence building.

Another scenario is when one's own factories are running stably, but the supply chain is particularly vulnerable or disruptions have a major negative impact, for example when a plant that supplies a critical primary product is affected. Here one should focus on approaches for which there are use cases. For the reasons mentioned above, machine reasoning cannot yet be applied here, but predictive analytics, automation and risk management can. If, for example, a risk is identified somewhere in the supply chain that will lead to a supply bottleneck in a few weeks, you have to quickly switch to an alternative source of supply. There are a lot of activities involved in such a process - factory inspection, sampling, accreditation of transport routes, customs duties, etc. This can be done through intelligent process automation. This can be supported by intelligent process automation in such a way that nothing is forgotten and the quality and speed of the processes are significantly increased.

In both scenarios, success depends heavily on operating models and the industrialisation of services. That is why it often makes sense to bundle these services end-2-end in shared service organisations, where processes and technologies are managed and further developed and made available as services. This relieves the functional areas, ensures security, efficiency, quality and automation of the processes - and the advantages of digitalisation can really take effect.