

Agile process management for dynamic reactions

Agility Cockpit

In the corporate context, agility describes the ability to take targeted action at an early stage by analyzing changes using predictive tools and creating feasible alternative courses of action.

This capability is more vital for machine and equipment manufacturers today than ever before. On the one hand, they have to react quickly and reliably to short-term changes on the customer side. The growing demand for customized adaptations of series products results in increasing complexity and makes fast reactions more difficult. On the other hand, cross-company value chains must be mastered in order to ensure high quality and delivery reliability despite a wide range of dynamic influencing factors.

The goal of the project »MAP – Machine Learning for agile process management in machine and equipment manufacturing« is to develop an integrated agile product portfolio and process management system that enables the derivation and realization of simulation and process scenarios which can be implemented at short notice. Therefore, two use cases from industrial partners with different focuses are considered. For budatec GmbH, an integrated agile process management system is created that enables the derivation and realization of quickly executable process scenarios with the push of a button. For the first time, foresight instruments are linked with the automated generation of processes and implemented as a prototype.

Automated generation of process scenarios

Customization of standard products is a clear strength of small and medium-sized companies. At the same time, manufacturing of such products requires a high level of technological expertise and thus manual labor. These two aspects increase the complexity of order and production processes, because no two products are alike. The make-or-buy decisions

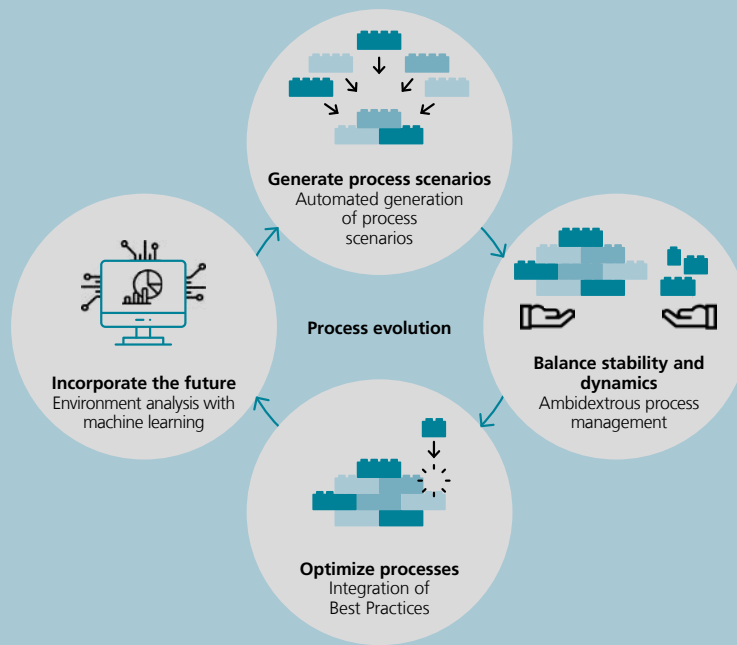
for individual assemblies are also made on an order-specific basis with the help of the model-based interactive situation awareness monitor developed by Fraunhofer IPK, which is based on capacity information of resources and available suppliers.

An assistance system for the shop floor is being developed to provide employees with the information required to execute an individual order on a role-based basis. The order-specific work steps and associated documents are displayed on a mobile device. The foundation for this is the automated generation of order-specific manufacturing process models (process scenarios) via preconfigured manufacturing process modules. These modules are individually assembled like building blocks for each customer order and enriched with order information. Feedback from employees also flows into the specific production model and can in turn be displayed on the situation awareness monitor.

Ambidextrous process management

The efficient implementation of ad-hoc tasks (e.g. on-site deployment at the customer's premises) is indispensable for ensuring high service quality. Similarly, order-specific components, for example, need to be designed and manufactured at short notice. From a strategic point of view, additional resilience measures for dealing effectively with disruptions must also be developed and implemented. At the same time, the stability of regular business and manufacturing processes must be ensured.

The concept of ambidexterity is used to master the tensions between dynamics and stability. By dual-operating organizational and process structures, ad-hoc tasks are handled separately from routine processes. This is made possible by transparent coordination of tasks, which is supported by the ambidextrous task management system. The task-related



Agile process management for dynamic reactions in the budatec use case

information is displayed and processed on a role-based basis as part of the situation awareness monitor or on the mobile device for the shop floor.

Integration of best practices

If mechanisms for handling ad-hoc tasks have proved themselves, they are integrated into the enterprise model. In this way, the optimized business and manufacturing processes form a more precise basis for ML-based environment analysis in the situation awareness monitor. The interaction of the systems enables a continuous and data-based evolution of the processes. They form the basis for the transparent management of recurring as well as ad-hoc processes and support networked actions throughout the company.

Corporate environment analysis with machine learning

Due to the diverse and overlapping influences from the corporate environment (e.g., pandemic, chip crisis, natural disasters), decisions must be made on the basis of both internal company data (e.g., liquidity) and environmental information (e.g., technology trends). Thus, the base for dynamic reactions is a constantly updated picture of the company and the corporate environment.

The model-based interactive situation awareness monitor enables the simulation of factors influencing liquidity. In the MAP project, it

is extended by the strategic component of model-based environment analysis in order to identify and prepare the information relevant for the company. Machine learning (ML) methods are used for this purpose. For example, messages on the latest technological developments in the products' application areas are displayed. Therefore, the model-based interactive situation awareness monitor with integrated ML-based environment analysis forms the assistance system for senior executives in strategic corporate management.

Consortium

- Fraunhofer IPK: Head of consortium
- budatec GmbH: Application partner
- KSB SE & Co. KGaA: Application partner
- Soley GmbH: Technology partner

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