Tool manufacturing ▪ process control ▪ software modules

Production management with >ToolProduction<

Development of a web-based information technology according to Industry 4.0 for digital design and decentralized, digital process control for the production of rotation-symmetrical precision tools in industrial SMEs.

In contrast to larger engineering enterprises with corporate structures, industrial SMEs suffer from competitive disadvantages because of limited personnel when it comes to administration and production and because of smaller lot sizes to be produced. Industrial SMEs rely on a much smaller organizational apparatus for technical order management. These disadvantages can be compensated through computer support in the product-defining fields of development, construction, preparation and production.

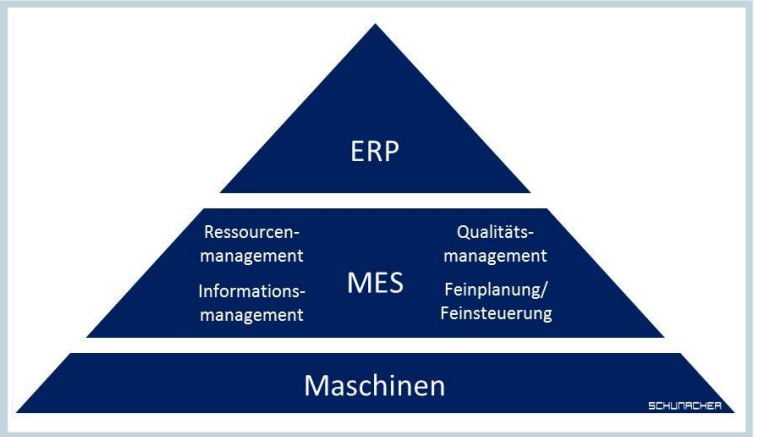
IT-support is almost as important as production itself

To release the available rationalizing potential in the fields mentioned above, the rapidly increasing demand for information during process execution must be covered. The channeling or forwarding of information that emerges during process execution requires a cross-departmental synchronization of all relevant fields. Computer support in the product-defining departments is similarly important as production itself for manufacturers with a direct link to their customers and relatively small lot sizes. With regard process control according to Industry 4.0, there is a catalogue of important organizational pre-conditions that have to available and controllable for SMEs for the successful realization of digital and decentralized control methods.

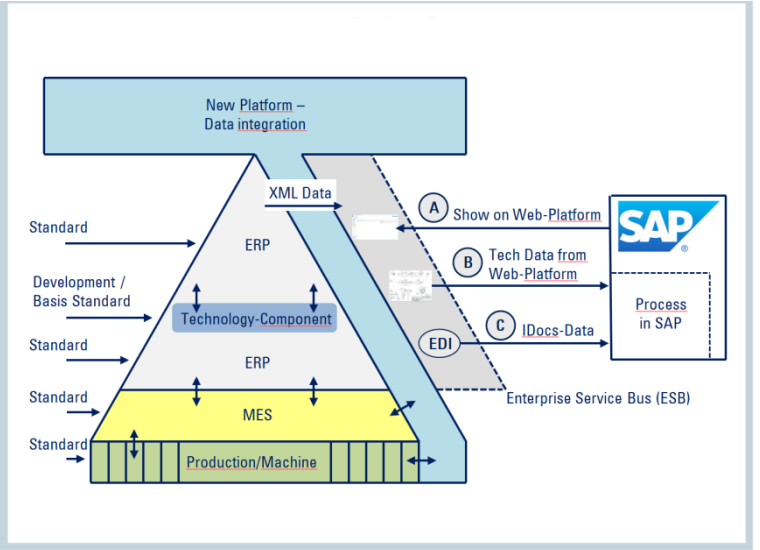
1 The increasing degree of automation and digitalization transform precision tool manufacturing into a proving ground for digital structures as the foundation of an Industry 4.0 (© Schumacher)

First and foremost, these computer-assisted systems include merchandise management modules (ERP) and process control modules (MES). Schumacher's close contacts within the board of the engineering association VDMA, Frankfurt as well as the company's research in 2015 and 2016 revealed that the organizational infrastructure of the majority of SMEs is insufficiently prepared for a realization of control mechanisms according to Industry 4.0..

The research showed that deficits were particularly striking for enterprises for which the correction of these deficits is absolutely crucial in order to introduce a cross-departmental digitalization of the processes. Even issues that appear trivial such as data redundancy can be found in today's corporate organizations. Further serious deal breakers occur in the fields of products, production and synchronization with suppliers.



2 Basis for research on the Industry 4.0 capability of SMEs: the VDI 5600 guideline for networking in production companies (© Schumacher)



3 Concept of data integration for different IT modules (© Schumacher)

The majority of SMEs is not yet prepared for Industry 4.0

Furthermore, Schumacher's research in the industry showed that the IT modules needed for a 'digital transformation' such as ERP, MES and NC-machines do not have sufficient interfaces for data synchronization with each other. This shortage represents a major challenge for SMEs in particular. This is based on an observation according to the VDI guideline 5600 for networking in production companies. The necessary framework conditions for a promising introduction of digital and decentralized control mechanisms in SMEs were fulfilled in the company Schumacher Precision Tools through the various components of computer-supported information processing in the preparation, execution, and securing of production.

As part of the introduction of a CIM strategy (Computer Integrated Manufacturing), which was initiated more than 25 years ago, Schumacher connected all areas related to production through a consistent cross-departmental information system. Today, the use of electronic data processing in the company comprises the following technical-organizational areas: warehousing, distribution, development and construction, production planning and control, production, logistics and quality assurance.. The current initiative >Industry 4.0< accounts for the changing conditions in the manufacturing industry and necessitates the advancement of the CIM-strategy, which was originally introduced in the 1980s and 90s. The integration of data and functionality in the company from the CIM-strategy is in this example an absolute prerequisite for further development of digital process control. The aim is to achieve a largely decentralized supply and processing of data whenever it offers technical and economical benefits for the company's goals. The new Schumacher project aims at developing an all-encompassing system that plans and controls processes according to Industry 4.0. The project is focused on the manufacturing of rotational-symmetric precision tools. Under the project name ToolProduction (TP), Schumacher is going to digitally project the whole process of the precision tool manufacturer, independent of the manufacturer's location: from incoming orders to construction, simulation, production, QS-management, management control, and including warehouse and distribution logistics. The centerpieces of TP are the Schumacher-developed modules ToolDesign and ToolSimulation for digital construction and simulated application of the tools. The current modules of the company – both the ERP merchandise management system as well as the MES system are to be integrated. Following the guideline VDI 5600, these IT modules will be projected onto a user interface that is going to be developed as part of this project.

Defining necessary framework conditions and identifying existing ones

The following framework conditions are available for Schumacher to successfully realize a project in this innovative field:

INFORMATION & SERVICE

HERSTELLER

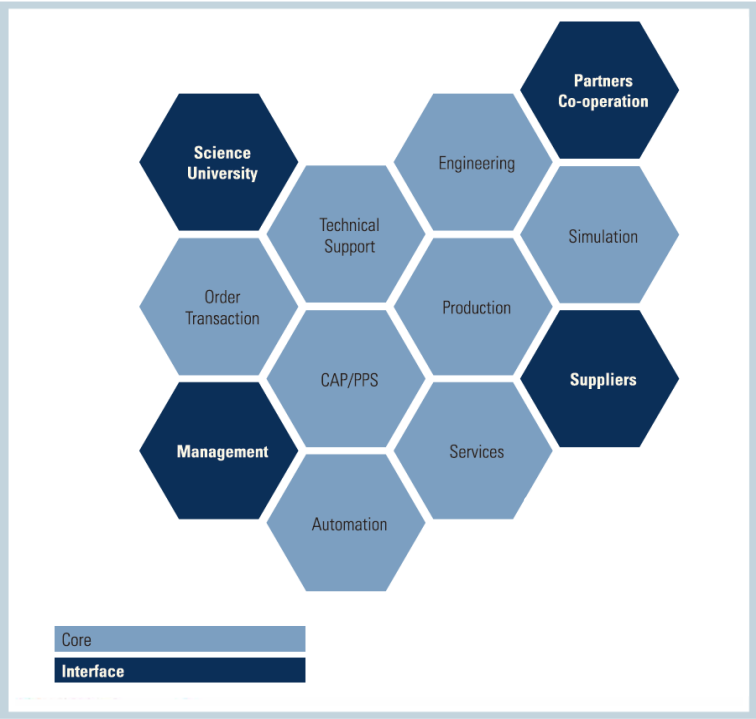
Schumacher Precision Tools GmbH
42857 Remscheid
Tel. +49 2191 9704-0
www.schumachertool.de

DER AUTOR

Dr.-Ing. Bernd Schniering ist geschäftsführender Gesellschafter von Schumacher Precision Tools in Remscheid
schniering@schumachertool.de

PDF-DOWNLOAD

www.werkstatt-betrieb.de/3316093



4 Diagram of the central flow of information within production management by the use of ToolProduction (© Schumacher)

• Clear corporate goals for process definitions
• The management identifies with Industry 4.0
• Sufficient experience with technical data processing

• The willingness and capacity to invest as well as
• Personnel resources in terms of quality and quantity

The guideline VDI 5600 was modified to ensure a unified interface for all modules with the following goals:

• Clarity in the operative usage
• Simplification of the standard modules and
• Independence from updates of the standard modules

The entire integration of the IT modules is carried out using existing, modular, core data management. Among other things, this entire core data system for Round Tools leads to the use of algorithms for the expansion of the internet-based WEB-platform with Smart Services according to I4.0. For the development of ToolProduction, Schumacher made extensive use of the mentioned CIM-concept, which the company realized with the support of RWTH Aachen.

Today's market conditions allow the conclusion that a considerable reduction of complexity costs through the use of cross-departmental process control for precision tools is a key competitive factor and thereby guarantees the survival of SMEs in this industry. The aim is to develop the system largely with standard ERP and MES modules and to modify the guideline VDI 5600 for a standardized user interface.