Industry 4.0
Needs SMEs

A brief study by
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and
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Industry 4.0 is the subject of numerous conferences, publications and subsidy programmes. You would think that it is in everyone’s mouth – so to say – but that is not the case with our small and medium-sized (SME) industry. This has been found in numerous studies of SMEs that come to the same conclusion.

Almost two-thirds (64.3 %) of the roughly 1,000 SMEs surveyed in Germany, Austria and Switzerland could not conceive of anything under the term Industry 4.0 in 2014. In the automotive industry, it was 60 %.

The reasons for this certainly lie in the inflationary use of the term Industry 4.0 (a German-language construct), which causes the related content to become less clear and precise.

And even companies that are already addressing this future trend are extremely hesitant in regard to its implementation.

According to a survey of over 200 managers at the Porsche subsidiary MHP in 2014, there are significant impediments in the "lack of transparency with regard to the economic benefits", particularly in the automotive industry (connected with the expectation of an "insufficient return on investment" and consequently a "lack of willingness to invest").

In addition, an adjustment of the processes and the work organisation, which usher one into the world of Industry 4.0, are one of the top problems with implementation.

Source: Techconsult (2014)
These empirical findings lead to headlines such as "Mittelständler verpassen die Zukunftstrends" [SMEs are missing the trends of the future] (Wirtschaftswoche), "Industrie 4.0 ist im Mittelstand noch nicht angekommen" [Industrie 4.0 has not arrived at SMEs] (Markt und Mittelstand), "Vor allem der Mittelstand, das Rückgrat der deutschen Ökonomie, hängt durch" [Primarily SMEs, the backbone of the German economy, are not keeping up] (Manager Magazine) or much more soberly in academic studies: "Ein Großteil der Fertigungsbetriebe ist derzeit noch nicht fit für Industrie 4.0, insbesondere im Mittelstand" [Most production companies are currently not yet ready for Industry 4.0, particularly SMEs] (SAS).

What should be done? There are two elementary places to start as far as we see it:

- campaigning for a holistic understanding of Industry 4.0 as a paradigm change, which will alter our industrial world, and
- pointing out specific entry points that allow SMEs in particular to see direct and transparent benefits for themselves.

### Industry 4.0 – no web-based revival of CIM/CAM

In an editorial published by the journal "Produktion", an author made the following provocative statement: "There is another new pig that has to be driven through the factory workshop: It is called the "Internet of Things" or "Factory 4.0" or "Cyber Physical Systems" and means the next generation of automation for producers. ... The idea is not really new; it already existed in the 80s with "Computer Integrated Manufacturing" (CIM) and later "Computer Aided Manufacturing" (CAM) as the first step.
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toward the digital factory. If we focused on "computer-based" back then, now it is "web-based". Nothing much has changed in terms of the actual goal – "humanless production" (Issue no. 16/2012).

Automation may play a role in the context of Industry 4.0, but the critical mission of Industry 4.0 cannot be reduced to an automation strategy in a new outfit.

Industry 4.0 stands for a fundamental paradigm shift to an intelligently networked factory that is made feasible through modern information and communication technologies – particularly an industrially-used internet. The new aspect (and the fascinating one) in this development is that in the automotive industry not only the product CAR is increasingly networked, but also the locations and processes in automotive production. And this is done with technologies that come from "outside", from other "sectors", from other worlds of innovation. The future trend of Industry 4.0 shall add Smart Factories and Smart Manufacturing to Smart Cars.

The automotive added value of the future

The automotive added value of the future does not involve automating the production process, but rather controlling the entire business process in real time.

For customers, the automotive added value process is largely a black box today. Between the order and the forecast/fulfilment of the delivery date, the customer has no transparency – irrespective of the controlling principles of the individual manufacturers – and does not know the status of his or her order. The possibility of changing customer specifications at short notice is also extremely limited.

A similar statement can be made about suppliers, which are responsible for 70% of the added value of a car today. They plan their capacities and resources according to the preview data of the manufacturers, ensure the availability of materials on the basis of split deliveries and produce using detailed delivery schedules and, with ready-to-install models, JIT call-offs. They have no transparency with regard to the production process of the manufacturer.

And the manufacturers themselves? The production process is largely planned and controlled centrally; only after the beginning of the order does it become decentral in the plant. Production is carried out on rigid, synchronized lines, with profitability reflected in units at a break-even point of over 70%.

Is this the future? – definitely NOT.

Automotive manufacturers have technically succeeded in optimising conventional drive technologies so that 4, 5 and 6 litre cars have become possible without any reduction in output. But there are still 25-28 days between the customer order and shipment to the customer (assuming available capacity). Where is the 5 to 10 day car (at least in the high volume segment)?

The automotive industry is technically at the forefront of development with its innovation leadership in various areas. Organisationally, this definitely cannot be said. In this area,
the automotive industry clearly lacks speed and transparency in its business processes. It can and must learn from other areas of innovation and life.

At the latest, the customer of tomorrow, the "digital native" (generation internet), will demand not only the networking and connectivity of the product CAR (this has already been realised by the industry), but also the business process itself. Yet the possibility of on-line configuration is no longer sufficient. On-line access to data in the order process is required, particularly the possibility of making adjustments requested by customers.

This is a particular challenge in an industry with very complex products and processes, where the production depth of OEMs continues to decline. The entrepreneurial motto of costs – quality – punctual delivery may continue unabated, but the demand for speed and flexibility will be superimposed on it. Not only the customer, but also the company's own competitiveness will require this. Market segments for each product and thus also the volumes will become smaller; life cycles will become shorter; complexity will increase again and market-related volatility will rise.

In order to meet the need for speed and flexibility at competitive costs, much has to (and will) change. However, one thing is absolutely necessary: production data in real time - within companies, between value-added partners, and with respect to the customer. This is a demand that can be satisfied with the information and communication technologies available today.

And this is the path that SMEs can (and should) head down as they develop in the direction of Industry 4.0, which will also bring direct benefits in the present.

Production control as an area with potential for optimisation in small and medium-sized industry

"Production on demand", combined with flexibility at competitive costs, is the paradigm of Industry 4.0. On the one hand, the production facilities will be made more flexible; on the other, greater demands will be made of production and order management.

The extent to which SMEs in particular fall short of this goal can be seen in the results of a survey by the Fraunhofer IAO (Fraunhofer Institute for Work Sciences and Organisation) with over 600 companies in 2013.

As the results of this survey show, flexibility in small and medium-sized industry is a very extensive and cost-intensive asset that will no longer do justice to the future requirements – including those expected by the surveyed companies.

Lack of transparency, failure to update production data and the insufficient quality of the data, unsatisfactory early identification and previews, slow reaction time in the case of deviations and changes requested by the customer – these are the shortcomings identified by a majority of small and medium-sized enterprises.
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This list also makes the gulf between today's SME reality and the vision of Industry 4.0 clear. It is also evident to SMEs that something must be done. The question is where and how to begin.

Bridges for SMEs

In our studies at SMEs, we were able to discover that they do not sufficiently use data from various sources in their companies today. Data comes primarily from business segments such as production, logistics and finance, and is largely produced by ERP and CRM systems. The reporting based on this is usually oriented on the past, offering neither a preview for what can be done in the short term nor answers to the challenges of the future.

It is known that production controls are only as good as their underlying data. Here, reality is characterised by the imprecise entry of data, lack of feedback from production and absent automation for the entry and analysis of data.

Both areas, i.e.

- insufficient analysis of available data
- shortcomings in the available data

result in order and production management that requires improvement, and forms the basis for our project planning model, building feasible bridges for small and medium-sized enterprises.

Source: IAO (2013)
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The project planning model developed by CATI/CARNET always assumes production tailored to the customer (stock check – analysis of requirements – solution model) and also combines three complementary solution modules (smart data – online visualisation – role-based distribution).

In the SMART DATA module, it is already possible today, with a reasonable effort, to select available data, link it intelligently, evaluate it dynamically and obtain results in real time. A process in Business Analytics helps with this. This does not eliminate possible shortcomings in the available data, which are due to operating processes in particular, however.

Starting with select pilot applications, SMEs can deal with this by pursuing the more intensive evaluation of machine data and by using RFID / sensors for the automatic feedback of production data.

In the ONLINE VISUALISATION module, it is possible to see on-line statistics of the factory (parts of the process and the overall process) in real time with a reasonable effort. The status of the factory is no longer determined as a result of numerous phone calls, but can be seen at the push of a button. Visualised reporting (oriented on target/actual values with included thresholds and warning features) as well as retrieval tools for selective detailing can also be supplied in real time. Business Analytics and Visual Computing also allow for decision-oriented forecasting in the case of occurring/assumed deviations or malfunctions, and facilitate preventive risk management as a result.

Source: CATI / CARNET (2014)
In the module ROLE-BASED DISTRIBUTION you can obtain location- and function-based information and data in real time by linking technologies to indoor tracking within the factory, incl. push signals with a warning function. This provision of information and data also includes the use of mobile end devices. Interactive tools also let the individual user integrate additional data, information, object drawings and photos, etc. by using augmented reality.

Summary

SMEs will only achieve Industry 4.0 by taking small steps down this path. Whether or not we call these individual steps Industry 4.0 is secondary.

The implementation of the system described for Production Management 4.0 does not mean that orders control themselves as they pass through the factory, nor does it mean that they already engage the required machines and equipment themselves and also order the required material independently. But with such digital step, two core elements of Industry 4.0 enter into the factory: information in real time and the integration of de-centralised data sources and responsibilities.

Besides the direct gain for production management through greater flexibility at a lower cost, we consider this integration of decentral components to be indispensable. Industry 4.0 requires not only SMEs, but also the digital competency of people.
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