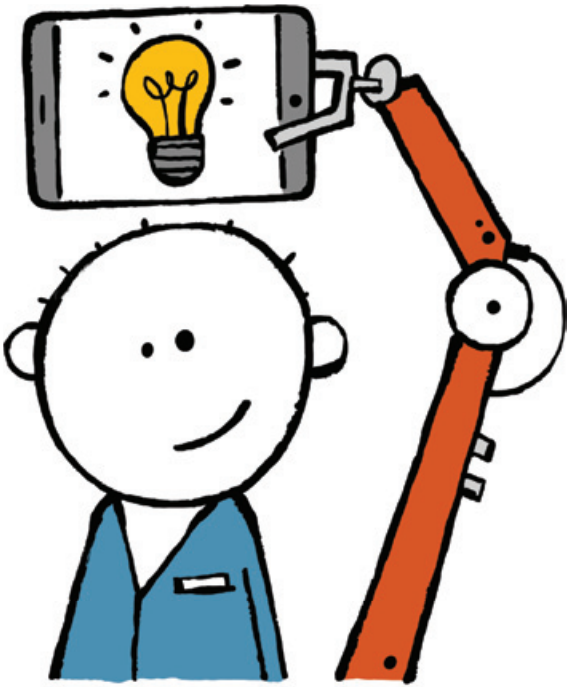
GOING SMART

Milestones on the Road to an Intelligent Factory

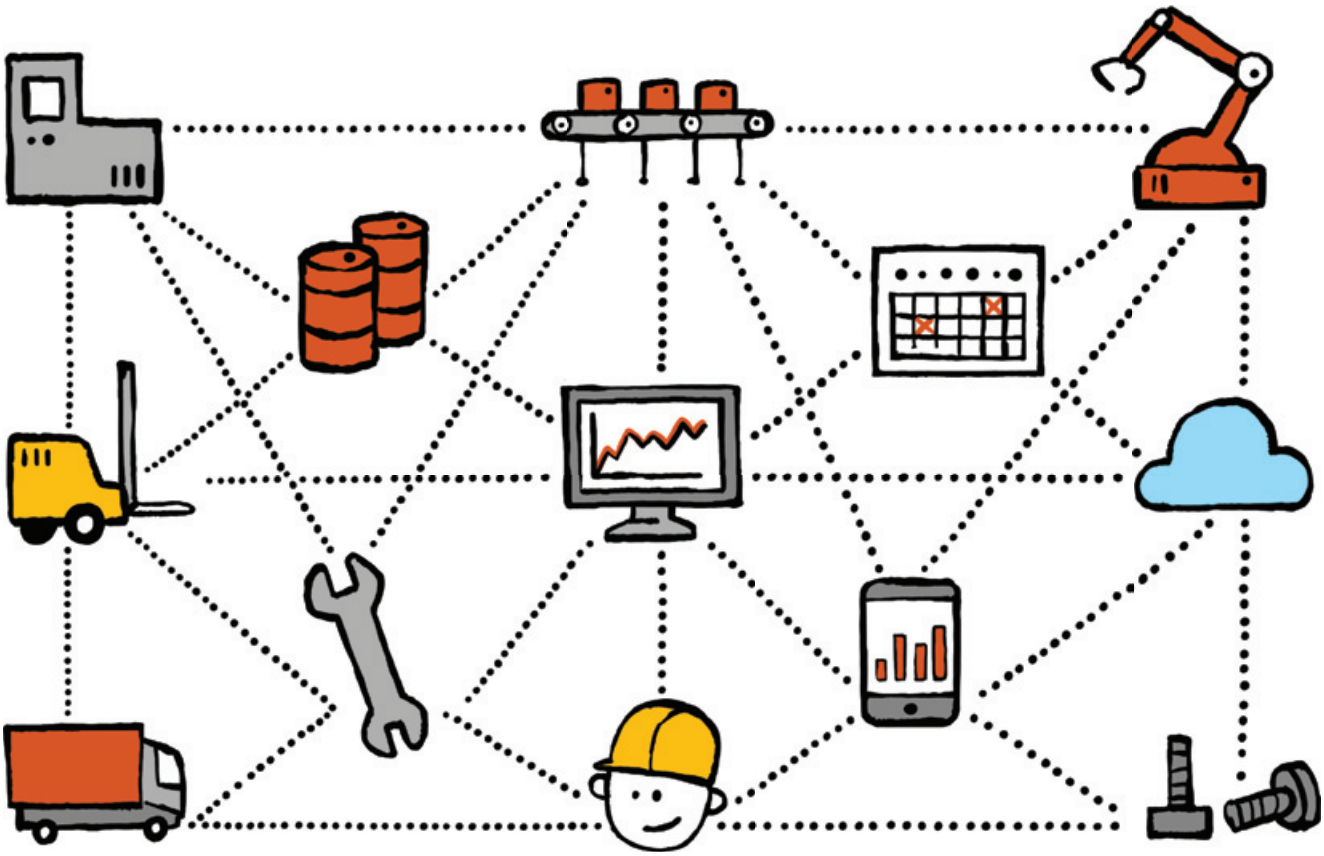
by Professor Werner Bick, Chief Representative, ROI Management Consulting AG



Ever since the first factories came into being in the 17th century, such institutions have been the traditional focus of commercial and technological approaches to optimization and innovation. In the context of digitalization, too, the spotlight is once again on the factory floor, as the increases in efficiency and effectiveness promised by the use of IoT and Industry 4.0 technologies directly affect the processes and organization of the production plant—or "smart factory". The way to increasing quality and output while using fewer resources is via a comprehensive model of operational excellence. In this area, six especially promising elements have come to the fore over recent years.

Core Technologies of the Smart Factory

1. One essential element in making the intelligent factory a reality is the widespread use of assistance systems. As a complement to lean approaches, these are intended to reduce the pressure on workers, both physically and in terms of time, enabling them to concentrate on value-adding core activities. On the physical level, assistance systems in the factory have in many cases already been implemented in the form of autonomous transportation systems, or robotics solutions. Nevertheless, it is digital technologies that above all else offer the greatest potential. For example, the status of a machine can be quickly and easily read using apps that run on a tablet, while capacity utilization, critical wear values, and advanced statistics are immediately available thanks to the inclusion of all the elements involved in a "factory cloud". In this context, new opportunities are offered by the use of augmented reality technologies, which as a result of low-cost, user-friendly, and effective devices such as smart glasses are becoming ever more attractive. Thus, for example, working instructions or important statistics can be made directly accessible.



2. Another key characteristic of the smart factory is its decentralized organization. The dismantling of pyramid-type structures in favor of a network aligned with the process of creating value reduces control costs and allows for the largely autonomous coordination of the various network elements and production-relevant software solutions, such as ERP, MES, and PPS systems. These are based on the use of M2M, RFID, or smart OTS technologies and the equipping of machinery, tools, and production facilities with sensor technology.

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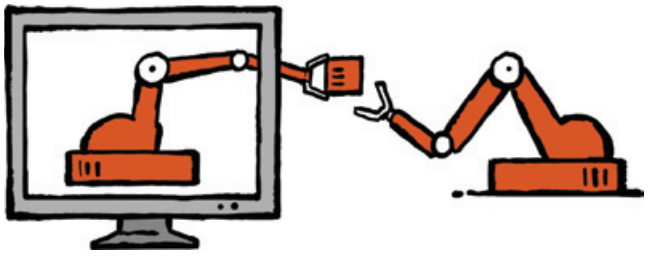
3. With regard to the avoidance of waste and production errors, increasing importance is being assigned to real-time production control and real-time quality control. The deployment of sensor-based solutions enables key process parameters to be captured in real time and compared to sample values. This allows counter-measures to be taken in good time, resulting, for example, in a significant reduction in reject parts. For example, by analyzing sensor signals in the welding process, systems can immediately detect a high probability of a defective welding point and therefore correct the welding procedure within milliseconds. The same principle underlies what is termed "smart" quality control. In this case, specified critical values are used on a continuous basis to take measurements. Errors are therefore identified and corrected very early on, leading to a significant reduction in quality-related costs.

4. One of the best known scenarios being discussed in the context of the smart factory is "predictive maintenance". This approach, which combines statistical forecasting models with sensor technologies, is often cited as an example of the way that new business models can develop, or at least can be developed further. This combination of product and service, however, is of most significance within the factory. Not only can costs be dramatically reduced by the fact that maintenance takes place at the very moment it is needed and production standstills due to total system failures can be avoided – but the analysis of operational data and load scenarios also allows for the very precise allocation of production resources and the avoidance of idle states or system overload. At the same time, predictive maintenance approaches can be combined with condition-monitoring systems for the continual tracking of especially critical elements. This enables machinery to remain at high availability levels while costs are substantially reduced.



5. A strategy for handling with big data forms the common basis for all of the technologies described. The benefits of digital technologies can only be sustainably exploited when there is an integrated approach – in terms of how the immense quantity of data arising in a smart factory might be efficiently and securely clustered, analyzed and incorporated into decision-making processes.

6. The organization and processes within a smart factory are significantly different from those that characterize the traditional image of a production plant. They involve not just the dismantling of accepted procedures but also questioning established social frameworks and skills that had been thought of as secure. A structured approach to shop-floor management and an intensive engagement with newly introduced processes and technologies are therefore vital factors in breaking down old routines and the establishment of new working methods and use scenarios.

Smart Start

Nowadays, particularly in the high-wage economies of the West, all sectors could profit from the introduction of at least some Industry 4.0 elements to their factories – and in fact should do so if they are to succeed long-term in the face of global competition. Despite this, the degree of implementation currently seen in industry is surprisingly low. An important reason for this – stated in polemical terms – lies in managers' inability to "slice the elephant", as it were. Very often, the task of implementing smart factory principles is hindered by a concentration on taxonomies, extensive safety concepts, and highly complex visions. This process is used to dismiss the opportunities for embarking on small-scale digitalization. However, the highly dynamic nature of the topic, the extremely fast pace of technological change, and the lack of standards in the field actually call for more local initiatives, a willingness to engage in a trial-and-error approach, and a passion for creative experimentation. As the organizers of the "Industry 4.0 Award", we have observed over the last few years that the majority of successful projects have come about without five-year plans. This clearly shows that a "smart start" is the best way of bringing the smart factory into reality.

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