# DIGITAL STEEL

## What IT and production can achieve together

*By Hans-Georg Scheibe, Member of the Management Board, ROI Management Consulting AG*

Let's conduct a little test. What do most technological and organizational developments of the last few years have in common? I would say convergence. Convergence, from the Latin word 'convergere' – to incline together – is what we can observe in many areas and what is both an opportunity and a problem at the same time. It is an opportunity because the combination of known elements gives rise to something new – new products, new solutions, new business models. It is a problem because the complexity that arises from the integration of what were hitherto independent elements is huge – at a strategic, technological, procedural and ultimately cultural level. This development is particularly severe with regard to the fusion of digital and analog elements, when ones and zeros are combined with steel.

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What we can see today is the likely large-scale deployment of cyber-physical systems (CPS) in development, industrialization and production that has the potential to be a game changer in a large number of industries. As a kind of 'spiritual successor' to the Internet and to computer-integrated manufacturing (CIM) in particular, CPS will open up a whole new level of integration by providing analog structures with intelligence and communication capabilities and linking heterogeneous production and logistics environments with remote networks.

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**The network paradigm**

This results in a process for dealing with the overall application that is distributed and networked rather than being based on centralized management from production control centers as is the case with CIM. It enables objects in the network to manage themselves and thus allows not only the integration but also the distribution of management tasks. A network develops that in comparison to conventional process and structural models of the organization allows a faster and more flexible response to changing customer expectations, increasing demand for customization and market fluctuations. The role of IT in this is pivotal since without it the Internet of Things is not possible. The technologies that are available today can overcome the restrictions that hampered the CIM solutions of the 1980s and 1990s and that ultimately prevented their universal deployment.

As with Internet-based business models, proof must also be provided in this instance that a fascinating base technology is also capable of satisfying concrete requirements and enabling new process landscapes that actually pay off for businesses and customers alike. And as with the Internet, we will experience a great many flops and only a few models for success in the coming years. However, these will be of such transformative nature that they will radically change the rules of the game in manufacturing industry.

**Internet of things**

A marvelous example of this is provided by Maschinenfabrik Reinhausen (MR), winner of the current Industry 4.0 Award presented by the trade journal 'Produktion'. MR has actually succeeded in generating long-term competitive advantages from the integration of formerly separate units. As Johann Hofmann, MR's CAM Business Unit Manager relates in this issue of DIALOG, the company has developed an intelligent system that interconnects the different production plants with each other enabling them to communicate and exchange information. This unique network is not organized along centralized lines but instead allows local data storage. And the other elements in the network can fetch the information from where it is stored – a CPS and Internet of Things in the purest of forms. Modifications and adjustments that are initiated at a certain point in the network take effect throughout the network at the speed of Twitter. Savings in terms of time and cost and the increase in process transparency are huge. The relevance of this development for the future – particularly in a high-wage country like Germany – is obvious. When deployed correctly, cyber-physical systems enable a jump in productivity, especially with regard to small batch runs and product customization.

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CPS at Maschinenfabrik Reinhausen also illustrates the fundamental structure of Industry 4.0. It includes manufacturing execution systems (MES) that control operational order workflow and thereby the exchange of information between the elements of the production network. This is the area that is today often the focus when dealing with Industry 4.0 at a practical level The second fundamental area is that of production planning and management systems (PP / PPM), which constitute not just a technological but also in particular a procedural challenge. The principles of lean logic must be applied in order to avoid creating an IT monster. As many areas of production as possible must function under autonomous control using basic data and enable a production facility to optimize itself. However important this

planning tier is, Industry 4.0 takes place primarily in the field. It requires a lean and flexible control logic but must in all other respects rely on the intelligence of the network.

**All theory is gray**

However, as is so often the case, this is more easily said than done, since the organizational as well as cultural consequences of an extensive Industry 4.0 implementation are huge. A large proportion of conventional business processes are turned on their head, especially as departmental and even corporate boundaries may continue to function as the limits of communication. Vertical as well as horizontal integration is the prerequisite for an organization that has a decentralized structure and distributes intelligence throughout the network. There is probably no decision-maker who would not subscribe to this view. There are, however, probably few companies that have managed to implement this type of collaboration and distribution of competences without any problem. Network organizations are indispensable for managing increasing complexity and in particular volatility. However, they contradict almost our entire professional socialization, our learned patterns of interaction and the forms of work and organization that derive from them – provided employees are older than 20.

A further significant factor is the fragmentary and heterogeneous IT landscapes with which most companies still have to struggle. And not just companies. A glance at the market for IT service providers reveals first and foremost a picture shaped by insular solutions and 'best-of-breed' approaches. None is currently suited to meeting all the technological requirements for company-specific cyber-physical systems.

Against this background it is advisable to choose an approach that is guided by a pragmatic vision. This means, above all, not putting the cart before the horse. The crucial question is about what technological architecture is to be developed to cope with concrete market and customer requirements and how extensive it needs to be – and not about how existing technologies can be harnessed. As at Maschinenfabrik Reinhausen, implementation often has to be based on in-house developments and creative solutions. For this reason in the coming years Industry 4.0 will continue to be primarily an experimental field at the interface between technologies, processes, the exigencies of business and inspiration.

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